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SKYE PLATFORM: UTILITY AND USABILITY ASSESSMENT FOR SUPPORTING BLENDED PSYCHOLOGICAL INTERVENTIONS

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ABSTRACT

Skye is a digital platform designed to support the professional practice of psychology and promote adherence to and continuity of psychotherapeutic interventions among young adults experiencing anxiety-related issues and disorders. This paper is mostly focused on presenting the Skye platform's utility and usability assessment by the intervenient in the psychotherapeutic process. The research uses design thinking structured in four phases: (i) concept, (ii) design, (iii) development, and (iv) assessment. The assessment follows an exploratory, mixed-methods approach with two independent groups of participants: (a) mental health professionals who assessed the desktop version of Skye designed for psychotherapists, and (b) young adults who tested the mobile version intended for clients. The assessment was conducted remotely using a test version of the Skye platform, alongside an electronic survey. A total of 28 complete responses were collected, six from professionals and 22 from potential clients. Findings indicate largely positive evaluations of the platform's utility and usability. The results are mostly positive regarding the utility and usability of the Skye platform in both populations. The research supports the adequacy of this digital resource in facilitating blended psychological interventions for professionals and their clients, contributing to the digital transformation in mental health and human-computer interaction.

KEYWORDS

Digital Platforms, Mental Health, Blended Psychological Interventions, Anxiety

1. INTRODUCTION

Mental health encompasses the physical and psychological well-being and quality of life that allows individuals to feel good about themselves, establish relationships with others, and

actively contribute to society (WHO, 2022). Mental pathologies – mental disorders, psychosocial deficiencies, mental states associated with significant suffering, functional disability, or risk of self-harm – affect 970 million people worldwide. These pathologies can lead to substantial periods of disability, lasting from one to six years, and in more severe cases, they can shorten life expectancy by one to two decades (WHO, 2022).

In Portugal, the latest official data on population's mental health dates to 2019, highlighting the growing trend in the prevalence of mental disorders, with a special warning for the incidence of anxiety, mood, obsession-compulsion, and substance use problems and disorders among younger layers, aged between 10 and 29 years old (NOFAP, 2021; NHC, 2019). Despite the relevant improvements in the access and quality of mental health services observed in the last decade, the latest data shows that about 64% of the Portuguese working-age population has mental health needs that are not currently met, mainly due to financial issues, waiting times, and travel constraints (OECD, 2021; Silva *et al.*, 2022).

Psychotherapeutic interventions that utilize cognitive-behavioral therapy are the most effective treatments for mental problems and disorders (Beck, 2016, 2020; Dobson and Dozois, 2019). In the Portuguese population, these interventions help to manage the impact of mental illness, mitigate the negative effects of mental health issues in society, and reduce the costs of mental health services by 20 to 30% (OPP, 2011). However, the alarming deficiency of qualified psychotherapeutic professionals in public health services continues to contribute to serious insufficiency in the response to the real mental health needs of the population (NOFAP, 2021; Silva *et al.*, 2022). This results in work overload for professionals and may have contributed to the progressive rising trend in the use of pharmacotherapies for the treatment of mental problems and disorders (NOFAP, 2021; NHC, 2019).

Blended psychotherapeutic interventions have been supporting professionals to mitigate the negative trends in mental health care, mainly due to accessibility, convenience, and cost-effectiveness (Mendes-Santos *et al.*, 2020). Portuguese psychologists support blended treatment interventions, particularly when compared to standalone internet interventions, but they also acknowledge the lack of knowledge and training (Mendes-Santos *et al.*, 2020).

Considering the national Portuguese panorama for mental health care, with a growing need for qualified professionals, the increasing prevalence of mental disorders among young adults, and the lack of support from digital resources to facilitate psychotherapeutic interventions, the focus for the design and development of the Skye platform was to search for a solution to address these real-world problems. Skye aims to support professional psychotherapeutic interventions for young adults experiencing anxiety. It emphasizes evidence-based interventions grounded in cognitive-behavioral theory (Beck, 2016, 2020), following the recommendations for blended care (Wentzel *et al.*, 2016), attending to the guidelines for providing psychology services mediated by information and communication technologies (OPP, 2019), and considering the use of mental health applications (OPP, 2022).

The present paper presents the assessment of the utility and usability of the Skye platform, designed and developed to support blended psychological interventions performed by qualified professionals with young adults presenting anxiety. This paper is organized into six sections: 1. Introduction, providing the rationale for the research; 2. Theoretical Framework, introducing the main concepts, strategies, and techniques supporting the study, encompassing (2.1) Anxiety and psychotherapeutic interventions, and (2.2) Blended care and digital platforms in mental health; 3. The Skye platform, describing the process to achieve its high-fidelity prototype, covering (3.1) The concept, (3.2) Design, and (3.3) Development; 4. The Research Methodology, explaining all the research process, including (4.1) Research goal, question, and

design, (4.2) Population, recruitment, and criteria, (4.3) Study phases and objectives, (4.4) Data collection and treatment, and (4.5) Instruments; 5. Results, presenting the findings of the study, involving (5.1) Sample characterization and accomplished tasks, (5.2) Utility assessment, (5.3) Usability assessment, and (5.4) Results discussion; and 6. Conclusion, reflecting on the research conducted, identifying limitations, and suggesting future studies.

2. THEORETICAL FRAMEWORK

2.1 Anxiety and Psychotherapeutic Interventions

Anxiety is one of the most common disorders among the worldwide population (WHO, 2022). It is characterized by a persistent and recurrent fear that places the body in a constant state of alert, causing clinically significant discomfort (APA, 2013; WHO, 2019).

Psychotherapeutic interventions are combined strategies and techniques developed by qualified professionals that aim to reduce clinical symptoms of mental problems and disorders and to promote mental health (OPP, 2011). These techniques aim to communicate theoretical and practical knowledge to support the clients in their therapeutic process (Beck, 2020).

Effective psychotherapeutic interventions in anxiety are mainly supported by cognitive-behavioral therapy (CBT; OPP, 2011). CBT interventions seek to identify and monitor clinical symptoms of anxiety by analyzing activating events, negative automatic thoughts, unrealistic beliefs, and maladaptive behaviors, aiming to prevent intrusions, create more coherent cognitive rationales, and facilitate the experience of positive emotions and adaptive behavioral responses (Beck, 2020; Curtiss et al., 2021; Dobson and Dozois, 2019; Ferguson and O'Donohue, 2015; Kodal et al., 2018).

CBT strategies and techniques for psychotherapeutic intervention in anxiety include, among others, the following: (i) psychoeducation – transmission of mental health knowledge that facilitates understanding and overcoming the mental problem or disorder; (ii) journaling – recording and monitoring automatic thoughts, emotions, and behaviors resulting from clinical patterns typical of mental problems and disorders; (iii) cognitive restructuring – discussion of negative automatic thoughts and unrealistic beliefs that aim to develop critical thinking and generating more positive and adaptive cognitions; (iv) relaxation and mindfulness – sets of exercises and techniques that aim to promote relaxation and well-being with a focus on the present; and (v) reinforcement – thoughtful application of incentives that aim to reinforce positive and adaptive thoughts, emotions and behaviors, facilitating the intervention process.

Although psychotherapeutic interventions for anxiety supported by CBT are scientifically effective, they depend heavily on the clients' engagement and motivation (Beck, 2020). It is the responsibility of the therapist to build a relationship of trust and support with the clients, conveying confidence, security, and well-being by attending to their specific interests and needs, promoting engagement with the proposed treatment, and active participation in the psychotherapeutic process, for achieving the expected results (Beck, 2020).

2.2 Blended Care and Digital Platforms in Mental Health

Blended care is a form of health intervention that combines the advantages of face-to-face and distance formats to achieve optimal benefits (Kemmeren *et al.*, 2023; Romijn *et al.*, 2021; Wentzel *et al.*, 2016). To achieve the best results through blended care, the following recommendations were established (van Gemert-Pijnen *et al.*, 2011; Wentzel *et al.*, 2016): (i) both components should be complementary; (ii) both components should contribute to the therapeutic process; (iii) both components should be capable of adjustment and adaptation; (iv) both components must commit to the treatment protocol established between the therapist and client; and (v) the technological integration should fit the client's needs, capabilities, and agreement.

The recommendations from the Order of Portuguese Psychologists (OPP, 2019) for providing psychology services mediated by information and communication technologies (ICT), supported by the resolutions and decisions on e-health from the World Health Organization (WHO, 2005), include four main principles: (i) the respect for the ethical and deontological principles of psychological interventions; (ii) the development of technical knowledge on information and communication technologies supporting the therapeutic process; (iii) the consideration of each specific framework regarding the suitability, benefits, clinical validity, and complementarity of the face-to-face intervention; and (iv) the use of resources with evidence of efficacy, supported in randomized controlled trials and validity studies.

The most accessible mental health care mediated by information and communication technologies is supported by mobile applications that offer a range of services through smartphones, tablets, and computers, aiming to enhance overall health and well-being (OPP, 2022). These applications typically include features such as mental health management, cognitive training, skills development, social support, symptom monitoring, and passive data collection. While some evidence supports their effectiveness, particularly in treating depression and anxiety disorders, which show moderate reductions in clinical symptoms, it's estimated that only three to four percent of these applications are supported by scientific evidence (OPP, 2022).

Despite these resources offering several potential advantages, including convenience, anonymity, increased access to psychological care, broader reach, continuous availability, and the ability to collect data, they also present several challenges, including concerns about efficacy, suitability for specific target groups, privacy issues, the need for proper guidance, regulation, excessive marketing, and security risks (OPP, 2022).

3. THE SKYE PLATFORM

3.1 The Concept

The Design Thinking approach (Brown, 2009) was used, which emphasizes the designer's sensitivity and innovative methods to align user needs with technical and financial feasibility, with the aim of improving usefulness and usability for the target audience.

Benchmarking was carried out to analyze similar products, gather feedback from users, and identify opportunities for differentiation, supporting the research question, and establishing the main goals of the Skye platform. From the data retrieved, the idea behind the Skye platform focused on the relationship between psychotherapists and their clients, prioritizing

psychotherapeutic interventions carried out by qualified professionals and ensuring the safety and accessibility of the therapeutic process for clients. To achieve our idea, the platform aimed to create a single, versatile, simple, and secure digital environment for professionals to use and personalize, supporting blended interventions near their clients. The digital platform aims to facilitate the clinical practice of psychology, collect data at the moment, enable the psychotherapist to monitor clients closely, complement the face-to-face intervention, promote clients' engagement with treatment, increase clients' responsibility and active participation, reinforce the relationship between psychotherapist and client, increase the support given to the clients, mitigate the lack of support between appointments, increase the clients' knowledge about mental health, and promote the client's autonomy and self-management.

The Skye platform is primarily conceived as a digital resource to assist blended mental health interventions, with a special focus on young adults with anxiety problems and disorders, drawing on cognitive-behavioral therapy techniques. Its main goals include the following: providing an integrated system for psychotherapists to manage clients, interventions, and appointments; conveying psychoeducation to clients through various content and exercises; complementing face-to-face therapy by integrating activities for clients to develop between appointments, known as homework tasks; and enabling reinforce strategies to promote adherence and maintenance of the therapeutic process by the client.

3.2 Design

The design of the product was based on the established concept and involved several key steps. These included developing a brand, creating personas to represent the people involved in the psychotherapeutic process, conceptualizing functional and non-functional requirements, and creating navigation maps.

The Skye brand represents more than just a name; it embodies the aspirations and journey of its users. The name "Skye" reflects its dual meanings, symbolizing both "heaven," which represents high aspirations and hope, and an "island" for safety, tranquility, and self-discovery. Just as an island offers refuge from the chaos outside, the platform aims to provide a similar shelter for its users.

To be adequate for the psychological intervention, two personas with different needs – psychotherapist and client – were created to support the user profiles of the platform. Focusing on the purpose of supporting blended psychological interventions, the design of Skye encompasses two profiles, one for each type of user, both supported by different hardware. Psychotherapists access the platform through a desktop version, enabling them to manage functions, support data collection, and monitor and evaluate progress. Clients access the platform through a mobile version, easily accessing the psychotherapeutic intervention, supporting distinctive features for engagement with treatment and support provision between appointments. An illustration of the Skye platform layout between versions and profiles is presented in Figure 1.

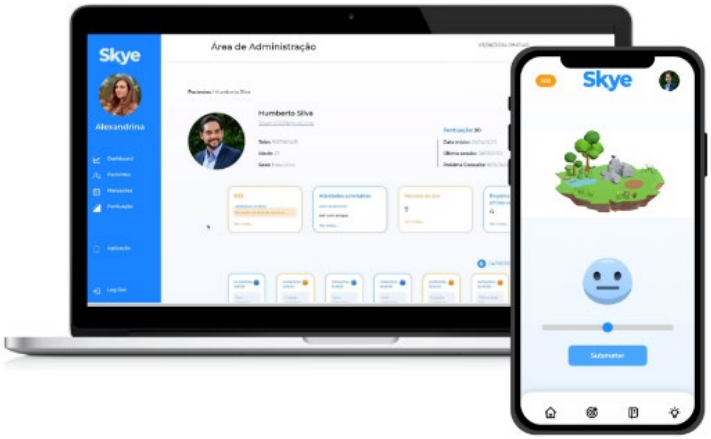

Figure 1. Examples of the Skye platform layout in different versions and profiles

Attending to the different personas created, several functionalities were included in the platform, tailoring functional and non-functional requirements through the type of user and respective profile, as presented in Table 1.

Table 1. Functional and non-functional requirements of the Skye platform by type of user

Functional and non-functional requirements	
Psychotherapists	***Clients***
Activate/lock access (client's management)	Register for the application
Add new clients (enable access)	Create a username and password
Lock a client (disable access)	View and manage personal data
Access to the client's file	Add new data
View the client's data	Edit data
View the client's activity	View next appointment
View the client's development	Report anxiety state
View enquiry calendar (appointments)	Rate the state of anxiety
Add a new appointment	Include a brief description
Add a summary to an appointment	Access journal (private)
Include exercises (intervention data)	Add an entry
Add an existing exercise	Register experiences
Create a new exercise	View exercises (intervention support)
Include content (intervention data)	View contents (intervention support)
Add an existing content	Access activities (intervention data)
Create new content	View activities
View enquiry calendar (appointments)	Complete activities
Add a new appointment	View token (intervention support)
Add a summary to an appointment	Observe token
Include activities (intervention data)	Notice its evolution
Add an existing activity	Report an anxious episode (SOS button)
Create a new activity	Rate the anxiety state
Score an activity (assessment)	Add an episode description
View token information (assessment)	

To each type of user and their respective requirements, the navigation maps for the Skye platform were drawn and interrelated, as shown in Figure 2.

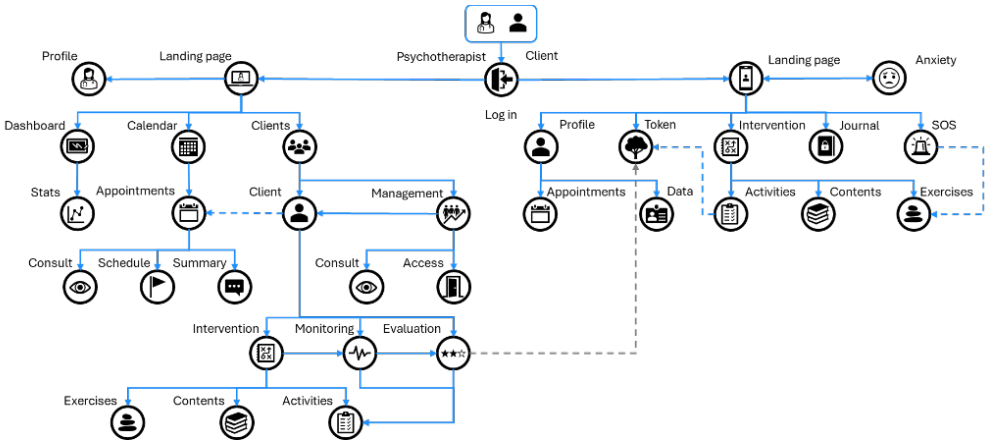

Figure 2. Navigation maps for the Skye platform

3.3 Development

The development of the platform was carried out using a combination of modern and robust technologies, enabling efficient development and an engaging user experience.

Skye appeals to "ReactJS" to create reusable components and efficiently manage states, which are essential for the application's maintenance and scalability. This approach also supports rapid prototyping and continuous integration of new features based on user feedback.

For data management and authentication, the implementation appealed to the "Firebase," used as a real-time database that allows instant synchronization of information between different types of users. The immediacy of this communication ensures that therapists and clients always have access to up-to-date information, which is particularly relevant for monitoring anxiety symptoms and the respective therapeutic progress to manage them. The "Firebase" security protocols are solid and help ensure that all personal and clinical data are handled with confidentiality and integrity, exclusively by the professional.

The mobile application for clients also incorporates an interactive and gamified 3D component (token) created in "Unity" and exported via "WebGL", providing a rich and interactive visual experience that enhances usability and user engagement. This "token" component represents the client's therapeutic process through an island, establishing a link to the inspiration of the Skye brand. The token evolves through 14 levels, according to the psychotherapist's assessment of the client's progress in the activities (homework tasks) developed, offering a tangible and motivational representation of the efforts made through therapy. An illustration of the token and its evolution is presented in Figure 3.

Figure 3. The token's evolution (first, seventh, and fourteenth levels)

Low-fidelity prototypes were developed and tested with experts, leading to the development of more refined prototypes, further assessed by the target audiences to evaluate their usefulness and usability.

4. RESEARCH METHODOLOGY

4.1 Research Goal, Question, and Design

The main goal of the research was to design, develop, and assess a digital platform to support blended psychological interventions performed by qualified professionals with young adults presenting anxiety. The study aims to answer the research question: *What characteristics should a digital platform have to support blended psychological interventions performed by qualified professionals with young adults presenting anxiety?* The study is supported in design thinking, appealing to exploratory research between subjects for its assessment, utilizing a mixed methodology, and collecting data remotely on the utility and usability of the Skye platform. The assessment involves the exploration of Skye's demo version and the submission of an online formulary regarding its utility and usability, appealing to a convenience sample with two groups: (a) Psychotherapists assessing the desktop version for professionals and (b) Young adults evaluating the mobile version for clients.

4.2 Population, Recruitment, and Criteria

Psychotherapists were recruited through e-mails directed to professionals in Portuguese mental health private clinics and through posts on different social media, appealing to groups with Portuguese psychologists. The inclusion criteria for psychotherapists were two, namely, to have (at least) a master's degree in psychology and training in mental health intervention.

Young adults were recruited through e-mails directed to mailing lists of different departments at the University of Aveiro in Portugal and posts on various social media appealing to groups of students at the same university. The inclusion criteria for young adults were two, namely, to be between 18 and 29 years old and have (at least) a secondary education.

4.3 Study Phases and Objectives

The study encompassed four phases with specific objectives: (i) Concept – included the benchmarking analysis and the definition of the purpose and goals of the platform; (ii) Design

– encompassed the creation of the brand, personas and respective profiles, the establishment of functional and non-functional requirements, and the conception of navigation maps; (iii) Development – focused on the implementation of the product with the development of low and medium fidelity prototypes tested with experts, to achieve the high-fidelity version; and (iv) Assessment – enclosing the development of the instrument, the recruitment of participants, and the data collection and treatment regarding the utility and usability of the Skye platform.

4.4 Data Collection and Treatment

Participants gave prior informed consent to participate in the study, including the permission to collect, treat, and publish data within the scope of the funded project supporting the study. Participation took around 30 minutes, 10 minutes to explore the Skye platform, and 20 minutes to respond to the electronic form. Data was collected and treated anonymously and confidentially, respecting the General Data Protection Regulation (GDPR).

4.5 Instruments

The implementation phase of the study was conducted at a distance, enabled through a questionnaire with two different versions, one for each group, and both including five parts: (I) Study Presentation and Informed Consent; (II) Sociodemographic Characterization; (III) Task Assignment; (IV) Utility Assessment; and (V) Usability Assessment.

In the Study Presentation and Informed Consent (I), all participants were informed about the study and participation conditions and gave prior consent to collect and treat personal data.

In the Sociodemographic Characterization (II), all participants were asked about their gender, age, and academic level.

Within the Task Assignment (III), each group of participants was assigned eight different tasks to perform in their respective versions of the Skye platform, accessed through a hyperlink and distinguished by the access credentials available for each group of participants:

a) Psychotherapists tested the desktop version for professionals, with the following tasks assigned: (T1) log in, (T2) consult a client, (T3) add an appointment summary, (T4) see a completed activity, (T5) assign a score to the completed activity, (T6) add a new activity, (T7) add a new appointment, and (T8) add a new patient.
b) Young adults tested the mobile version for clients, with the following tasks assigned: (T1) log in, (T2) report the anxiety state, (T3) identify the token, (T4) consult ongoing activities, (T5) mark one of the ongoing activities as complete, (T6) find the exercises, (T7) open an exercise, and (T8) report anxious episode.

The Utility Assessment (IV) included the collection of quantitative and qualitative data. Both groups evaluated quantitatively the utility of the platform through a Likert scale of five points (1=*Very reduced*; 2=*Reduced*; 3=*Not reduced or elevated*; 4=*Elevated*; 5=*Very elevated*; 6=*Non applicable*), on five different topics based on the platform goals for each profile:

a) Psychotherapists assessed the utility of the platform regarding i) clients' management, ii) anxiety intervention, iii) clients' therapeutic adherence, iv) clients' therapy maintenance, and v) overall utility.
b) Clients assessed the utility of the platform regarding i) daily life, ii) monitoring mental health, iii) therapeutic adherence, iv) therapy maintenance, and v) overall utility.

The qualitative assessment of utility was identical between groups, appealing to two short questions with open answers, retrieving the positive and negative aspects.

The Usability Assessment (V) also included the collection of quantitative and qualitative data, with an identical structure between both groups. The quantitative evaluation appealed to a Likert scale of five points (1=*Strongly agree*; 2=*Agree*; 3=*Don't agree or disagree*; 4=*Disagree*; 5=*Strongly disagree*), regarding the observation of the ten heuristics for the assessment of digital resources established by Nielsen (1994): i) visibility of system status, ii) match between the system and the real world, iii) user control and freedom, iv) consistency and standards, v) error prevention, vi) recognition rather than recall, vii) flexibility and efficiency of use, viii) aesthetic and minimalist design, ix) help users recognize, diagnose, and recover from errors, and x) help and documentation. The qualitative assessment of usability was made through two short questions with open answers regarding positive and negative aspects.

5. RESULTS

5.1 Sample Characterization and Accomplished Tasks

The research retrieved 29 complete and 70 incomplete responses from 99 participants, with a dropout rate of around 70%.

The sociodemographic characterization of participants is synthesized in Table 2.

Table 2. Sociodemographic characterization of participants

Sample		**Results**	
Characteristic	*Category*	*N*	*%*
Participant group	Psychotherapists	7	24,14
	Young Adults	22	75,86
Gender	Female	21	72,41
	Male	8	27,59
Age range	18 – 29 years	22	75,86
	30 – 39 years	2	6,90
	40 – 49 years	3	10,34
	50 – 59 years	2	6,90
Educational level	Secondary	6	20,69
	Undergraduate degree	12	41,38
	Master´s degree	10	34,48
	PhD	1	3,45

Fifteen participants (51,72%) completed all the tasks required on the Skye platform, and fourteen didn't (48,28%), with eleven (37,93%) not finishing one task, two participants (6,90%) only completing three tasks, and one (3,45%) concluding only one of the assigned tasks.

When attending to the tasks' completion by groups: in the psychotherapists' group (N=7) three participants (42,86%) have completed all the tasks, another three (42,86%) couldn't perform the last task required, and one (14,29%) couldn't perform any task – this subject was eliminated from the sample; in the young adults' group (N=22), twelve participants (54,55%) concluded all the tasks, five (22,73%) couldn't perform the fifth task, three (13,64%) couldn't perform the last (eight) task, and two (9,09%) completed only three tasks (first, second, and fourth tasks).

The final sample comprised 28 participants, 6 psychotherapists, and 22 potential clients.

5.2 Utility Assessment

5.2.1 Quantitative Assessment of Utility

The general quantitative assessment of utility (N=28) resulted mostly in *"Elevated"* or *"Very Elevated"* evaluations, with few neutral (*"Not Reduced or Elevated"*) and negative (*"Reduced"* or *"Very Reduced"*) responses.

Attending to the qualitative assessment of utility between groups, results from psychotherapists and from clients are presented in Figure 4 and Figure 5, respectively.

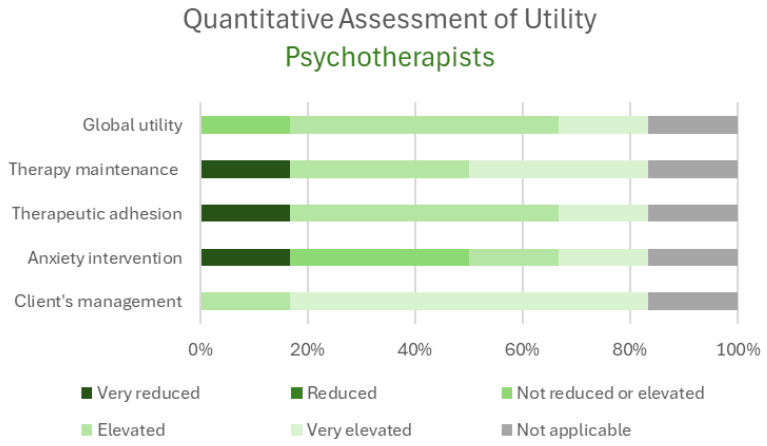

Figure 4. Quantitative assessment of Skye's utility (percentage) by psychotherapists

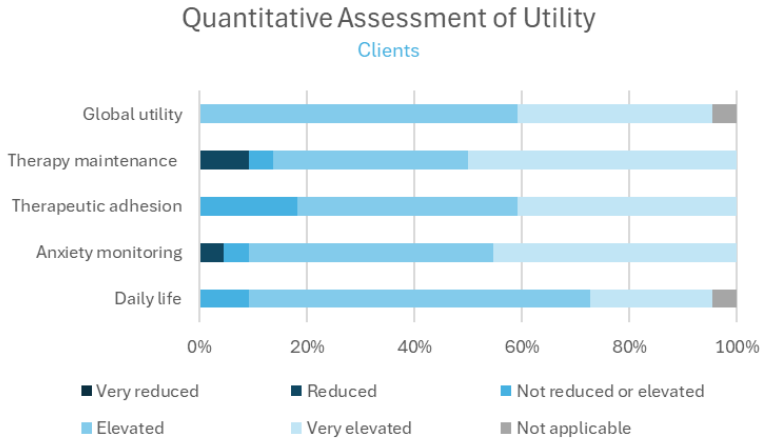

Figure 5. Quantitative assessment of Skye's utility (percentage) by clients

5.2.2 Qualitative Assessment of Utility

The qualitative assessment of utility regarding the Skye platform retrieved 36 positive aspects (psychotherapists = 6; clients = 30) and 22 negative aspects (psychotherapists = 5; clients = 17).

Focusing on psychotherapists' thoughts, positive aspects include the following with the respective count: application potential (3) – high potential and relevance of the platform; ease of handling and access (2) – ease of access and handle information; and benefits for therapists and clients' management (1) – access to data between appointments, case management, and easy transition between face-to-face and distance formats. Negative aspects from the psychotherapists' perspective include the following with the respective count: confidentiality and privacy (1) – confidentiality and privacy of the data entered; application development stage (1) – comment on current stage of the platform development; design (1) – comment on the amount of information on the dashboard; superficial applicability (1) – superficiality of the application; lack of content (1) – lack of different content and exercises.

Attending to the clients' views, the following positive aspects of utility include: mental state monitoring and management (9) – usefulness for monitoring mental status, tracking progress, setting personal goals, recording anxiety episodes, and keeping an emotion diary, facilitating the process of self-management and organization of tasks and objectives; ease of use and accessibility (6) – usability and accessibility of the platform, highlighting the simplicity, ease of communication, and the tailored use for both patients and therapists; features and usefulness (6) – important features such as tasks, exercises, SOS, anxiety checker, and monitoring anxious symptoms; practical and efficient application (4) – practical, straightforward, and useful, particularly in mental health management and organization; benefits for therapists and patients (3) – an asset for therapists and patients, helping with communication and follow-up; and design and visual appearance (2) – design, such as the tranquil blue color and the general aesthetic.

Attending to the clients' opinions, the negative aspects included: suggested features and improvements (6) – adding other features and upgrades, such as an online sharing forum, the possibility to add personalized activities by users, the possibility of contacting the therapist synchronously, the creation of a specific program for each client, or the home page having a system of daily tasks to motivate the client; technical/functional limitations (3) – little variety, lack of possibility of direct communication, and no professional psychological support; clarity and purpose of the application (2) – lack of objectivity on the purpose and in the relationship between elements; emotional and psychological impact (2) – introduces fear, stress and confidence, and it can become a factor of obsession; user autonomy and discipline (2) – it requires some self-discipline and greater therapeutic adherence from the client; comparison with other existing resources (1) – other applications offer the same possibility; and suitability for different audiences (1) – with more senior clients may not be the best tool.

5.3 Usability Assessment

5.3.1 Quantitative Assessment of Usability

The quantitative assessment of usability among participants (N=28) resulted mostly in *"Agree"* and *"Strongly agree"* evaluations, with few neutral (*"Don't agree or disagree"*) and negative responses (*"Disagree"* and *"Strongly disagree"*).

The general (N=28) quantitative assessment of Skye's usability is presented in Table 3.

Table 3. General quantitative assessment of usability (frequency and percentage) by heuristic

	Heuristics	General Quantitative Assessment of Usability									
		Strongly agree		*Agree*		*Don't agree or disagree*		*Disagree*		*Strongly disagree*	
		N	%	N	%	N	%	N	%	N	%
i.	Visibility of system status	9	32,1	14	50	3	10,7	1	3,6	1	3,6
ii.	System vs. real world	10	35,7	12	42,9	5	17,9	1	3,6	0	0
iii.	User control and freedom	12	42,9	12	42,9	4	14,3	0	0	0	0
iv.	Consistency and standards	15	53,6	9	32,1	4	14,3	0	0	0	0
v.	Error prevention	7	25	15	53,6	5	17,9	1	3,6	0	0
vi.	Recognition vs. recall	12	42,9	13	46,4	2	7,1	0	0	1	3,6
vii.	Flexibility and efficiency	13	46,4	12	42,9	2	7,1	0	0	1	3,6
viii.	Aesthetics and design	16	57,1	8	28,5	4	14,3	0	0	0	0
ix.	Help users with errors	9	32,1	10	35,7	9	32,1	0	0	0	0
x.	Support & documentation	12	42,9	12	42,9	4	14,3	0	0	0	0

The graphical representation of results from the quantitative usability assessment of the Skye platform between groups is presented in Figure 6.

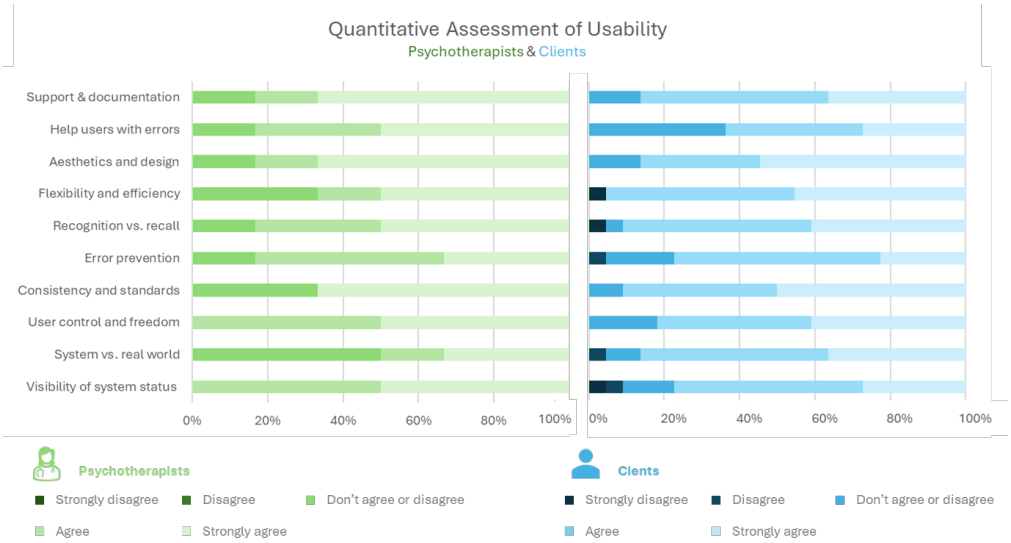

Figure 6. Qualitative assessment of usability (percentage) between groups – psychotherapists and clients

5.3.2 Qualitative Assessment of Usability

The qualitative assessment of the Skye platform usability retrieved 39 positive aspects (psychotherapists = 8; clients = 31) and 33 negative aspects (psychotherapists = 7; clients = 26).

Focusing on psychotherapists' opinions, positive aspects of usability include the following with the respective count: ease of use and access (4) – facility for entering information, quick access, having processes organized in a single place, and simplicity; design and features (3) – simplicity of layout, intuitive use, clear and accessible features, and pleasant looks; and application potential and idea (1) – reference to the potential of the application. Negative aspects of usability from the psychotherapists' perspective include the following with the respective count: technical problems and functionality (4) – errors in the operation of the application, difficulties in adding patients, failures in certain features; usability and navigation (2) – problems with intuitive use and navigation; and confidentiality and privacy (1) – guarantee of confidentiality.

Attending to the clients' opinions, positive aspects of usability include the following with the respective count: usability and intuition (10) – intuitive, simple, easy to use, straightforward, and affordable; design and visual communication (7) – clean, attractive, clear and non-cluttered image, and useful navigation bar; features and practical usefulness (7) – useful tools for dealing with anxiety, activities, recording emotional state, and advice; language and clarity (4) – clear, objective language, and effective communication; and therapeutic value (3) – application required, relevant to clients and therapists. Attending to the clients' opinions, negative aspects include the following with the respective count: technical issues and functionality (8) – crashes, button errors, features that don't work, difficulties closing windows, delayed feedback, and failures in the reporting process; navigation and user interface (6) – difficulties with design and navigation, unclear icons, lack of initial orientation, very simplified interface, requiring prior exploration; lack of features or options (4) – limited exercise options, lack of reflections, symptom or language option for audios; functionality and design (3) – suggestions and criticisms about the SOS functionality; design and visual appeal (3) – suggestions for improving the design to make it more appealing and welcoming; unwanted features and events (2) – possible unexpected malfunctions, such as wrong appointments.

5.4 Results Discussion

The results regarding the utility and usability of the Skye platform were mostly positive among both groups included in the research.

The "Global utility" of the Skye platform was exclusively positive between psychotherapists and clients. Only positive evaluations regarding utility were also retrieved on "Client's management" among psychotherapists and "Therapy maintenance" among clients. The less positive assessments regarded "Anxiety intervention" among psychotherapists and "Anxiety monitoring" among clients. Qualitative assessment reinforces its potential through the design established and the functions included for both profiles, with specific concerns addressed by psychotherapists and mostly suggestions for upgrades from clients. These results highlight the need for digital resources to support blended psychological interventions, and they also support the design and development of the Skye platform as an adequate digital resource for this purpose.

Attending to Skye's platform usability, participants' quantitative evaluations were also mostly positive. Among psychotherapists (N=6), no negative evaluations were found. The heuristics "Help and documentation" and "Help users" presented the most positive results, and "Visibility of the system status" and "Error prevention" had the least positive evaluations. Among clients (N=22), "Help and documentation," "Help users," "Aesthetics and design,"

"Consistency and standards," and "User control freedom" were the heuristics without any negative evaluations, while "Visibility of the system status" presented the worst assessment, with only two negative reviews among clients. Qualitative data reinforces the ease of use and access, the intuition, design, and visual communication, with the technical issues being the most concerning problem.

These results highlight the platform's support and feedback and draw our attention to the need for improvement in the functional systems.

6. CONCLUSION

This paper presents the assessment of the Skye platform, focusing on its utility and usability for the different interveners in the psychotherapeutic process. The Skye platform aims to provide a functional, interactive, and secure environment for supporting blended mental health care for both psychotherapists and clients, following the recommendations for blended care (Wentzel *et al.*, 2016), attending to the guidelines for providing psychology services mediated by information and communication technologies (OPP, 2019), and considering the use of mental health applications (OPP, 2022).

The platform features two tailored profiles, each with specific functionalities, to support psychological interventions that can be personalized to meet users' needs, attending to the different roles performed in the psychotherapeutic process. It enables professionals to manage the clients and personalize the interventions through the contents, exercises, and activities, and also adds relevant functions for clients to self-manage their mental health, with a gamification element embedded through a token system.

The design of the Skye platform is supported by the belief that there is a crucial need for a comprehensive and integrated digital resource to support blended psychological interventions for the Portuguese population, considering the national landscape of mental health care (OECD, 2021; NHC, 2019; Silva et al., 2022). Our perspective is reinforced by the exclusively positive results obtained from the utility of the Skye platform.

Since the platform was developed in an academic setting, several constraints related to time, available resources, and project scope have impacted its current stage of development, functionality, and scalability, potentially affecting the usability results. While the platform has achieved a notable level of functional maturity, some issues still need to be addressed to ensure broader accessibility and long-term scalability, most notably the presence of occasional bugs that impact the user experience and require ongoing refinement. To overcome the constraints found and support the platform's future growth, it's important to implement a more robust and scalable backend architecture capable of handling more complex business logic, meeting stricter security requirements, and enabling deeper integration with healthcare infrastructures.

The plan for the next phase is to overcome the constraints and limitations found and to enhance user experience by incorporating features, such as improved responsiveness, better user interaction, and various technical and UX enhancements, including elements to enrich the overall experience and refine the platform's appearance. As for the token implementation, it's relevant to explore its execution better, to overcome technical constraints, and to increase efficiency. The product should then be tested for its effectiveness in supporting blended psychological interventions, as recommended by the Order of Portuguese Psychologists (OPP, 2022).

Participants in this assessment had limited knowledge of the Skye platform and its connection to the psychotherapeutic process. Their focus was on assessing utility and usability, not on effectiveness for blended psychological interventions. This lack of familiarity influenced the qualitative data collected. Some participants suggested adding existing features, while others thought the platform only supported distance interventions and struggled to see the relationship between features and intervention content.

Future personalization and upgrades will incorporate participant suggestions and desired features, including: more content, exercises, and activities; expanded token options for individual preferences; customizable avatars for enhanced engagement; and integration of biometric data from wearable devices, like heart rate monitoring, to identify anxiety triggers and support biofeedback techniques from third-wave cognitive behavioral therapy (Ferguson and O'Donohue, 2015).

The main limitations of the research include: the dropout rate of around 70%, which might be due to the study being conducted at a distance and/or the functional problems reported in the platform during the implementation phase; the sample volume (N=28), not being representative of the population under the scope of the present study, given the limited time available to collect data; and the sample distribution, with fewer psychotherapist (N=6) for the number of clients (N=22), and more feminine participants (N=21) than male (N=8), both probably due to recruitment constraints during the implementation phase of the research. The main limitations of the Skye platform included accessibility problems, as the platform was not yet fully compatible with all web browsers, mainly due to the constraints of free versions of software (for instance, the use of Unity's WebGL export, which restricts access for users on certain browsers or devices), and functional problems, probably also related to the software supporting and deploying the platform (for instance, the use of Firebase, which presents limitations in terms of customization, advanced data handling, and integration with external systems).

Despite the limitations found in the research and the digital resource, the results were very positive and act as drivers for improving the Skye platform and developing new technologies and features that might help to support blended or distance interventions in mental health, contributing to human-computer interaction and the digital transformation in mental health.

Future studies with Skye should mitigate the research and platform limitations found in the present research. Research limitations can be mitigated by extending the sample size and including a more heterogeneous sample. Platform limitations can be mitigated by integrating a dedicated database system to better manage data and to ensure higher standards of security and privacy for sensitive user information, and by the separation of user access using more adequate software solutions for each version (desktop and mobile), optimizing the user experience for each group, and better addressing data protection by minimizing shared access environments.

Future studies with the final product should include the assessment of the platform's effectiveness in supporting blended psychological interventions when compared to exclusive face-to-face therapy and/or other digital resources to support blended interventions.

To conclude, the Skye platform was designed and developed to be adoptable and adaptable for various settings through its personalized structure and features, allowing for future developments and studies to assess its potential with different types of mental disorders and populations.

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