Evaluation of usability and acceptability of Telemental health service among vulnerable occupational workers: A formative study based on user-centered design

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Abstract

Background: The COVID-19 pandemic marked an increase in depressive, anxiety, and post-traumatic stress disorder symptoms, more specifically among healthcare workers, teachers, and police officers. These workers face external and occupational factors that limit the early detection and access to mental health services.

Objective: Designing a telehealth service for screening, initial management, and timely referral in mental health for workers with a history of SARS-CoV-2 infection and evaluating its usability, acceptability, and user satisfaction.

Methods: This is a formative mixed-method study with a user-centered design approach involving key external and internal service users in three sequential stages (pre-design, co-design, and post-design).

Results: The proposal included a service model guide and the telecare software platform. The pilot test involved 698 screened patients; 193 were identified with mental health risks, and 134 of them received psychoeducation sessions. In addition to user acceptance, the usability score was 86.1 ± 16.9 SD, satisfaction dimensions was 45.1 ± 7.2 SD for satisfaction with care processes, and 36.7 ± 5.2 SD satisfaction with psychological care.

Conclusions: The proposal for telecare services in mental health was successfully designed and garnered acceptance among internal and external users. Additionally, it achieved higher scores in satisfaction and usability compared to Peru's outpatient care services. This proposal demonstrates replicability within the occupational health sphere for the mentioned vulnerable occupational groups.

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Author's contribution:

Jimmy Andreyvan Cainamarks-Alejandro, Liliana Cruz-Ausejo, Miguel Angel Burgos-Flores, Juan Israel Ambrosio-Melgarejo, Jaime Rosales-Rimache and John Astete- Cornejo, participated in the conception of the idea, methodology design, collection and analysis of data, writing the first draft of manuscript and approval of the final version.

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Conclusion: The proposal for telecare services in mental health was successfully designed and garnered acceptance among internal and external users. Additionally, it achieved higher scores in satisfaction and usability compared to Peru's outpatient care services. This proposal demonstrates replicability within the occupational health sphere for the mentioned vulnerable occupational groups.

Keywords: telemedicine; health personnel; schoolteachers; police (MeSH terms)

Introduction

The COVID-19 pandemic has increased the incidence of mental health issues, including depression, anxiety and post-traumatic stress disorder symptoms related to mourning [1,2]. During the first year of the pandemic, a global increase of 28% and 26% in symptoms of depression and anxiety, with approximately 159 million additional cases of both conditions, was evident [3]. Furthermore, it has been observed that individuals with a history of SARS-CoV-2 have a 2.5 to 3 times higher risk of experiencing these disorders, compared to the general population, along with a more significant burden of long-term illness [4–6].

Measures to stop the virus from spreading, such as social distancing and remote work, drastically altered working conditions in different occupational sectors [7,8]. Vulnerable occupational groups, such as healthcare workers, police enforcement personnel, and teachers, experienced a significant increase in workload, direct exposure to the virus, shortage of personnel protective equipment, and instances of abuse, including discrimination [9–15], which had a significant impact on mental health.

There has been a reported prevalence of depression and anxiety of 16.2% and 27.3% among teachers,

19.6% and 17.3% in police officers, and 24.6% and 39.1% in healthcare workers, respectively, during the pandemic. Therefore, the sequels in these vulnerable occupational groups might represent a higher burden of professional illnesses in its economic sector [13,14,16].

The assessment of mental health at work is the primary strategy to mitigate the burden of mental health pathologies. The World Health Organisation (WHO) indicates that workplaces are essential targets for mental health prevention and promotion programs [17]. Likewise, the evidence supports this statement by reporting that workplaces are conducive spaces for implementing strategies and interventions that promote mental health care, as well as prevent, identify, and manage mental disorders effectively [15,18].

Despite the availability of effective treatments, many individuals with mental disorders do not receive adequate care due to internal and external barriers [19]. Personal barriers include stigma and negative attitudes towards mental health, which delay the seeking of help. On the other hand, external barriers, such as lack of access to specialized services, long waiting times, and a shortage of qualified personnel hinder treatment access. Mental health care in primary care requires a process of early identification (screening) and timely referral of complex cases [20]. However, in developing countries like Peru, the normative approach focuses more on specialization than early detection, further overloading the system. Therefore, it is necessary to implement efficient screening and referral processes, thus facilitating access to appropriate treatment [21,22].

In this context, mental health intervention programs, including telehealth services, have been demonstrated to be workable and cost-effective, facilitating widespread access by shortening wait access and ensuring secure and confidential environments for conversation [23,24]. Telehealth-based interventions for screening and treatment represent a viable alternative for addressing common mental health issues [23,24]. A meta-analysis demonstrates significant improvements in well-being, symptoms of mental illness, and social and occupational functioning compared to the waitlist of standard care controls. Similarly, high levels of acceptance and satisfaction among telehealth users in mental health settings have been evidenced, supporting the effectiveness, safety, and usability of these interventions. It is, therefore, possible to assert that such telehealth services hold promising potential for mental health care, particularly within the Peruvian context [25,26].

Telehealth emerges as an effective alternative for addressing challenges in mental health care, although its implementation encounters obstacles. The variability in the effectiveness of digital health services, depending on geographic location, underscores the influence of sociocultural aspects on their deployment [27,28]. Therefore, using frameworks based on center user design, evaluating user usability and satisfaction are crucial to ensure the success and scalability of these interventions [29–32].

In the Peruvian context, private telehealth platforms offer integrated services across various aspects of healthcare, including mental health. However, the oversupply of services may compromise coverage and efficiency, especially in the early identification of mental health issues [22,33]. Peruvian regulations define telehealth as providing healthcare services through communication and information technologies, facilitating their organization and use [34]. Although there was a significant increase in demand for telehealth services during the pandemic, its implementation was primarily focused on treating patients, leaving a gap regarding early identification through screening and the initial management of patients to prevent the progression of the illness [35].

This study addresses the findings of a digital health intervention in the early identification of mental health problems related to symptoms of depression, anxiety, and post-traumatic stress in post-

COVID-19 workplaces in Peru, targeted at vulnerable groups such as health workers, police officers, and teachers. A formative research was conducted that described the development and the outcomes of usability and acceptability assessment of a mental health telehealth service based on user-centered design approach. Our Paper describes the results and the methodology applied, providing a local perspective for future occupational interventions that are relevant to Latin America.

Methods

Formative mixed-study design was organized in three phases (pre-design, co-design, and post-design), based on and adapted from "A generative co-design framework for healthcare innovation: development and application of an end-user engagement framework" by Bird *et al.* [32] and "Health Design Thinking methodology - Creating Products and Services for Better Health" by Ku B *et. al.* [31] . (See fig.1.)

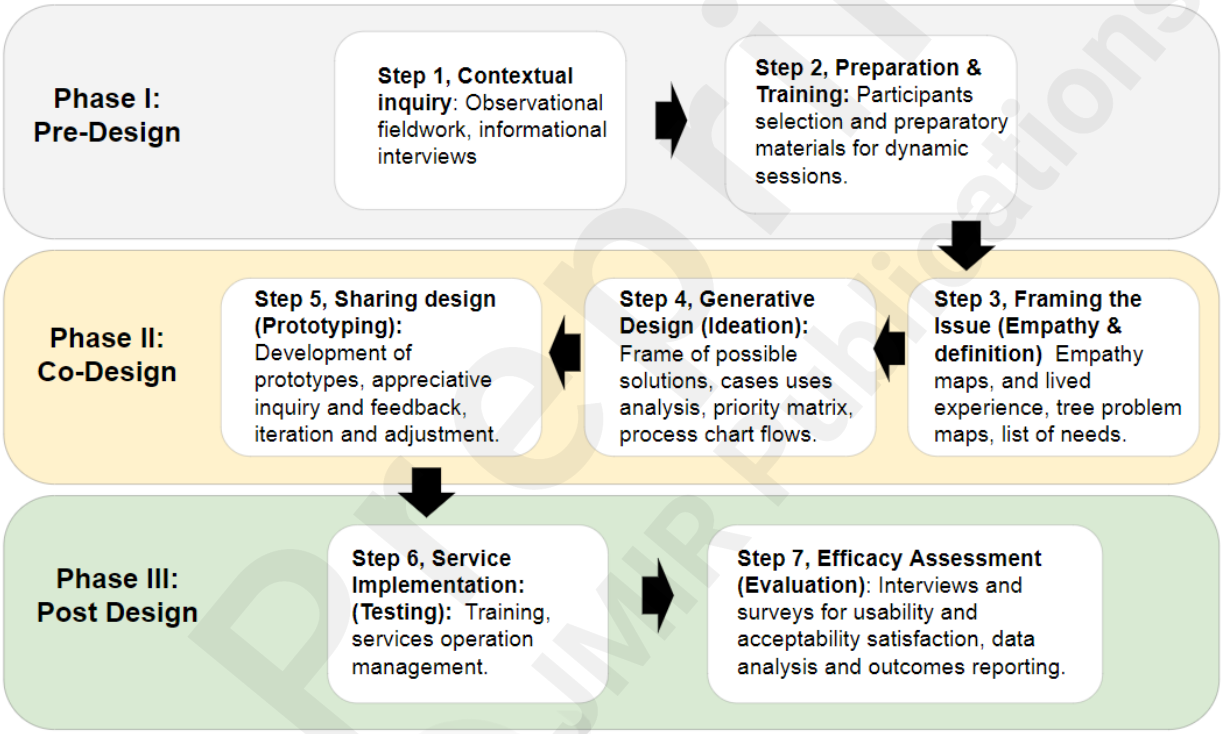

Figure 1. Phases of telehealth service development

Phase I: Pre-design

This phase had 1 month and half duration; a bibliographic review of regulations, backgrounds and best practices for implementing telehealth services targeting prioritized occupational groups was conducted for the contextual inquiry analysis (step 1), enriching the requirements for the development of the telehealth platform and the service implementation. Furthermore, a qualitative approach was employed, using semi-structured interviews to explore the needs, barriers, and limitations faced by users participating in telehealth services for mental health. During one month, 23 volunteers with a history of COVID-19 were interviewed and participated (five teachers, five healthcare professionals, five police officers, five healthcare professionals responsible for telecare, and three health decision-makers). Participants were recruited from various institutions, including those from the education, health, police sectors, and Community Mental Health Centers. A non-

probabilistic sampling method was used. An anthropologist and the research team conducted the interviews, lasting 20-30 minutes each. Following data collection, information was coded and analyzed using a phenomenological approach with the assistance of Atlas Ti [36].
Preparation materials and training resources (step 2) was required to prepare next co-design sessions. In this step all participants were selected for the next phases.

Phase II: Co-design

This phase lasted for two months and involved the development of the service. It involved four psychologists with extensive experience in telehealth, one software engineer, one health professional specialist in software development, and the research team. Together, they delineated the design characteristics of the care processes and the development of the telecare platform prototype through co-creation workshops based on the application of Design Thinking methodology (*Emphaty, definition, ideation and prototype design*) [31].
Drawing from the information gathered in Phase 1, co-design tools such as empathy mapping, lived experience discussion, problem tree maps, and list of needs were employed by the participants throughout workshops for framing issues cases (step 3). Then in the generative design activities (step 4), the participants developed a frame of possible solutions, creative matrix, impact matrix, cases use discussions and process chart flows were conceived for defining prototypes models. Information compiled from these sessions served in delineating the functional requirements of the platform prototype alongside service care guidelines.
Following this, the platform web prototype was developed by the software specialists team and shared with the team for testing (step 5). First, it was stemmed from drawings, image mock-ups, Excel spreadsheet templates and Google Forms tools that evolved towards a functional and integrated web platform through 3 iteration design process. It was possible with the participation of tele-psychologist professionals and the research team that validated each stage of the platform development. The early use of no-code tools from the prior stages of web development facilitated the definition of the service model process, the structuring of care forms, automated calculation algorithms, response listings, registration flow automation, and care status management (See supplementary A).
Ultimately, pilot tests of the service were conducted, preceded by virtual training sessions and direct observation usability evaluations with the participants and some early users. Service feedback facilitated three iterations of adjustments to the initial proposal, culminating in the final version of the technological proposal for use in the subsequent phase [37–39].

Phase III: Post-design

It spanned three months of intervention and evaluation of the telehealth service designed during Phase 2 (Service care guidelines and the functional prototype of the telecare platform). The deployment comprised two sub-stages:

Telehealth service intervention

Three tele-psychologists and one service operator were trained for using the model service guide. Then, they carried out operation management of telehealth service under researchers supervision (step 6). Among the primary activities, coordination with healthcare organizations, educational centers, and the national police sector was conducted to promote the screening service to the target audience. A social media communication campaign was also deployed to pre-identifying potential participants. Then, pre-identified users were approached by a service operator to schedule a psychoeducation session. The service concluded with issuing the final report, a certificate of attendance, and guidance for the timely referral, just in cases that required specialized clinical treatment [40].
Several resources were used to monitor the efficiency of care attention, such as Google Analytics for

tracking web user metrics and Google Looker Studio for assessing care progress [41].

Usability, satisfaction and acceptability assessment

The telehealth platform's efficacy was assessed by quantitative and qualitative instruments (Step 7). A quantitative evaluation for usability assessment was applied by online survey application to 81 patients who utilized the service. It employed the “Computer System Usability Questionnaire Scale (CSUQ version 3)”, which assessed three dimensions: system quality, information quality, and interface quality [42,43].

The qualitative evaluation for acceptability assessment comprised semi-structured interviews directed towards six external users (patients), three of whom received at least two service components, three who received only one component, and three internal users (operators and tele-psychologists) [36]. On the other hand, satisfaction was evaluated through two methods, qualitatively by the semi-structured interviews and quantitatively by the “Outpatient Medical Consultation Users´ Satisfaction Scale (ESCOMA)” applied to 81 participants, assessing satisfaction across two dimensions: satisfaction with care management processes and satisfaction with psychological care [44]. All the quantitative information was structured and analyzed using SPSS 23.0 and qualitative information was coded and analyzed using a phenomenological approach with the assistance of Atlas Ti.

Ethical Considerations

This study was approved by the ethics and research committee of the National Institute of Health of Peru, through Directorial Resolution No. 206-2023-OGITT-INS (COD. OC-048-22).

Results

Phase I

The main outcomes of the initial phase, which involved interviews with 23 users and stakeholders in the mental telehealth ecosystem services were identified, highlighting common opinions. These included: a) Dissatisfaction with telehealth services was perceived as "very impersonal" and "distant”. Also, lacking the use of clinical records; b) Issues with scheduling and appointment times related to flexible schedules and missed appointments; c) Training for healthcare workers in telecare described as issues with rapport between patients and healthcare professionals and connectivity problems; d) The need for healthcare system integration, described as a lack of infrastructure and the need for more coordination with other governmental entities.

Phase II

Characteristics of telehealth service and platform design

The telehealth service model was named TelePsico CENSOPAS and comprised four general processes: a) Service promotion; b) User pre-identification; c) Appointment management; d) Psychoeducation counseling and referral.

The service promotion activities aimed to attract potential users through talks and educational training on mental health in the workplace with allied institutions and the dissemination of advertising about the service's benefits on social networks. Subsequently, users accessed the TelePsico web platform where they could find information about the service and access educational information.

Next, users accessed the mental health risk pre-identification evaluation questionnaire through the telehealth website. The form included psychometric assessment instruments: Patient Health Questionnaire PHQ-9 for detecting depressive symptoms, Generalized Anxiety Disorder GAD-7 for detecting anxiety symptoms, and the Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5) for detecting posttraumatic stress. Demographic, contact and sociodemographic data were also obtained. Upon completing the form, users received an email with an automated personalized message about their evaluation results, and those at risk were invited to schedule a psychoeducation session.

Appointment scheduling was managed by a service operator who downloaded the data of pre-identified users to send private communication through a project-exclusive WhatsApp channel. In coordination with the users, scheduling times for appointments were established. Additionally, the channel was used for reminders and communication support. Scheduled appointments were recorded in the TelePsico web platform for telecare management, so the attending psychologists could address them.

Psychological counseling and referral consisted of a video call session between the user and a psychologist, lasting 40 minutes for an interview. The session allowed for the consolidation of the patient's mental health diagnosis. It was recorded through an assessment report, proof of care, and guidance, which was subsequently delivered to the patient via email after the interview for timely referral if necessary.

The characteristics of the service are described in four steps. (See fig.2.)

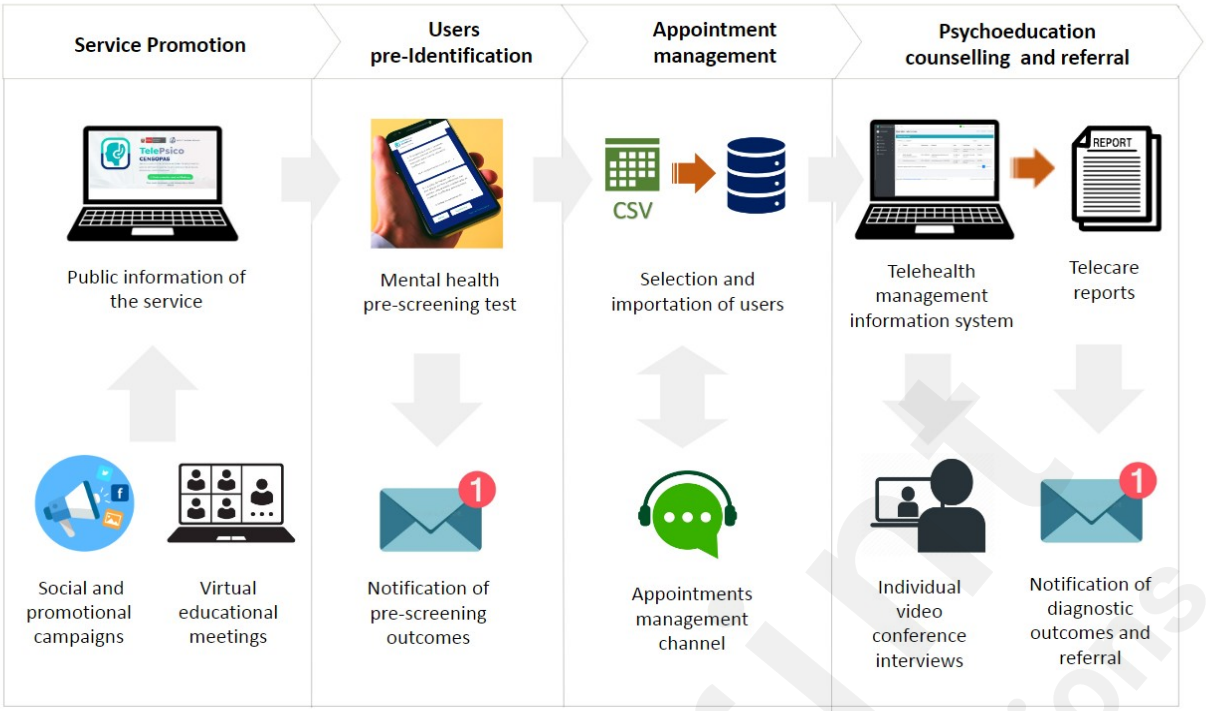

Figure 2. Telehealth Service Delivery Process Flowchart.

The development of the telehealth platform required integrating various digital technologies, including an owner development platform and third-party service technologies that allowed communication support and information exchange. The owner telehealth platform prototype developed by the research team was named TelePsico Web Platform https://telepsicocensopas.ins.gob.pe/ (See supplementary B). On the other hand, third-party services platforms that were used as complementary technologies tools in the service flow. These comprised video calling platforms such as Zoom and Google Meet, communication resources as WhatsApp, and social networks like Facebook, LinkedIn, and email (Google Gmail). The description of the digital modules used is detailed in Table 1.

Table 1. Telehealth software functionality requirements at service flow.

Requirements	Functionality description	Inserted into TelePsico web platform	Digital application resources
Public information of the service	A responsive website tailored for web browsers on PCs and mobile devices, displayed general service information, as well as announcements for talks, explanatory videos, and psychoeducational materials for patients and the general public (See supplementary C).	Yes	TelePsico web platform
Social and promotional campaigns	Social network profiles serve as communication channels with other users, enabling the sending of educational messages and other means of promoting the service. Additionally, links to free courses and mental health conferences were disseminated through the WhatsApp channel and social media platforms, aiming to provide knowledge and preventive tools in mental health to the target population and encourage enrollment in the TelePsico service.	No	Whatsapp channels / Facebook pages / LinkedIn pages
Virtual educational meetings	Video calling platform for conducting educational meetings with allied institutions and communities of occupational health and safety	No	Google Meet /Zoom

	workers.		
Mental health pre-screening test	Web-responsive form questionnaire integrated into a public web information site. This resource calculated pre-screening outcomes for mental health risk using algorithms for the PHQ-9, GAD-7, and PCL-5 instruments.	Yes	TelePsico web platform
Notification of pre-screening outcomes	The system allowed integration of the screening test registration form with automated email responses through service integration, such as Google AppScript, enabling personalized messages to be sent regarding questionnaire results. Messages were tailored based on whether users were at risk or not for mental health issues, as determined by the results of the depression, anxiety, and post-traumatic stress questionnaires.	Yes	Google App Scripts and Gmail integration
Selection and importation of users	Web tool for downloading contacts of pre-identified users. It allows the importation in CSV format of selected contacts for scheduling appointments in the system.	Yes	TelePsico web platform
Appointments management channel	An exclusive WhatsApp user profile was assigned for the service for communication with potential users and operator service.	No	WhatsApp contact
Telehealth management information system	Intranet module designed for internal users of the service (researchers, service operators, and tele-psychologists) in a web format, allowing for appointment scheduling and management of the status processes of care (initiated, in progress, attended, completed, and notified) for service progress monitoring. The system had different access levels among users, ensuring the protection of patients' personal and health data.	Yes	TelePsico web platform
Individual video conference interviews	Video calling platform for conducting individual psychoeducational sessions between psychologists and users.	No	Google Meet /Zoom
Telecare reports	The system enabled tele-psychologists to fill out psychological medical records for the generation of reports and certificates of care. Researchers could access progress reports on care through integrated dashboards (See supplementary D).	Yes	TelePsico web platform Google Analytics Google Locker Studio
Notification of diagnostic outcomes and referral	An exclusive email account for the project was utilized, managed by the service operator, for sending individual reports and certificates of care following the appointment, as well as providing guidance for timely referral if required by the diagnosis.	No	Google Gmail

Phase III

Telehealth service intervention outcomes:

The pilot test deployment reached 3900 users who visited the informational website. Among them, 698 users completed the mental health screening questionnaire, pre-identifying 193 patients with symptomatology of risk (see supplementary material 1). Of these, 134 users attended psychoeducation sessions. Finally, 81 patients responded to the phase 3 evaluation surveys (satisfaction and usability).

Table 2 shows the characteristics of the 698 participants who completed the screening test surveys. External users were mainly composed of women 527 (76%). Forty percent of the participants were between 25 and 35 years old, and 2% were over 65 years. Regarding occupation, 85% were healthcare workers, followed by the education sector (14%). Additionally, participants were asked if they had received any previous diagnosis in mental health before their participation; 8% did before the pandemic, and 4% did during the pandemic.

Table 2. General characteristics of external users who completed the screening test (N= 698)

Sociodemographic characteristics	n	%
Gender		
Female	527	76%
Male	171	24%
Age group		
<25 years	46	7%
25-35 years	280	40%
36-45 years	223	31%
46-55 years	90	13%
55-65 years	48	7%
>65 years	11	2%
Occupational group		
Education workers	97	14%
Teacher	50	7%
Education administrative staff	47	7%
Police workers	9	1%
Police officers	5	1%
Police administrative staff	4	1%
Health workers	592	85%
Healthcare Workers	439	63%
Health administrative staff	153	22%
Work Modality		
Hybrid work (remote and in-person)	73	10%
On-site work	606	87%
Remote work	19	3%
Diagnosis of mental health		
No	613	88%
Yes, before the pandemic	57	8%

Yes, during the pandemic	28	4%

One hundred ninety-three individuals (27.7%) were pre-identified with some mental health symptomatology. Figure 3 describes the distribution of workers with single or associated risk symptoms. Among them, mainly 149 workers exhibited symptoms of post-traumatic stress. Workers' symptoms distribution by job position are described in supplementary material 1.

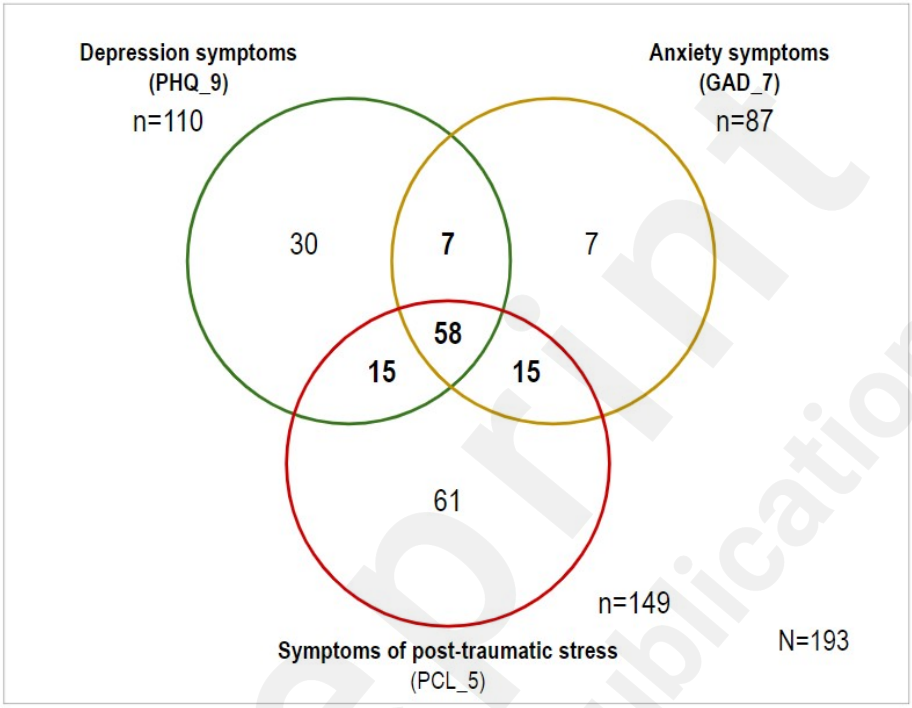

Figure 3. Distribution of workers pre-identified with symptoms of mental health risk.

Usability evaluation outcomes:

Concerning quantitative evaluation analysis; 81 external users (patients) who participated in psychoeducation sessions were surveyed. As a result, an average score of 86.1 ± 16.9 SD was obtained on the Computer System Usability Questionnaire Scale (CSUQ version 3), which is classified at an "Excellent" level within the SUS scale. The following scores were observed for usability dimensions: D1 - System Quality 38.0 ± 5.6, D2 - Information Quality 36.3 ± 6.9, and D3 - Interface Quality in external users (patients) 24.3 ± 5.1 (See supplementary material 2); 30.9% of respondents rated the usability of the platform as "Best imaginable", followed by "Excellent" (32.1%), "Good" (18.5%), and "Okay" (12.3%). On the other hand, low levels of usability were observed with ratings of "Poor" (3.7%) and "Horrible" (2.5%) (See supplementary material 3).

The qualitative evaluation analyzed various topics from responses described by external users during the interviews. They expressed quick adaptation, ease of system use, and understanding of instructions. Additionally, they suggested the need to incorporate detailed instructions for individuals with limited knowledge of using digital technologies, incorporating blog-style informative components and increased promotion on social media platforms. On the other hand, internal users expressed rapid learning of tool usage and satisfaction with saving time in patient report

development using the platform. However, they emphasized simplifying the registration system and promoting platform usage training for all users (See supplementary material 4).

Service satisfaction and acceptability evaluation outcomes:

Eighty-one external users (patients) were surveyed for assessing service satisfaction. The survey results revealed an 82.7% medium-high satisfaction rate for the "Satisfaction with care processes" dimension and a 91.4% medium-high satisfaction rate for the "satisfaction with psychological care" dimension (See supplementary material 5). Overall, external users exhibited higher satisfaction with the psychological care received than care management processes, including service provision, appointment scheduling, and result notification processes.

The acceptance evaluation was conducted through in-depth qualitative semi-structured interviews with both external and internal service users. Six internal users (patients) and three external users (telepsychologists and service operators) were interviewed. The categories of acceptability evaluation responses in external and internal users are described in supplementary material 6.
Regarding the perception of acceptability among external users, they expressed a positive experience using the service, highlighting the ease of access for telecare through any device. Another aspect mentioned was the trust in the service generated through dissemination activities such as educational talks and sharing information within professional groups, which instilled a sense of security in users regarding the service's credibility. Areas for improvement include the need to standardize messages from the operator, and enhance the efficiency of meeting scheduled appointments. They also suggest the creation of support communities and social media outreach.
On the other hand, internal users reported an easy adaptation to using the platform during the service, especially in accessing information about scheduled patients and the quick preparation of reports, which contributed to their service's efficiency. Opportunities for improvement include optimizing the user experience in the system, providing training to the target audience to promote the service, and offering education on digital literacy for users with limited digital skills.

Discussion

Principal Results

This study describes the results of the development and evaluation processes of a telehealth service model for vulnerable occupational groups. It details the service design characteristics and the telehealth software platform, as well as the pilot service implementation results and the assessment of satisfaction, usability, and acceptability among internal and external users.

During the pre-design phase, users and other stakeholders in the telehealth service ecosystem were identified, recognizing their needs, limitations, and barriers. Among the main barriers identified were uncertainty in appointment management, non-compliance with scheduled times for these services, lack of clear communication and the absence of a legal framework integrating care outcomes with the healthcare system for a timely referral. Despite on Peru has made significant improvements in the regulatory framework, allowing the development of many of these services, there are still legal and operational gaps to achieve sustainable satisfaction and adherence, which also serves as limitation for the integration of health services [45], especially when telehealth services are not developed with the end user in mind or fail to address digital divides [46]. Rees and Peralta point out that many telehealth services focus on solving operational problems within the healthcare system without considering patient needs, which affects their sustainability and acceptance [47]. Given this reality, it is proposed to follow Bird's recommendations [32] for user-centered development, which was

employed in the present study, to ensure its replicability and sustainability.

The co-design phase activities allowed researchers and project stakeholders developing a service model and platform in an agile, participatory, and iterative manner. Methodologies such as Design Thinking have been widely used in recent years in developing innovative telehealth services due to their user-centered approach [31,48]. In this sense the co-design of minimum viable products (MVPs), have proven to be cost-effective and enable cost reduction in resources and maintenance, increasing productivity, acceptance, and effectiveness, particularly in healthcare settings with limited resources and high resistance to change [46,49,50].

The pilot implementation of the solution during the post-design phase (Phase 3) reached 698 users through coordination with occupational safety and health services, as well as human resources departments of entities corresponding to the target occupational groups. Additionally, educational talks on mental health were conducted, and digital marketing strategies, the creation of official communication channels, and a website were utilized. These actions elicited recommendations among users and professional circles, facilitating service satisfaction and usability feedback. In this regard, Otto L. et al. developed a working model called the Telemedicine Community Readiness Model (TCRM), which emphasizes the need to involve patient communities from prototype development to advanced evaluation stages. This model contributed to users not only being passive recipients but also adopting an active role as part of patient communities with common interests capable of providing solutions during service validation [51].

During the post-design stage, the pilot aimed to enhance access to mental health services among the target occupational groups. In order to achieve this aim, coordination was established with various institutions, such as healthcare networks, educational authorities, and law enforcement agencies. A higher participation rate was observed among healthcare workers (85%) than those in the education and law enforcement sectors. One possible reason is the working conditions experienced by other occupational groups, which might have limited their access to the service, such as conflicting work schedules that could have interfered with outreach activities. The commitment from occupational safety and health services facilitated user participation and trust, significantly promoting mental health and digital health education in the workplace, aspects that should be strengthened beforehand in the target audience to ensure adherence and acceptability of telehealth services [52–54].

Regarding the screening results, the high frequency of post-traumatic stress symptoms, anxiety, and depression among healthcare professionals is noteworthy. These findings align, particularly with what has been reported by medical professionals and nurses in the context of the COVID-19 pandemic, given the nature of their work (caring for critical patients, frontline work, etc.) [55]. Meanwhile, authors such as Pougnet et al. suggest that this prevalence was high even before the pandemic [56].

Regarding the telehealth service, the proposed model aimed to be disruptive regarding organizational structure and operational management compared to the traditional model. The functional structure was based on the model proposed by the US Department of Health and Human Services, which included various roles such as general coordination, supervision, training, and device management by the team [40]. Telecare service providers (psychologists) and scheduling managers (operators) provided flexibility in service delivery due to the demand for appointments outside of regular hours, facilitating communication and user participation. These benefits have been previously discussed by Sanders et al. [57], who reinforce the principles of communication, development of tracking metrics, and evaluation of progress in care for the rapid control, assessment, and adjustment of service distribution strategies. Additionally, according to the Framework for the Implementation of a

Telemedicine Service recommended by the WHO, organizations need to redesign their human resource management, processes, and working conditions in new scenarios, such as telemedicine, as the effectiveness of implementing these services is evaluated [58].

During the evaluation of the usability of the software platform, quantitative and qualitative techniques were combined, including the System Usability Scale (SUS) survey, semi-structured interviews, and direct observation [38,39,59]. These techniques are widely used in telehealth project development and help obtain a broader understanding of the service experience. It is worth noting that the evaluation process was ongoing throughout the development, even from Phase 2, where usability was assessed through direct observation with internal users during initial tests. As a result of the pilot, a usability score of 86.1 ± 16.9 SD was achieved, qualifying it as a product with a high level of acceptance among users. Authors like Hyzy et al. describe a usability level above 68 ± 12.5 SD as acceptable for software and hardware products, also applicable in the healthcare technological solutions field. Additionally, the authors describe in their review study an average usability score of 76.64 ±15.12 SD for computer applications in healthcare [60], so our results exceeded expectations.

As the main facilitator of service usage, external users identified the simplicity of the service usage on the platform, which required few steps for scheduling, while internal users highlighted the management of care and the rapid generation of care reports. On the other hand, both user groups described opportunities for improvement in the operator-patient communication flow, use of standardized messages, and active use of social networks for service positioning in user communities, as well as simplifying the system usage experience. At a functional level, one of the features that most contributed to users having a high degree of usability was the integration of third-party application services such as WhatsApp, video calling systems like Meet, Zoom, and Google Calendar, which were already in everyday use among users. Additionally, the use of a multi-device web system allowed easy accessibility on mobile phones and PCs. Presently, the increasing use of API-based technologies (Application Programming Interfaces) allows interoperability between various systems, streamlining development processes. However, the current debate on their use revolves around information security [61,62]. It is necessary to mention that participants' health data were not shared by third-party services, and the tools used only facilitated the operational management of service distribution.

The level of service usage satisfaction, evaluated using the ESCOMA instrument, showed a high score in satisfaction with care processes and psychological care. The evaluation instrument was initially developed by Moscoso et al., who found lower scores in satisfaction levels among users of MINSA, EsSalud, the Armed Forces, and private entities who received outpatient medical care services. These differences could be attributed to system characteristics such as the freedom of scheduling appointments and the accessibility described earlier, features that meet users' needs and expectations [44].

Additionally, a higher satisfaction score was identified regarding psychological care than the care management process. One possible reason could be that, during the pilot development, adjustments had to be made to the service management processes, so early users may have yet to experience high satisfaction with the operational management of appointments and result delivery.

Furthermore, age and previous experience with similar services facilitated a quick adaptation to using the service. Users considered transparency, accuracy of information, professional assurance, and appropriate handling of personal health data to be important requirements for service acceptance. These aspects align with the concept of user-centered security developed by Vega-Barbas et al [63]. Among other acceptance qualities, the structured flow of care, use of validated mental health

assessment tools, psychoeducation service provided by accredited psychologists, and institutional prestige contributed to greater participant and community confidence in using the service. All these characteristics ultimately shaped the service's business model, many of which coincide with the model for an online assistance service proposed by Van D. et al [64].

Strengths and limitations

The present study makes a valuable contribution to the field of telehealth and its development; however, several significant limitations are identified. The project's development time, spanning six months, proved challenging due to the high demand for design activities and solution iteration, leading to an accelerated process in the final phase, achieving three iterations. It is advisable to conduct more iterations before implementing the service in healthcare facilities to tailor it to their needs [32,64,65]. Wachtler et al., in their study on the design of an app for early detection of depression, also developed their proposal in three iteration cycles [66].

Furthermore, the participation of occupational groups, such as the educational and police sectors, was limited due to the need for more organization in their respective workplaces' occupational health and safety services, highlighting the need for a more robust institutional commitment. In terms of integration with the healthcare system, the lack of updating of the Peruvian legal framework and the insufficient availability of mental health services pose obstacles to the effective referral of users diagnosed with conditions requiring specialized psychological or psychiatric care [22]. On the other hand, the use of the ESCOMA instrument for satisfaction evaluation, while showing comparatively promising results for the telecare proposal of the study, could not be compared with other telecare services due to the novelty of the instrument.

Despite these limitations, the study offers a holistic approach to product design, focusing on the user and combining qualitative and quantitative components in its methodology [32,65]. Additionally, it prioritizes the attention to vulnerable occupational groups in the context of health emergencies, such as healthcare workers, teachers, and police officers, who face severe limitations in accessing mental health services, particularly during the COVID-19 pandemic [67,68].

Furthermore, the possibility of incorporating tools such as Chatbots operated with Artificial Intelligence in future projects is proposed to enhance the operational efficiency of telehealth services and complement the work of healthcare professionals [69–72].

Conclusion

In conclusion, the study enabled the development of a tele-mental health service and platform for the early identification of mental health risks in vulnerable occupational groups such as healthcare workers, teachers, and police officers. In order to achieve this, user-centered design methodologies were employed, using co-creation techniques with the participation of users themselves during three phases of development (formative, co-design, and implementation). Optimal satisfaction was achieved in the management of care processes and the psychological care provided, compared to outpatient services in Peru (MINSA, Armed Forces, National Police, and private). Additionally, the tele-mental health platform achieved a usability score, which rated the product with a high level of acceptance among users, surpassing the minimum acceptability required for software and hardware products, and the average for computer applications in healthcare.

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Conflicts of Interest
None declared.

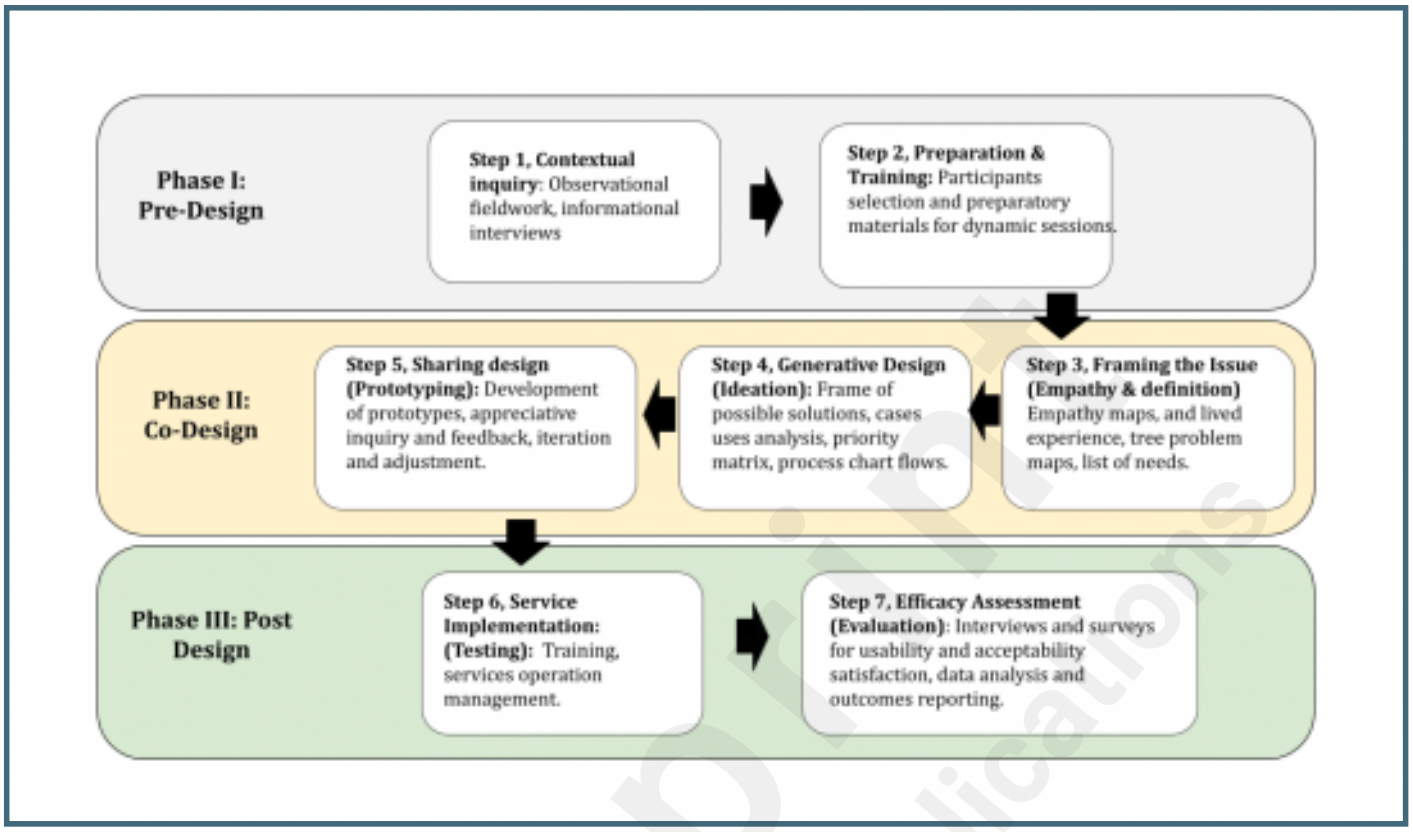
Abbreviations

CENSOPAS: National Center for Occupational Health and Environmental Health Protection, National Institute of Health.
CSUQ: Computer System Usability Questionnaire Scale
ESCOMA: Outpatient Medical Consultation Users´ Satisfaction Scale
PHQ-9: Patient Health Questionnaire (depressive symptoms)
GAD-7: Generalized Anxiety Disorder (Questionnaire for Anxiety symptoms)
PCL-5: Posttraumatic Stress Disorder Checklist for DSM-5

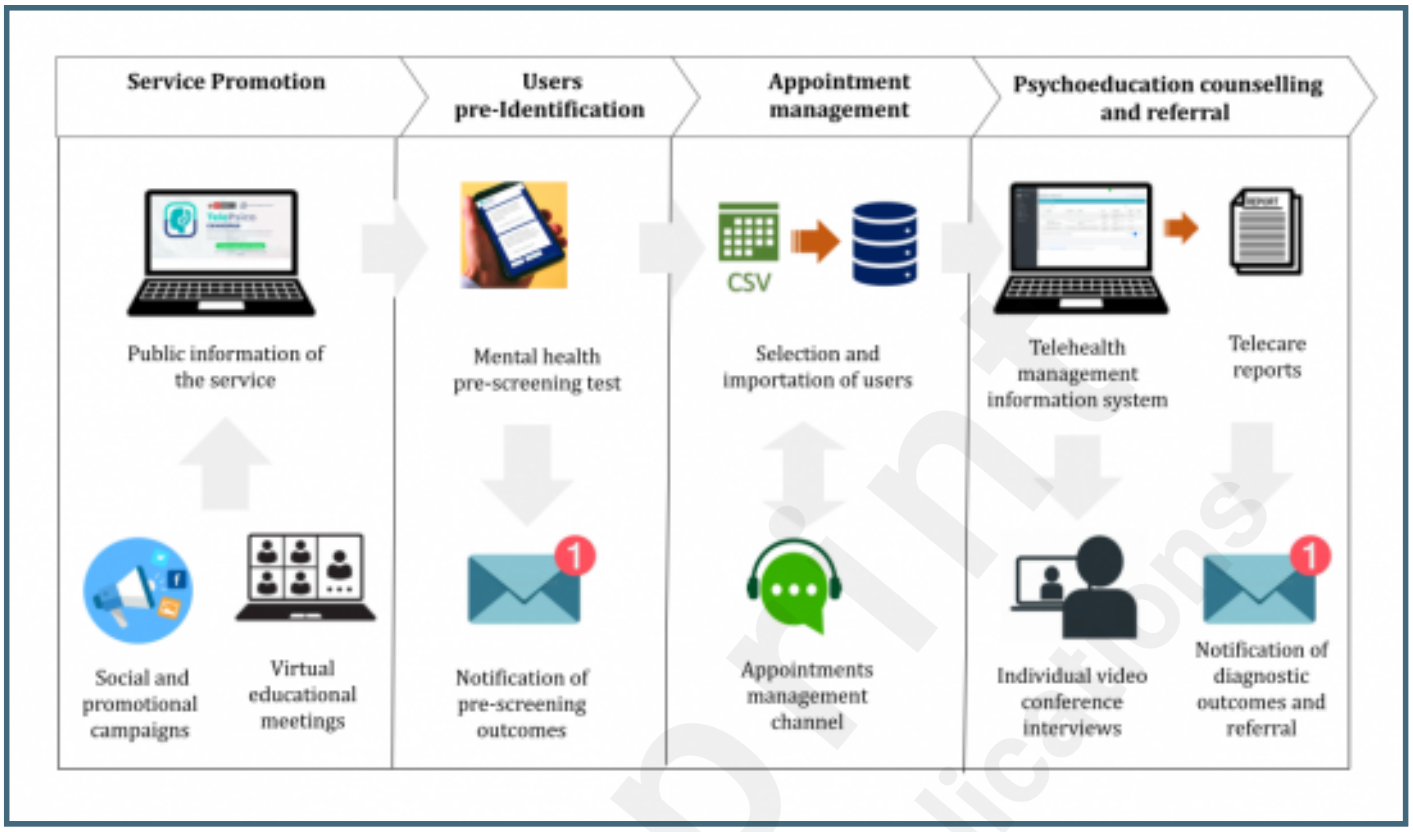
Supplementary Files

Figures

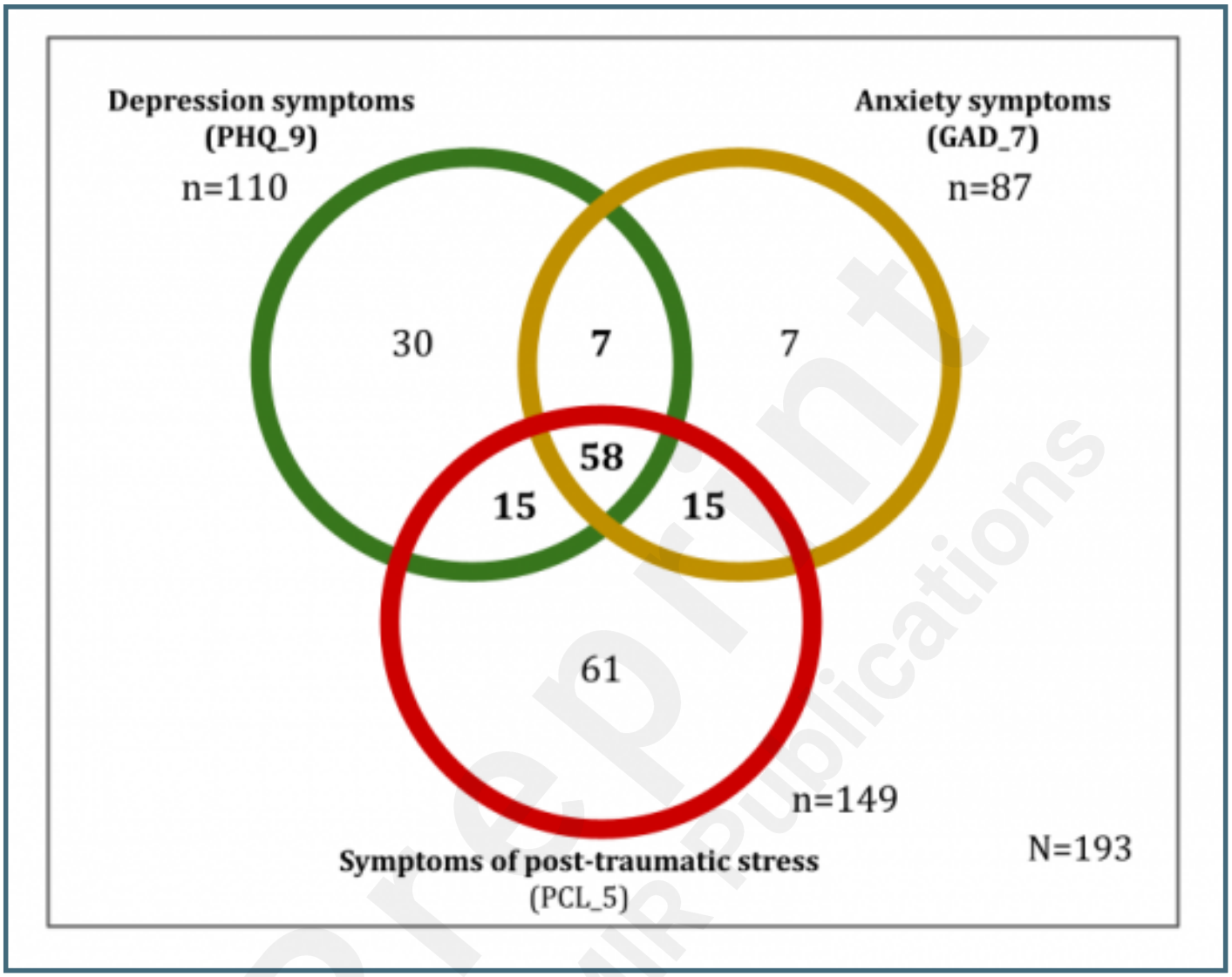
Phases of the methodology design of the TeleHealth service.



Telehealth Service Delivery Process Flowchart.



Distribution of workers pre-identified with symptoms of mental health risk.



Multimedia Appendixes

Supplementary material 1.
URL: http://asset.jmir.pub/assets/be9ee8d5e5fec1aa69e6d84daf65759a.docx

Supplementary material 2.
URL: http://asset.jmir.pub/assets/e94d223529b7a0a12550d3bdce84318a.docx

Supplementary material 3.
URL: http://asset.jmir.pub/assets/50b051b732883af48c9578fa3a5fb536.docx

Supplementary material 4.
URL: http://asset.jmir.pub/assets/8c93604612d3b373adfbe12cc9f35a5f.docx

Supplementary material 5.
URL: http://asset.jmir.pub/assets/453cdb2515b6f69617691a4f33e3d24d.docx

Supplementary material 6.
URL: http://asset.jmir.pub/assets/03536259c661ceda0f44edd57fefad90.docx

Supplementary A - Early prototypes in co-design phase.
URL: http://asset.jmir.pub/assets/e3f8821e1022eae3b68cff4ea4af970e.png

Supplementary B - TelePsico web platform prototype.
URL: http://asset.jmir.pub/assets/a0e05ca071c44934a5d6ca58c48a0116.png

Supplementary C - Public information of the service.
URL: http://asset.jmir.pub/assets/c7aa70464d1c9f83e44868f3b7f42332.png

Supplementary D - Telecare reports.
URL: http://asset.jmir.pub/assets/b11365d7afa4b1d09a1b90b23aaa6144.png