ACONCHEGO: CONSTRUCTION AND VALIDATION OF AN APPLICATION TO SUPPORT MENTAL HEALTH

ACONCHEGO: CONSTRUÇÃO E VALIDAÇÃO DE APLICATIVO PARA APOIO À SAÚDE MENTAL

ACONCHEGO: CONSTRUCCIÓN Y VALIDACIÓN DE APLICACIÓN DE APOYO A LA SALUD MENTAL

João Breno Cavalcante COSTA[1]
e-mail:brenocavalcanteenfermagem@gmail.com
Eliany Nazaré OLIVEIRA[2]
e-mail: elianyy@hotmail.com
Paulo César de ALMEIDA[3]
e-mail: pc2015almeida@gmail.com
Maristela Inês Osawa VASCONCELOS[4]
e-mail: miosawa@gmail.com
Joyce Mazza Nunes ARAGÃO[5]
e-mail: joycemazza5@gmail.com
Emanoel Avelar MUNIZ[6]
e-mail: emanoel.muniz@ifce.edu.br

Editor: Prof. Dr. Paulo Rennes Marçal Ribeiro
Deputy Executive Editor: Prof. DrJosé Anderson Santos Cruz

[1] Federal University of Ceará (UFC), Sobral – CE – Brazil. Student of the Academic Master's Degree in Family Health – UFC, Sobral, Ceará.
[2] Vale do Acaraú State University (UVA), Sobral – CE – Brazil. Postdoctoral. Professor of the Nursing course at (UVA).
[3] State University of Ceará (UECE), Fortaleza – CE – Brazil. Teacher.
[4] Vale do Acaraú State University (UVA), Sobral – CE – Brazil. Professor of the Nursing course (UVA).
[5] Vale do Acaraú State University (UVA), Sobral – CE – Brazil. Professor of the Nursing course at (UVA).
[6] State University of Ceará (UECE), Fortaleza – CE – Brazil. PhD in Clinical Care, Nursing and Health

ABSTRACT: This study aimed to build and validate a mental health support app. A methodological study was conducted to construct and validate a mental health support app from May 2021 to November 2022. Three stages were developed: situational diagnosis of scientific and technological production on the subject, development of the mobile application, and validation by Mental Health and Technology experts. The mobile application, called "*Aconchego*", provides support channels and tests to assess the mental state. In the validation by experts, the application showed excellent Appearance (1.0), Content (0.90), and Usability (0.91) validation indices. It is concluded that the Aconchego app, in its final version, is a powerful strategy to access reliable information through content based on scientific knowledge in a fast, didactic, non-tiring way and with language appropriate for the community in general.

KEYWORDS: Mental health. Medical informatics. Psychosocial support systems. Health promotion. Validation study.

RESUMO: O objetivo deste estudo foi construir e validar um aplicativo de apoio à saúde mental. Estudo metodológico de construção e validação de aplicativo de apoio à saúde mental, realizado no período de maio de 2021 a novembro de 2022. Desenvolveu-se três etapas: diagnóstico situacional da produção científica e tecnológica na temática, desenvolvimento do aplicativo móvel e validação por juízes das áreas de Saúde Mental e Tecnologia. O aplicativo recebeu o nome de "Aconchego" e disponibiliza de canais de apoio e testes para avaliação de seu estado mental. Na validação por juízes, o aplicativo apresentou excelentes índices de validação de Aparência (1,0), Conteúdo (0,90) e Usabilidade (0,91). Conclui-se que o aplicativo Aconchego, em sua versão final, constitui uma estratégia potente para acesso às informações confiáveis, mediante conteúdos pautados em conhecimentos científicos, de maneira rápida, didática, não cansativa e com linguagem adequada para a comunidade em geral.

PALAVRAS-CHAVE: Saúde mental. Informática médica. Sistemas de apoio psicossocial. Promoção da saúde. Estudo de validação.

RESUMEN: El objetivo de este estudio fue construir y validar una aplicación de apoyo a la salud mental. Estudio metodológico de construcción y validación de una aplicación de apoyo a la salud mental, realizado de mayo de 2021 a noviembre de 2022. Se desarrollaron tres etapas: diagnóstico situacional de la producción científica y tecnológica sobre el tema, desarrollo de la aplicación móvil y validación por expertos de Salud Mental y Tecnología. La aplicación se llamó "Aconchego" y brinda canales de apoyo y pruebas para evaluar el estado mental. En la validación por expertos, la aplicación mostró excelentes índices de validación de Apariencia (1,0), Contenido (0,90) y Usabilidad (0,91). Se concluye que la aplicación Aconchego, en su versión final, constituye una poderosa estrategia para acceder a información confiable, a través de contenidos basados en conocimiento científico, de forma rápida, didáctica, no cansadora y con lenguaje apropiado para la comunidad en general.

PALABRAS CLAVE: Salud mental. Informática médica. Sistemas de apoyo psicosocial. Promoción de la salud. Estudio de validación.

Introduction

Mental health (MH) is considered a public health issue due to the significant prevalence of mental disorders and social and economic impacts (FARO *et al.*, 2020). This raises awareness of the need for investments and changes in the MH care model worldwide, aiming to make the patient protagonist and co-responsible for monitoring and caring for their health (NÓBREGA *et al.*, 2021).

The use of mental health applications is popular in developed countries, such as the United States, United Kingdom, Canada and Australia, and health professionals often receive patients who are already using these digital tools. They are committed to offering possibilities for self-diagnosis, monitoring, symptom management and treatment (PARKER *et al.*, 2018).

It is possible to offer, for example, psychoeducation, meditation, breathing exercises, mindfulness, approaches from cognitive behavioral therapy, games, and chat for interaction between users (DRISSI *et al.*, 2020). A study conducted in Australia, with 525 people, reported that 76% of the sample showed interest in using applications, if they were free to use, for monitoring and self-management in mental health (ANTONIALLI, 2022).

With the evolution of smartphones and their widespread access, Mobile Applications (apps) have become tools for tracking information and encouraging people to self-care and representing a resource to be used by health professionals (GALINDO NETO *et al.*, 2020). mHealth mobile health technologies, a term used for healthcare practice supported by mobile devices, are an effective means of providing psychological and psychiatric treatment, if their offering is based on scientific evidence and contributes to helping users be more informed and active in the treatment.

With new investments and changes in the mental health care model worldwide, patients are increasingly becoming co-responsible for monitoring and caring for their health. However, most applications aimed at co-responsibility for care focus on chronic physical conditions, for people undergoing mental health treatment, they are still little explored, although they offer the potential to provide education, promote self-management and support rehabilitation objectives (RAMEY *et al.*, 2019).

With the onset of the COVID-19 pandemic, in view of the difficulty in effective communication, the need arose for the general population to seek care for their mental health, thus science joined the cause by producing several publications of studies on the use of digital applications in mental health around the world, with approaches to evaluating changes in behavior and/or signs of psychological distress in the general population, among students and

among health professionals (HUCKINS *et al.*, 2020; MARQUES *et al.*, 2021); adherence to the use of applications (DRISSI *et al.*, 2020); the availability of digital tools (ZHANG; SMITH, 2020); app design (RAVALIER *et al.*, 2020); in the effectiveness/efficacy of interventions (O'DONNELL; DUNBAR; SPEELMAN, 2020; LATOUR *et al.*, 2020).

This study aimed to build and validate a mental health support app. Initially, a situational diagnosis of scientific and technological production on mobile device applications that offer mental health support was carried out, followed by the development of the mobile application and, finally, validation by judges in mental health and technology.

Method

Ethical aspects

The study is part of a broader research entitled "Mental Health in Times of COVID-19: analysis and monitoring of Higher Education Students in the State of Ceará" financed by Notice nº 02/2020 of the Research Productivity Scholarship Program, Estímulo to Interiorization and Technological Innovation – BPI – FUNCAP, approved by the Research Ethics Committee of the Universidade Estadual Vale do Acaraú (UEVA), whose opinion is attached to this submission. Informed Consent was obtained from all individuals involved in the study via written/online means.

The research was developed in two phases. The first was a quantitative and cross-sectional study. The results of this first stage served as a diagnostic basis for the next stage. The second stage is constructing and validating a mental health support application for higher education students in the state of Ceará.

Study design, stages and period

The article is a methodological study for constructing and validating the content, appearance, and usability of a mental health support application carried out from May 2021 to November 2022. The research was carried out in three stages: situational diagnosis, scientific and technological production on the topic, development of the mobile application, and validation by judges in Mental Health and Technology.

The diagnostic, scientific, and technological phases aimed to search databases and digital platforms for studies and software that discussed and raised issues aimed at supporting

João Breno Cavalcante COSTA; Eliany Nazaré OLIVEIRA; Paulo César de ALMEIDA; Maristela Inês Osawa VASCONCELOS; Joyce Mazza Nunes ARAGÃO and Emanoel Avelar MUNIZ

Mental Health. In the development phase, the Design Thinking model was used as a method, and finally, validation was carried out through selecting judges with expertise in mental health and technology.

Step 1: Situational diagnosis of scientific production on applications on mobile devices that offer mental health support

The following guiding question was raised: what mobile mental health support applications are available on digital media and in databases during the COVID-19 pandemic period? With the following assumption: A Mobile Application to Support Mental Health built based on scientific literature and digital platforms, considering the characteristics and needs of the general population and validated by judges, it will help the patient in self-care and promote their mental health.

The initial search was carried out by surveying productions related to the topic of Mental Health support applications in times of the COVID-19 pandemic, in international and national health databases: Medline (VHL) and PubMed. The descriptors "Mental Health", "Information Technology", "Pandemic", "COVID-19" and "Application" were crossed, together with the Boolean operator AND, covering for filtering by crossing by "Title, summary, subject".

Available articles, complete texts and published between 2020 and 2022 were included and duplicated production and studies that did not address topics relevant to achieving the research objective were excluded.

The total number of productions found was 53 articles, of which 36 appeared in PubMed and 17 in Medline (VHL), after insertion of the inclusion criteria, 48 scientific articles remained, 34 in PubMed and 14 in Medline (VHL), however, when applying the exclusion criteria and reading the full text, four articles fit the proposed object, three in PubMed and one in Medline (VHL), in which they brought discussions about the use of applications to support mental health in times of COVID-19 pandemic.

The results were compared and substantiated with the propositions proposed by the applications, regarding their positive and negative points, functionality, and users' evaluation of their applicability. The information from each reviewed article was covered in a succinct and systematic way, comparing the findings.

Thus, the review identified ten software, and after analysis, it was found that they all contained themes aimed at promoting health and the interactivity of the software with the user,

thus being effective in improving the well-being and offering support for the public's mental health in general (COSTA *et al.*, 2022).

Step 1.1: Situational diagnosis of technological production of applications on mobile devices that offer mental health support

In addition to the methodological process, the material in this review was complemented by the identification of applications that appeared on the Google Play (Play Store) digital platform. The search was carried out based on the terms "Mental Health" and "Pandemic", resulting in 250 mobile applications. As inclusion criteria, the following were listed: applications (apps) that addressed mental health promotion without language restrictions and available in paid and free forms. Exclusion criteria: applications that had not been updated in the last two years, with functionalities like those selected and without user evaluation. Based on these criteria, eight applications were selected for analysis. Finally, the materials were read in full, categorized, critically analyzed, and presented.

Step 2: Application development

The design methodology mixed different linear models, known as the Horst Rittel model, and the graphic design methods of Gavin Ambrose and Paul Harris, called Design Thinking (HARRIS; AMBROSE, 2012). According to Rittel, each stage will always depend on the result of the previous stage, and there may be specific feedback within each stage. Thus, the methodological organization of Rittel's model is divided into the establishment and understanding of the problem, collection of information, analysis of information, development of alternative solution concepts, evaluation, and reevaluation of alternatives, tests, and implementations (SOUSA, 2019).

The Design Thinking method aims to find an appropriate solution to a problem, a process that, in general, begins with the work of identifying the problem, that is, being able to select works and styles in order to find something specific. Like Rittel's method that searches for problematic situations, in Design Thinking, there is a problematization phase, a research phase, a creative phase, detailing, implementation, and feedback (SOUSA, 2019).

In the problematization and research phase, the aim was to establish and understand the problem, collect information, and analyze the information, considering the findings of the "situational diagnosis of scientific and technological production" stage.

Considering the development of alternative solution concepts, the following were established: language style; font and font size; clear, concise texts that bring the application user closer to the context; choosing the name of the application and the creative phase, according to Design Thinking.

In this sense, a specialist in the area of design and application development was hired, the most viable platform was analyzed, the principle of Color Psychology was used, and the types of background contrast were chosen considering legibility in communication for harmonious use, and using dynamic media and infographic elements (GUERRA; TERCE, 2020).

In the detailing, implementation and feedback phase, the evaluation and reevaluation of alternatives, tests and implementations were considered. Having been developed through conversation circles with experts in the field of design and app development as well as advisors and academics. The moments were mediated by meetings, in person and remotely, with the aim of creating the screens that would make up the application.

The face-to-face meetings were held as conversation circles and took place monthly with the Mental Health Study and Research Group (GESAM) at the Vale do Acaraú State University (UVA), the agendas were focused on support possibilities, internal validation of evaluative tests and the software design, undergraduate and postgraduate students and researchers and teachers in the areas of mental health and technology participated in this moment and the duration was around sixty minutes. All suggestions were considered and discussed with the group.

As for the remote meetings, these took place bimonthly via Google Meet and aimed to share with the professor and researcher specializing in design and application development the discussions raised in the conversation circles, aiming at the construction of the prototype and validation by the supervising professor and student.

Step 3: Application Validation

To validate the application, a committee of judges was formed. In the literature, there is no established standard regarding the criteria for defining a judge and not even a consensus regarding the necessary number of individuals for the validation stage. However, the importance of selecting professionals who have experience and knowledge of the subject studied is highlighted (MELO *et al.*, 2020).

Thus, in this work, the judges were selected based on the following inclusion criteria: professionals working in the areas of mental health and/or management and with expertise in care and/or teaching in research and development and testing of evidence of the validity of health technologies, preferably in prototypes and applications for use in clinical practice.

Various references determine the number of experts who will be judges in the validation processes. This study used Pasquali's (2010) framework, which recommends a total number of judges ranging from 6 to 20. As for the selection process, the criteria established by Fehring (1994) were followed to ensure that only trained professionals who researched the topics judged the quality of the material to be validated. The searches were carried out by analyzing the Lattes curriculum through the Lattes Platform. This entire process of analyzing the CVs lasted approximately one month.

To the judges, an invitation was sent by email in October 2022 explaining the objectives and procedures for evaluating the appearance, content and usability of the application, in addition to a copy of the Free and Informed Consent Form (TCLE), the application link in the Android Package Kit (APK), which is a file format used by Android systems for distributing and installing applications, a form for a brief characterization of these judges and the Appearance, Content and Usability Validation Instrument, proposed by Jakob Nielsen (1993).

To validate appearance, content and usability, the Item (CVI-I) Content Validity Index (CVI) was used by content experts, who gave the item a relevance rating. The total Content Validity Index (CVI-total) was calculated by CVI-total/Ave (average) – an average of CVI-I and CVI-total/UA (universal agreement), which represents the proportion of items that achieved a classification of relevance for all specialists. It has been suggested that a CVI with a value of 0.88 or higher provides satisfactory evidence for validation of appearance and content (POLIT; BECK, 2019).

Regarding usability, we used Nielsen's usability heuristics (1993), which concern usability patterns, which are fully known by experts and whose absence is easy to recognize. It

aims to analyze the interface with standards in mind, highlighting non-conformities and suggesting actions to correct them.

Statistical analyses were performed using SPSS® (Statistical Package for the Social Sciences) software version 20®. Reliability in the technology equivalence dimension was assessed by the Intraclass Correlation Coefficient (ICC). The closer the value is to 1.0, the stronger the evidence of reliability (POLIT; BECK, 2019). After analyzing the data, they were systematized and presented through the construction of tables, using simple descriptive statistics, CVI analysis, and Conbrach's Alpha Coefficient to evaluate the reliability of the research (CRONBACH, 1951).

Results

Mental Health Support Application Construction Process

The app was named "*Aconchego*", and its final version resulted in 105 screens, distributed as follows: home menu, support screens, test screens and records screen. The screens were created based on the recommendations found in the narrative review (COSTA *et al.*, 2022), as well as the arrangement of functions so that the user has easy access and use. To improve the APP's interfaces and functionalities, five workshops were held with members of the Mental Health and Care Study and Research Group (GESAM). In these workshops, each interface and its content were discussed and analyzed.

Figure 1 – Logo of the Mobile Application "*Aconchego* APP"

Source: Prepared by the authors

When accessing the application, the user will have access to the menu screen, being welcomed by a pre-screening with "emoticons" about their mental health status, and just below, they will find icons directing them to its functionalities, whether to carry out assessments,

search for support, browse your previous records and information about the application. If this is the user's first access, there is an icon briefly specifying the navigation process and the content that will be found.

The icon related to support allows the user to go directly to the interface with several tabs and sub-tabs dedicated to the function, namely: meditation, food, music, series, films, *lisamcast*, and support channels. All information and directions made in this interface are public property, not causing accessibility conflicts between the user and the application.

As for the assessments, these will be carried out based on tests, validated nationally and internationally, with the adapted questionnaires "evaluating anxiety, depression and stress" (PATIAS *et al.*, 2016) "Evaluating mental suffering" (SOÁREZ *et al.*, 2007) and "Evaluating mental health care" (ABC, 2020). The tests are composed and parameterized by scores according to official validation, and the result is presented after the end of the exercise. It is worth noting that the tests are not for diagnostic purposes, but, depending on the degree of exposure to the result, the software suggests a search for help, directing you to the support screen.

The first test, referring to the icon "Assessing anxiety, depression, and stress," refers to the DASS-21 scale, this questionnaire contains 21 (twenty-one) questions with scores from 0 to 3 according to the Likert scale. After completion, the application measures an assessment that presents a result according to the Anxiety, Depression, and Stress dimensions in Normal, Mild, Moderate, Severe, and Extremely Severe, and depending on which classification the dimension is presented, it brings a brief text directing the user the best follow-up to take (PATIAS *et al.*, 2016).

The second test, referring to the icon "Assessing my mental health," refers to the SRQ-20 scale, this questionnaire contains 20 questions with answers of "Yes" or "No". This scale detects symptoms related to mental health problems in relation to the last 30 days. This test can be considered a screening test for detecting significant symptoms in mental health (SOÁREZ *et al*., 2007).

The third and final test refers to the icon "Evaluating mental health care", related to a quiz called Mental health care test. The quiz contains 10 questions about mental health care, which assesses your attitudes and behaviors daily. At the end, the result is presented based on the correct score (ABC, 2020).

Figure 2 – Screens of the "*Aconchego* APP" Mobile Application
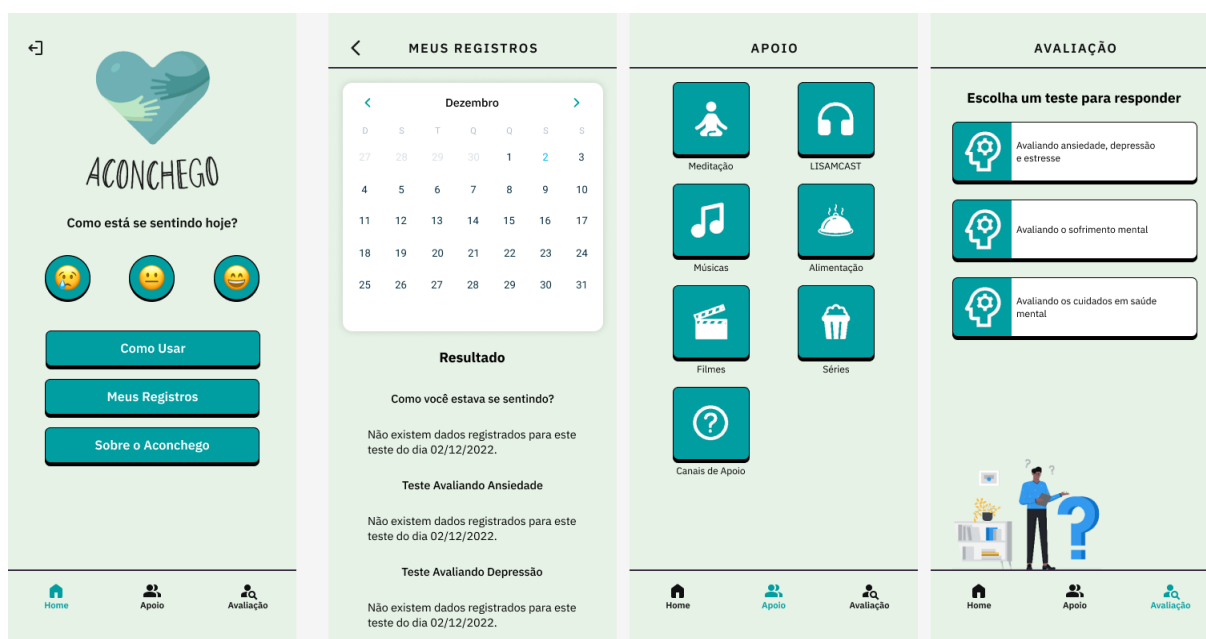
Source: Prepared by the authors

Evidence of validity of application content, appearance and usability

The participating judges in the validation process totaled 12, of which nine validated the appearance and content, and three assessed usability. The judges were selected based on pre-established criteria of expertise and experience in Mental Health and Technology.

The nine judges who validated the content and appearance had an age range of 37 to 69 years (average 50.0 years), with 77.8% being female. Eight of them were nurses, and one was a psychologist. The highest academic qualification was a Ph.D., accounting for 77.8%; all had dissertations and theses in the relevant field. These professionals were affiliated with eight institutions in six states in Brazil, namely Ceará, São Paulo, Maranhão, Piauí, Goiás, and Santa Catarina. Regarding professional practice, five were involved in teaching, three in management, and one in research. Among them, 88.9% had published scientific articles in indexed journals covering the topic of Mental Health. All judges had clinical and teaching experience in Mental Health Promotion.

The three judges who validated usability were aged between 38 and 41 years (average 40.0 years), and all were male. In terms of academic background, they were from the fields of electrical engineering, systems analysis, and computer science, with their highest qualifications

being post-doctorate, doctorate, and master's, respectively. All of them had published scientific articles in indexed journals that addressed the topic of technology.

Table 1 – App appearance assessment by mental health judges

Variables	PA*	TA*	CVI*	Cronbach's Alpha
1. The colors used in this Mental Health Support Application are appropriate.	11.1	88.9	1.0	0.89
2. The use of images and figures in this application is appropriate.	11.1	88.9	1.0	0.91
3. The resolution of the images is appropriate.	11.1	88.9	1.0	0.90
4. The use of media in this application is appropriate.	11.1	88.9	1.0	0.89
5. The size of the interfaces in this application is appropriate.	11.1	88.9	1.0	0.90
6. The overall appearance of the application is attractive.	0	100	1.0	0.90
7. The appearance of the application is modern and light.	0	100	1.0	0.90
8. The appearance of the application corresponds to the proposed theme, regarding support in Mental Health.	11.1	88.9	1.0	0.89
9. The typography used in this application is appropriate.	33.3	66.7	1.0	0.88
10. The typography used in this application is appropriate in terms of legibility and readability.	44.4	55.6	1.0	0.89
CVI – total			1.0	0.90

Source: Prepared by the authors

The Appearance Content Validation Index was evaluated and unanimously resulted in a total CVI of 1.0, which was considered excellent. Only 2 items (9 and 10) showed greater partial agreement and were considered to improve the application's typography. The Cronbach's alpha obtained was 0.90, showing a very high-reliability classification, as classified by Freitas and Rodrigues (2005), resulting from this tabulation in good consistency between the data validated by the judges regarding the appearance of the application.

The judges suggested, as an improvement process, analyzing and correcting the margins of some information boxes as they are asymmetrical and increasing the font size as it may interfere with accessibility for people who have some visual limitations.

João Breno Cavalcante COSTA; Eliany Nazaré OLIVEIRA; Paulo César de ALMEIDA; Maristela Inês Osawa VASCONCELOS; Joyce Mazza Nunes ARAGÃO and Emanoel Avelar MUNIZ

Table 2 – Evaluation of the app's content by mental health judges

Variables	PA[*]	TA[*]	CVI[*]	Cronbach's Alpha
1. The content used is suitable for the Mental Health support proposal.	11.1	77.8	0.88	0.88
2. The language used is appropriate for the audience.	22.2	55.6	0.78	0.87
3. The content used in this application is easy to read.	11.1	77.8	0.88	0.89
4. The content used is easy to understand.	11.1	77.8	0.88	0.87
5. The content used in the application provides correct information.	11.1	88.9	1.0	0.89
6. The content used in this application is simple, relevant, and current.	22.2	77.8	1.0	0.88
7. The content of the application includes sufficient information regarding the proposal to support Mental Health.	22.2	66.7	0.88	0.88
Total			0.90	0.90

*PA- Partially Agree; TA- Totally Agree; CVI- Content Validation Index; Cronbach's Alpha (internal consistency analysis).

Source: Prepared by the authors

The content validation results showed a CVI ranging from 0.78 to 1.0, the CVI-total 0.90, corroborating the internal consistency analysis based on Cronbach's alpha, which resulted in a total of 0.90. These data demonstrate that the application has a very high internal consistency and sticks to the ideal alpha value for validation, according to Streiner (2003), the maximum expected value for alpha is 0.90 since higher values may mean the presence of redundancy or duplication, which may mean that multiple items are measuring precisely the same element of a construct. If this occurs, redundant or duplicate elements must be eliminated.

Regarding suggestions for content validation, the judges suggested enabling an interactive space that would allow the user to write situations of pain and suffering experienced daily and make the language clearer and easier to understand, aimed at all target audiences.

Table 3 – Evaluation of the application's usability by technology judges

Variables	NAND[*]	DP[*]	PA[*]	TA[*]	CVI[*]
1. I would like to use this application often.	0	33.3	66.7	0	0.66
2. I thought the application was robust and reliable.	0	0	66.7	33.3	1
3. I thought the application was easy to use.	0	0	33.3	66.7	1
4. I can use this support application individually.	0	0	33.3	66.7	1
5. I thought that several functions of this application were well integrated.	0	0	66.7	33.3	1
6. I thought there was NOT much inconsistency in this application.	0	0	33.3	66.7	1
7. I estimate and deduce that most people would learn to use this application quickly.	0	0	0	1	1
8. I felt very confident using this application.	33.3	0	33.3	33.3	0.66
Total					0.91

*NAND- Neither Agree Nor Disagree; PA- Partially Agree; TA- Totally Agree; CVI- Content Validation Index; Cronbach's Alpha (internal consistency analysis);

Source: Prepared by the authors

The results of the usability validation showed a CVI ranging from 0.66 to 1.0, and the total CVI was 0.91. This data shows that the application has a good average agreement and evidence of usability with users.

Considering the judges' suggestions for improving the guide's appearance and content, in the final version, illustrations that were not at a good resolution were replaced and adjusted, the margins of some screens were corrected, and the font was increased while maintaining good typography. Regarding the content, some passages were reduced and adapted to the target audience's language. There were no suggestions regarding the judges' evaluation of the usability technology.

Discussion

The present study built and tested validity evidence for a mental health support application that offers targeted information on health promotion strategies so that it can mitigate and/or reduce damage resulting from the absence or inefficiency of self-care. In this sense, the use of information technologies in healthcare is an important component in creating effective, convenient and accessible education for professionals, managers and users in different healthcare systems and geographic locations (WEINSCHREIDER; SABOURIN; SMITH, 2019).

When based on evidence, mobile applications for self-care in mental health can benefit professionals and users, increase treatment adherence, and reduce medication regularity failures

and treatment costs. They use several resources to attract users, including gamification to motivate users to continue browsing the tool (NÓBREGA *et al*., 2021).

The application's main purpose was to provide assessment and support in SM to its users, early identifying some signs of need for support, based on the completion of some validated scales. The information contained was written in simple and objective language and was supported by carefully planned illustrations and videos to clarify and complement the idea conveyed, facilitating visual communication, and understanding for the target audience.

According to Marques *et al.* (2020) the use of mHealth can provide mechanisms to improve efficiency, effectiveness and satisfaction with the care provided by health professionals for promotion, prevention, and treatment. In this sense, digital health technologies such as the "*Aconchego*" app help empower users to actively manage their mental health and make them co-responsible for their quality of life and self-care, providing information resources and therapeutic support and reducing administrative burdens and direct assistance costs.

In the mental health setting, these devices are increasingly being developed to aid psychiatric treatment and assist individuals in self-managing their mental health conditions. Therefore, for them to be included in the professional's daily care, it is essential that they are evidence-based, safe, qualified, and consistent (LIMA *et al.*, 2022).

Thus, mHealth technologies are powerful tools for quality healthcare, especially when led and encouraged by the multidisciplinary healthcare team for their patients. They can also form an interactive work methodology in public and private health services, as they offer reliable and important information for patients, helping to record information and monitor their health (SILVA *et al*., 2019).

Australian study explored factors associated with the use of technology-based mental health platforms by university students vulnerable to developing a mental health condition. The apps were perceived as more helpful by those with a history of mental illness and associated with higher stress scores (PERICH; ANDRIESSEN, 2023). In this context, the "Aconchego" app provides tests for users to assess their mental state, stress levels, depression and anxiety and mental health care through validated scales.

In this sense, as they reorder the way psychological information is understood, presented, and used, psychological self-care mobile applications produce specific understandings and conceptions about psychological and emotional well-being. As these technologies are increasingly used and their functionalities become more sophisticated, they begin to be recognized as a privileged tool through which individuals can learn about and take

care of themselves, while their implications and effects remain relatively undefined (BRUNO *et al.*, 2021).

Another aspect that deserves to be highlighted is the dissemination of research results and technologies to society. In this context, the "Aconchego" app was made available free of charge to the population as a tool to promote mental health and prevent illnesses. Miranda and Murta (2022) highlight that although promising, the task of disseminating innovative mental health prevention and promotion programs and technologies is arduous.

Among the various limiting factors, there is the limited dialogue between universities and public authorities, the lack of knowledge on the part of a large part of society about social injustices as social determinants of mental health, scarce resources for research, weak dialogue between areas of knowledge in the sciences of health and related areas, and professional training focused on treatment.

Regarding the construction process of the "Aconchego" app, we sought to create an attractive technology that motivates the user to self-care based on understanding the ideas contained therein. These technologies are built to strengthen guidance for family members and patients, and can contribute favorably to the communication process, increase adherence to treatment and decision-making power (SANTIAGO; MOREIRA, 2019). Therefore, we sought to use information in clear and objective language, with simple definitions, as well as short paragraphs, structured into topics to facilitate understanding (DEATRICK; AALBERG; CAWLEY, 2010).

Validation of the app's content, appearance, and usability sought to deliver material with correct and relevant information and visually attractive to develop a critical sense (LIMA *et al*., 2017). Thus, considering that the constructed material must meet the needs and expectations of the intended audience, the evaluation stage by the judges, who are considered authorities on the subject, was seen as a rich moment of knowledge (SANTIAGO; MOREIRA, 2019). In general, corrections in spelling, grammatical agreement and font size were suggested by the judges, and all material was reviewed to meet the suggested adjustments.

Furthermore, textual changes were made to leave sentences in a direct voice, and the positioning of some illustrations was adjusted. Considering the recommendations of authors to arrange the illustrations in a way that facilitates their understanding of the reader (LIMA *et al*., 2020; FERREIRA *et al*., 2022).

Validating the app with judges is a necessary attitude and an important benefit for the researcher and team involved. It is a moment when one realizes what is really missing, what

was not understood, the distance that exists between what is written and what is understood, and the way in which it is understood (LIMA *et al.*, 2017).

In this sense, the "*Aconchego*" app can be considered as another option among the possibilities of interventions to promote mental health, similar to the software evaluated by Baldassarini *et al.* (2022) as they constitute promising tools, especially due to their easy access, low cost and overcoming barriers such as lack of time for more time-consuming approaches or difficulty in accessing face-to-face strategies.

From the discussions that took place to build and validate the app, a main limitation of the study was identified, user access, where to use the app it was necessary to have a smartphone, as well as having the Android operating system. According to Naslund *et al.* (2017), improving accessibility to digital technologies, especially in places with limited resources, can be a significant benefit to enable a drastic change in the use of affordable mobile technologies, which will enhance the service provided by Health professionals. Another limitation of the study was not having assessed the app's usability by the target audience.

In this sense, future research should improve the functionalities of mobile technologies in mental health, including other strategies that aim to increase self-care and make the search for help easier. Furthermore, it is necessary to continue the study based on the analysis of the usability of the technology with the target audience and the effectiveness of using the app, evaluating its effect on mental health promotion behaviors and/or anxiety symptoms, stress, and depression.

Final considerations

The *Aconchego* mobile application to support Mental Health was built on the continuation of a larger project to provide support to university students during the COVID-19 pandemic through the dissemination of self-care and health promotion strategies, in addition to local Mental Health care, making this process more accessible to users in the construction and validation of digital technology.

The application has evidence of validity, bringing contributions to good practices in mental health and stimulating innovation in care by constituting an information and psychosocial support tool. The development and improvement of health promotion strategies for the target audience, proposed by the app, therefore envisages changes in behavior and

attitudes, reverberating with the strengthening of autonomy and empowerment of users in self-management of care.

In its final version, the *Aconchego* app was tested on 105 screens, distributed as follows: home menu, support screens, test screens, and records screen. Based on the evaluation by the judges, it was observed that the app is a powerful strategy for accessing reliable information through content based on scientific knowledge in a quick, didactic, versatile, non-tiring way, with language suitable for the community in general. Furthermore, it highlights its good evaluation of the interface and usability, making it attractive to the target audience.

It is also worth noting that the general population will evaluate the application. This step is of fundamental importance to improve the final version of the app based on the proposed suggestions.

REFERENCES

ABRIL BRANDED CONTENT (ABC). **Saúde Mental**: faça o quiz e descubra se você sabe cuidar da sua. Veja Saúde, São Paulo, 2020. Available at: https://saude.abril.com.br/mente-saudavel/quiz-voce-cuida-da-saude-mental-da-mesma-forma-que-da-fisica/. Accessed in: 12 Mar. 2023.

ANTONIALLI, K. T. D. S. **Desenvolvimento colaborativo de intervenções em saúde mental para aplicativo (APP Mental) direcionado ao cuidado do profissional de saúde no contexto de pandemia (COVID-19) e situações de desastre**. 2022. Dissertação (Mestrado em Gestão da Clínica) - Centro de Ciências Biológicas e da Saúde, Universidade Federal de São Carlos, São Carlos, 2022.

BALDASSARINI, C. R. *et al.* Evaluation of software for mental health promotion of undergraduate nursing students in the early years of college. **Revista da Escola de Enfermagem da USP**, São Paulo, v. 56, p. e20220006, 2022. Available at: https://www.scielo.br/j/reeusp/a/vtT7p5pH4QMsYdr4s9vb5pS/abstract/?lang=en. Accessed in: 15 July 2023.

BRUNO, F.G. *et al.* "Tudo por conta própria": autonomia individual e mediação técnica em aplicativos de autocuidado psicológico. **Revista Eletrônica de Comunicação, Informação & Inovação em Saúde**, Rio de Janeiro, v. 15, n. 1, p. 33-54, 2021. Available at: https://www.reciis.icict.fiocruz.br/index.php/reciis/article/view/2205/2415. Accessed in: 24 July 2023.

COSTA, J. B. C. *et al.* Use of mental health support apps in times of the COVID-19 pandemic. **Research, Society and Development,** Vargem Grande Paulista, v.11, n.6, e5211628562, 2022. Available at: https://rsdjournal.org/index.php/rsd/article/view/28562. Accessed in: 13 Apr. 2023.

CRONBACH, L. J. Coefficient alpha and the internal structure of test. **Psychometrika**, [*S. l.*], v. 16, n. 3, p. 297-334, 1951. Available at: https://link.springer.com/article/10.1007/bf02310555. Accessed in: 13 Apr. 2023.

DEATRICK, D.; AALBERG, J.; CAWLEY, L. **A guide to creating and evaluating patient materials:** Guidelines for effective print communication. [*S. l.*]: MaineHealth's, 2010.

DRISSI, N. *et al.* Investigating the impact of COVID-19 lockdown on the psychological health of university students and their attitudes toward mobile mental health solutions: Two-part questionnaire study. **JMIR Formative Research**, Toronto, v. 4, n. 10, p. e19876, 2020. Available at: https://formative.jmir.org/2020/10/e19876/. Accessed in: 13 Apr. 2023.

FARO, A. *et al.* COVID-19 e saúde mental: a emergência do cuidado. **Estudos de Psicologia (Campinas)**, Campinas, v. 37, p. e200074, 2020. Available at: https://www.scielo.br/j/estpsi/a/dkxZ6QwHRPhZLsR3z8m7hvF. Accessed in: 13 Apr. 2023.

FERHING, R. J. The Fehring model. *In*: CARROL-JOHNSON, P. (ed.). **Classification of nursing diagnosis:** Proceedings of the tenth conference of North American Nursing Diagnoses Association. Filadélfia: Lippincott, 1994. p. 59.

FERREIRA, S. L. *et al.* Construção e validação de tecnologia educacional para familiares de pessoas com úlcera venosa. **Revista Brasileira de Enfermagem**, Brasília, v. 75, n. 5, p. e20210555, 2022. Available at: https://www.scielo.br/j/reben/a/3k4C63hDLs5mGfwnwSnLnck/?lang=pt. Accessed in: 13 Apr. 2023.

FREITAS, A. L. P.; RODRIGUES, S. G. A. Avaliação da confiabilidade de questionário: Uma análise utilizando o coeficiente alfa de Cronbach. *In*: SIMPÓSIO DE ENGENHARIA DE PRODUÇÃO, 12, 2005. **Anais** [...]. Bauru, SP: UNESP, 2005.

GALINDO NETO, N. M. *et al.* COVID-19 e tecnologia digital: Aplicativos móveis disponíveis para download em smartphones. **Texto & Contexto Enfermagem**, Florianópolis, v. 29, p. e20200150, 2020. Available at: https://www.scielo.br/j/tce/a/bJgShJrBQZ6z65hsmnSTP7P/?format=pdf&lang=pt. Accessed in: 13 Apr. 2023.

GUERRA, F.; TERCE, M. **Design digital**: conceitos e aplicações para websites, animações, vídeos e webgames. Editora Senac São Paulo. 2020.

HARRIS, P.; AMBROSE, G. **Design Thinking**. Porto Alegre: Editora Bookman, 2012.

HUCKINS, J. F. *et al.* Mental health and behavior of college students during the early phases of the COVID-19 pandemic: Longitudinal smartphone and ecological momentary assessment study. **Journal of Medical Internet Research**, Pitisburgo, v. 22, n. 6, p. e20185, 2020. Available at: https://www.jmir.org/2020/6/e20185/. Accessed in: 13 Apr. 2023.

LATOUR, C. *et al.* Improving mental health in US Veterans using mHealth tools: A pilot study. **Health Informatics Journal**, *[S. l.]*, v. 26, n. 4, p. 3201-3214, 2020. Available at:

https://journals.sagepub.com/doi/full/10.1177/1460458220954613. Accessed in: 13 Apr. 2023.

LIMA, A. C. M. A. C. C. *et al.* Development and validation of booklet for prevention of vertical HIV transmission. **Acta Paulista de Enfermagem**, São Paulo, v. 30, n. 2, p. 181-189, 2017. Available at: https://www.scielo.br/j/ape/a/SBDGBgkRwk4QGnwNnsKnSCs/?lang=en. Accessed in: 13 Apr. 2023.

LIMA, A. C. M. A. C. C. *et al.* Construção e validação de cartilha educativa para sala de apoio à amamentação. **Reme: Revista Mineira de Enfermagem**, Belo Horizonte, v. 24, p. e-1315, 2020. Available at: https://reme.org.br/artigo/detalhes/1461. Accessed in: 13 Apr. 2023.

LIMA, M. G. P. *et al*. Tecnologias para o cuidado em saúde mental e enfermagem: Revisão integrativa. **Research, Society and Development**, Vargem Grande Paulista, v. 11, n. 15, p. e484111537648-e484111537648, 2022. Available at: file:///C:/Users/Editora%20Convidado/Downloads/37648-Article-412548-1-10-20221124.pdf. Accessed in: 15 July 2023.

MARQUES, A. D. B. *et al.* Usabilidade de um aplicativo móvel sobre o autocuidado com o pé diabético. **Revista Brasileira de Enfermagem**, Brasília, v. 73, n. 4, e20180862, 2020. Available at: http://www.revenf.bvs.br/scielo.php?script=sci_arttext&pid=S0034-71672020000400175&lng=pt&nrm=iso. Accessed in: 24 July 2023.

MARQUES, G. *et al.* Impact of COVID-19 on the psychological health of university students in Spain and their attitudes toward Mobile mental health solutions. **International Journal of Medical Informatics**, Shannon, v. 147, p. 104369, 2021. Available at: https://www.sciencedirect.com/science/article/pii/S1386505620319055?via%3Dihub. Accessed in: 13 Apr. 2023.

MELO, E. B. M. *et al.* Construction and validation of a mobile application for development of nursing history and diagnosis. **Revista Brasileira de Enfermagem**, Brasília, v. 73, p. e20190674, 2020. Available at: https://www.scielo.br/j/reben/a/rYMd46kz6zDRNsHkPDLvyMy/?lang=en. Accessed in: 13 Apr. 2023.

MIRANDA, A. A. V.; MURTA, S. G. Difusão de Programas Preventivos em Saúde Mental: Notas Teóricas. **Psicologia: Teoria e Pesquisa**, Brasília, v. 38, p. e38421, 2022. Available at: https://www.scielo.br/j/ptp/a/QDFg9FKMG4CxhRw5JpnfFfy/?lang=pt. Accessed in: 15 July 2023.

NASLUND, J. A. *et al*. Digital technology for treating and preventing mental disorders in low-income and middle-income countries: a narrative review of the literature. **The Lancet Psychiatry**, London, v. 4, n. 6, p. 486-500, 2017. Available at: https://pubmed.ncbi.nlm.nih.gov/28433615/. Accessed in: 15 July 2023.

NIELSEN, J. **Usability Engineering**. São Francisco: Morgan Kaufmann Publishers Inc., 1993.

NÓBREGA, M. P. S. S. *et al.* Explorando o uso de aplicativos móveis para autogestão do tratamento em saúde mental: scoping review. **Revista de Enfermagem da UFSM**, Santa Maria, v. 11, p. 1-24, 2021. Available at: https://periodicos.ufsm.br/reufsm/article/view/64393. Accessed in: 12 July 2023.

O'DONNELL, K. T.; DUNBAR, M.; SPEELMAN, D. L. Effectiveness of using a meditation app in reducing anxiety and improving well-being during the COVID-19 pandemic: A structured summary of a study protocol for a randomized controlled trial. **Trials**, Londres, v. 21, n. 1, p. 1006, 2020. Available at: https://trialsjournal.biomedcentral.com/articles/10.1186/s13063-020-04935-6. Accessed in: 13 July 2023.

PARKER, L.; BERO, L.; GILLIES, D. *et al.* Mental health messages in prominent mental health apps. **Annals of Family Medicine**, Leawood, v. 16, n. 4, p. 338-342, 2018. Available at: https://www.annfammed.org/content/16/4/338.long. Accessed in: 13 Apr. 2023.

PASQUALI, L. **Instrumentação psicológica:** Fundamentos e práticas. Porto Alegre: Artmed, 2010.

PATIAS, N. D. *et al.* Depression anxiety and stress scale (DASS-21) - short form: Adaptação e validação para adolescentes brasileiros. **Psico-USF**, Campinas, v. 21, n. 3, p. 459-469, 2016. Available at: https://www.scielo.br/j/pusf/a/CtJv6LTmfYxKfXzmP4j6q5g/?lang=pt. Accessed in: 13 Apr. 2023.

PERICH, T.; ANDRIESSEN, K. Predictors of digital technology-based mental health programs in young adults for mental health support. **Health Promotion International**, Oxford, v. 38, n. 3, p. daad024, 2023. Available at: https://academic.oup.com/heapro/article/38/3/daad024/7150745. Accessed in 24 July 2023.

POLIT, D. E.; BECK, C. T. **Fundamentos de pesquisa em enfermagem:** avaliação de evidências para a prática de enfermagem. 9. ed. Porto Alegre: Artmed, 2019.

RAMEY, L. *et al.* Apps and mobile health technology in rehabilitation: the good, the bad, and the unknown. **Physical Medicine and Rehabilitation Clinics of North America**, Filadélfia, v. 30, n. 2, p. 485-497, 2019. Available at: https://www.sciencedirect.com/science/article/abs/pii/S1047965118308659?via%3Dihub. Accessed in: 13 Apr. 2023.

RAVALIER, J. M. *et al.* Co-creating and evaluating an app-based well-being intervention: The HOW (Healthier Outcomes at Work) social work project. **International Journal Environmental Research and Public Health**, Basileia, v. 17, n. 23, p. 8730, 2020. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7727806/. Accessed in: 13 Apr. 2023.

SANTIAGO, J. C. S.; MOREIRA, T. M. M. Booklet content validation on excess weight for adults with hypertension. **Revista Brasileira de Enfermagem**, Brasília, v. 72, n. 1, p. 95-101, 2019. Available at: https://www.scielo.br/j/reben/a/mhVsyC4cGtfGGjsWZMtXF9t. Accessed in: 13 Apr. 2023.

SILVA, R. M. *et al.* Uso de tecnologia móvel para o cuidado gestacional: avaliação do aplicativo GestAção. **Revista Brasileira de Enfermagem**, Brasília, v. 72, sup. 3, p. 266-273, 2019. Available at: http://www.revenf.bvs.br/scielo.php?script=sci_arttext&pid=S0034-71672019000900266&lng=pt&nrm=iso. Accessed in 24 July 2023.

SOÁREZ, P. C. *et al.* Tradução para português brasileiro e validação de um questionário de avaliação de produtividade. **Revista Panamericana de Salud Pública**, Washington, v. 22, n. 1, p. 21-28, 2007. Available at: https://scielosp.org/article/rpsp/2007.v22n1/21-28/pt/. Accessed in: 13 Apr. 2023.

SOUSA, M. G. P. D. **Desenvolvimento e validação de um protótipo de aplicativo para plataforma móvel para promoção da saúde de gestantes**. 2019. 112 f. Dissertação (Mestrado Profissional em Saúde da Família) – Universidade Federal do Ceará, Fortaleza, 2019.

STREINER, D. L. Starting at the beginning: An introduction to coefficient alpha and internal consistency. **Journal of Personality Assessment**, *[S. l.]*, v. 80, n. 1, p. 99-103, 2003. Available at: https://www.tandfonline.com/doi/abs/10.1207/S15327752JPA8001_18. Accessed in: 13 Apr. 2023.

WEINSCHREIDER, J.; SABOURIN, K. M.; SMITH, C. M. Preparing Nurse leaders in nursing professional development. **Journal for Nurses in Professional Development**, Hagerstown, v. 35, n. 5, p. 281-285, 2019. Available at: https://journals.lww.com/jnsdonline/Citation/2019/05000/Preparing_Nurse_Leaders_in_Nursing_Professional.8.aspx. Accessed in: 13 Apr. 2023.

ZHANG, M.; SMITH, H. E. Digital tools to ameliorate psychological symptoms associated with COVID-19: Scoping review. **Journal of Medical Internet Research**, Pitsburgo, v. 22, n. 8, p. e19706, 2020. Available at: https://www.jmir.org/2020/8/e19706/. Accessed in: 13 Apr. 2023.

João Breno Cavalcante COSTA; Eliany Nazaré OLIVEIRA; Paulo César de ALMEIDA; Maristela Inês Osawa VASCONCELOS; Joyce Mazza Nunes ARAGÃO and Emanoel Avelar MUNIZ

CRediT Author Statement

Processing and editing: Editora Ibero-Americana de Educação.
Proofreading, formatting, normalization and translation.