

Co-Creation, Translation, and Localisation of Sentinel: A Protocol for Testing a Digital Mental Health App in Diverse Socio-Economic Contexts

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Abstract

Background: Digital mental health interventions have emerged as scalable tools to support psychological wellbeing and reduce acute stress among frontline and trauma-exposed occupational groups. However, many existing interventions lack cultural adaptation, contextual sensitivity, and linguistic inclusivity, factors that are critical for sustained user engagement, particularly in low-resource and non-Western settings. Barriers such as stigma, lack of local relevance, language mismatch, and digital inequity often limit the accessibility and effectiveness of these tools across diverse socio-economic and geopolitical environments.

Objective: This protocol outlines a participatory, multi-country research study focused on the co-creation, translation, and localisation of Sentinel, a trauma-informed digital mental health intervention designed for frontline workers. The aim is to evaluate usability, acceptability, feasibility, and perceived psychological impact of localised versions of Sentinel in three international settings, South Africa, Saudi Arabia, and Ukraine, each representing distinct cultural, linguistic, and occupational landscapes.

Methods: The study employs a four-phase, mixed-methods, participatory research design. Phase 1 involves stakeholder engagement and cultural insight workshops with frontline professionals to guide adaptation of app content and interface. Phase 2 focuses on professional translation and linguistic validation into Arabic, isiXhosa, Afrikaans, and Ukrainian, following forward-backward translation and cognitive testing protocols. Phase 3 involves iterative localisation and adaptation of the app interface and content through user feedback. In Phase 4, a six-week feasibility pilot will be conducted in each country, with 100 participants per site using the localised app version. Data collection will include validated quantitative outcome measures, in-app usage analytics, and post-intervention qualitative interviews to explore cultural fit, usability, and psychological impact.

Results: The study will generate linguistically and culturally adapted versions of Sentinel and yield comparative data across three diverse global contexts. Outcomes will offer insights into engagement patterns, user preferences, and the role of cultural adaptation in shaping perceived utility and psychological outcomes. The research will also produce practical guidance for future localisation of digital health tools, with a focus on trauma-informed care.

Conclusions: This protocol addresses a critical gap in the localisation and ethical deployment of digital mental health interventions for underserved and trauma-exposed populations. By embedding co-creation, linguistic validation, and cultural adaptation into each phase, the study advances best practices for the equitable and sustainable implementation of digital mental health tools in LMIC and crisis-affected settings. Findings will contribute to global mental health research and support the scaling of culturally intelligent interventions that are responsive to local contexts and frontline needs.

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Original Manuscript

Title: Co-Creation, Translation, and Localisation of Sentinel: A Protocol for Testing a Digital Mental Health App in Diverse Socio-Economic Contexts

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Conclusions: This protocol addresses a critical gap in the localisation and ethical deployment of digital mental health interventions for underserved and trauma-exposed populations. By embedding co-creation, linguistic validation, and cultural adaptation into each phase, the study advances best practices for the equitable and sustainable implementation of digital mental health tools in LMIC and crisis-affected settings. Findings will contribute to global mental health research and support the scaling of culturally intelligent interventions that are responsive to local contexts and frontline needs.

Keywords:

Digital mental health, co-creation, localisation, translation, trauma-informed, frontline workers, participatory research, Arabic, isiXhosa, Afrikaans, Ukrainian, global mental health, public and patient involvement

Introduction

Co-creation processes that involve patients and the public have been shown to improve the design and implementation of health interventions, ensuring they are user-centred and culturally appropriate [1]. In the context of digital health, involving end-users in the development process helps to identify potential barriers to adoption and to tailor solutions to meet the specific needs of diverse communities [2]. Furthermore, integrating Public and Patient Involvement (PPI) in digital mental health research fosters trust and empowers participants, leading to more effective and sustainable interventions. By actively involving patients and the public, researchers can ensure that the tools developed are not only technically sound but that they also resonate with users' values and preferences, thereby enhancing engagement and outcomes [3].

Frontline and trauma-exposed occupational groups globally experience high rates of psychological distress, burnout, and reduced wellbeing [4-6]. These individuals, including emergency responders, health and social care staff, and essential service workers, often operate in high-pressure environments where exposure to trauma, moral injury, and cumulative stress is routine [7]. Despite the significant mental health burden, many frontline workers face barriers to accessing traditional face-to-face psychological support [8]. These challenges include stigma around help-seeking, fears of professional repercussions, confidentiality concerns, irregular shift patterns, and limited service availability, particularly in under-resourced or rural areas [6,9]. Moreover, existing mental health services are not always tailored to the unique cultural, occupational, and linguistic needs of these populations, further limiting their accessibility and relevance [10].

Digital mental health interventions have the potential to offer timely, scalable, and flexible support, especially when designed in a way that recognises the lived realities of frontline work [11]. However, for such interventions to be meaningful and effective—particularly in non-Western and socio-economically diverse contexts—they must be co-designed with end users and culturally adapted [12]. Co-production with providers and stakeholders is increasingly positioned as the gold standard for improving uptake, engagement, and healthcare outcomes in digital mental health interventions [13]. Nevertheless, clear guidance around the process of co-production is lacking [14]. Additionally, cultural and contextual adaptation of digital health interventions is essential to ensure their relevance and effectiveness across diverse populations [3]. Differences in access and use of digital health tools are influenced not only by economic and physical factors, but also by culture, language, and local context [15].

Sentinel is a trauma-informed digital mental health intervention app for mobile devices developed to support the psychological wellbeing of frontline and trauma-exposed occupational groups. Co-created with end users and subject matter experts across the UK [6], the intervention is grounded in evidence-based psychological principles and tailored specifically to the challenges faced by those working in high-risk, high-pressure environments such as emergency response, healthcare, and humanitarian aid. The app offers in-the-moment tools to manage acute stress, including guided breathing exercises, grounding strategies, and mindfulness-based practices designed to regulate physiological arousal. In addition, users have access to psychoeducational modules covering key topics such as trauma, burnout, moral injury, sleep, and psychological safety. These modules are delivered through text, voice narration, and imagery to ensure accessibility and relevance. To promote longer-term resilience and post-traumatic growth, the app also includes reflective exercises that encourage users to explore personal strengths, values, and coping strategies. Designed for mobile-first delivery, the app features a personalised dashboard that allows users to track their

engagement and revisit tools over time. While Sentinel is not designed for crisis intervention or clinical diagnosis, it provides scalable, preventative, and user-led support to enhance mental health and psychological resilience in occupational groups facing cumulative and acute stressors.

This protocol details the study which aims to address this critical gap by outlining the co-creation and localisation of a trauma-informed digital intervention, Sentinel, developed in collaboration with partners based in the UK, and adapted for implementation in Saudi Arabia, South Africa, and Ukraine. The project aims to ensure that the content, language, and delivery of the digital intervention are contextually grounded, culturally resonant, and responsive to the complex needs of frontline and trauma-exposed occupational groups [16]. The United Kingdom, Saudi Arabia, South Africa, and Ukraine were chosen as implementation sites due to their shared challenges and distinct socio-cultural environments, offering critical insights into localisation. The UK served as the initial development and concept validation site for the Sentinel app, providing early-phase user feedback and foundational design principles. Saudi Arabia is undergoing major health system transformation under its Vision 2030 initiative, which prioritises digital health, mental wellbeing, and the empowerment of women [17]. South Africa, with its multilingual and multi-ethnic population, high levels of trauma exposure, and strong public health-academic infrastructure, offers a compelling site for testing cultural adaptation in a low- and middle-income country (LMIC) context [18]. Ukraine, in the midst of geopolitical conflict and humanitarian crisis, presents an urgent need for trauma-informed mental health support. The inclusion of these sites enables the study to explore localisation across varied socio-political and linguistic contexts, including settings with collective trauma and disrupted service infrastructure [19].

This protocol places a strong emphasis on PPI as a foundational element of the co-creation process [1]. Engaging with frontline professionals and local stakeholders ensures that cultural nuances, lived experiences, and context-specific needs are embedded from the outset. PPI will be integrated throughout the project lifecycle, from the design of localised content to feedback on app usability and dissemination of findings. Meaningful PPI enhances the relevance, accessibility, and uptake of digital mental health interventions, particularly among underserved and trauma-exposed populations (see Table 1).

Table 1.

Summary of Patient and Public Involvement (PPI) Across Study Phases

Study Phase	PPI Activities	Purpose	Participant Groups Involved
Phase 1: Co-Design & Cultural Insight	Participation in cultural insight workshops and needs assessments	Identify culturally relevant mental health concepts, language, and delivery preferences	Frontline workers, community leaders, mental health advocates
Phase 2: Translation & Validation	Review of translated materials; contribution to terminology selection	Ensure linguistic equivalence, cultural resonance, and avoidance of stigmatising or clinical jargon	Bilingual PPI contributors, local health professionals
Phase 3: Localisation & User Testing	Testing of prototype versions of the app; usability feedback through interviews	Refine visual and functional elements; assess cultural and contextual fit	Frontline professionals, peer supporters
Phase 4: Evaluation & Refinement	Participation in post-trial qualitative interviews and focus groups	Explore lived experiences of using the app; identify areas for improvement	Study participants, local advisory panel members
Dissemination	Co-creation of community-friendly summaries; input on	Promote accessibility of findings; ensure relevance to target audiences	PPI contributors, local organisations, NGO

academic and policy outputs

partners

Objectives

This study aims to develop and evaluate a culturally adapted digital mental health intervention for frontline and trauma-exposed occupational groups across diverse international contexts. The objectives are to:

1. Co-create culturally relevant content for the Sentinel digital mental health intervention by engaging local stakeholders in Saudi Arabia, South Africa, and Ukraine. This collaborative approach ensures the intervention aligns with the unique cultural, linguistic, and occupational contexts of these regions.
2. Translate and linguistically validate the Sentinel intervention into Arabic, isiXhosa, Afrikaans, and Ukrainian. This process will adhere to established best practices, including forward-backward translation, expert panel reviews, and pre-testing with target populations to ensure semantic, conceptual, and experiential equivalence.
3. Conduct a six-week feasibility study to assess the usability, acceptability, and perceived psychological impact of the localised versions of the Sentinel intervention. Usability will be evaluated using standardised tools, while acceptability and psychological impact will be measured through user engagement metrics and validated mental health outcome measures.
4. Evaluate the impact of localisation on user engagement and cultural fit by analysing user interaction data, conducting qualitative interviews, and assessing cultural relevance through participant feedback. Insights gained will inform iterative refinements of the intervention and contribute to broader understandings of effective strategies for culturally adapting digital mental health tools.

Methods

Study Design

This study employs a multi-phase, mixed-methods, participatory research design [20] to develop, localise, and evaluate the Sentinel digital mental health intervention across diverse cultural contexts. This approach supports the iterative adaptation of digital interventions to meet the nuanced needs of frontline and trauma-exposed populations, ensuring that both content and delivery are grounded in real-world experiences and local contexts.

The Sentinel app is a trauma-informed, modular digital mental health intervention designed to provide flexible, user-led support for frontline and trauma-exposed professionals. Grounded in evidence-based psychological principles, the app offers a range of interactive components that can be accessed on demand to support acute stress regulation, psychoeducation, and longer-term psychological wellbeing.

Users engage with the app through three primary pathways: immediate stress management tools, psychoeducational content, and reflective exercises. The stress management tools include short, guided practices such as breathing techniques, grounding strategies, and mindfulness-based visualisations, all designed to be used independently in moments of distress. These tools are available in both visual and audio formats and can be accessed without the need to complete prior

modules, allowing users to select support based on their immediate needs.

The psychoeducational modules cover key topics relevant to frontline work, including trauma, burnout, sleep disruption, moral injury, and psychological safety. These are delivered in brief, accessible segments using text, narration, and imagery to enhance engagement and accessibility. Within each module, users are invited to reflect on their experiences through prompts that support self-awareness and learning. To encourage post-traumatic growth and self-reflection, the app also includes values-based and strengths-focused activities. These are designed to help users explore their coping strategies, personal responses to stress, and evolving resilience over time. Reflections are stored privately in a personalised dashboard, which also allows users to track their engagement with different parts of the app, revisit previously used tools, and monitor changes in their interaction patterns. The overall structure of the app is non-linear and intentionally low-barrier. Users are not required to follow a sequential pathway, and the design accommodates varied working patterns and fluctuating psychological states. The intervention is intended to be self-guided, scalable, and accessible across diverse occupational and cultural contexts. During localisation, the content and interaction patterns will be adapted to ensure cultural fit, with specific attention to tone, pacing, and visual style, while preserving the trauma-informed principles that underpin the intervention. There are four phases to the project.

Phase 1: Stakeholder Engagement and Cultural Insight Workshops: In this initial phase, stakeholder engagement workshops will be held with frontline professionals and local advisors in Saudi Arabia, South Africa, and Ukraine. These sessions will gather in-depth qualitative insights into local mental health needs, existing coping practices, help-seeking barriers, and cultural and language norms. This information will guide decisions regarding content framing, language tone, visual design, and cultural sensitivities to ensure contextual relevance.

Phase 2: Translation and Linguistic Validation: Building on the insights from Phase 1, the intervention will be professionally translated into Arabic, isiXhosa, Afrikaans, and Ukrainian. The process will follow international best practices for health translation, including forward-backward translation, reconciliation by expert panels, and cognitive pre-testing with representatives from the target user groups. This phase ensures not only semantic and grammatical accuracy but also conceptual alignment with local understandings of mental health and trauma.

Phase 3: Localisation and User Adaptation: This phase focuses on adapting the Sentinel interface and content based on linguistic validation outcomes and additional cultural input. Localised modules will be tested and iteratively refined in collaboration with end users. Adaptations may include changing idioms, modifying imagery, adjusting visual layout, or incorporating locally relevant metaphors. The localisation process will be guided by user-centred design principles, ensuring that the platform is intuitive, engaging, and aligned with the day-to-day realities of its intended users.

Phase 4: Pilot Feasibility Trial and Post-Trial Qualitative Interviews: A six-week pilot feasibility trial will be conducted in each implementation site. Participants will receive access to the localised version of Sentinel and be invited to use the app independently. While no minimum usage requirement will be imposed, participants will be encouraged to engage regularly. Standardised pre- and post-intervention measures will also be used to assess behavioural (e.g., help-seeking behaviour, coping strategies) and psychological (e.g., anxiety, acute stress, wellbeing, and perceived psychological safety) outcomes. In-app analytics will provide data on engagement patterns, duration of use, and interaction with specific features such as breathing exercises or grounding tools. Following the trial, semi-structured qualitative interviews will explore user experiences, acceptability, cultural fit, and suggestions for improvement. This phase will provide comprehensive

insight into how digital mental health tools are perceived, experienced, and integrated within different socio-cultural and occupational settings, and the extent to which they support emotional regulation, behavioural change, and psychological recovery.

Setting

The study will be conducted across three international sites, Saudi Arabia, South Africa, and Ukraine, each involving regional research teams and community health partners. This collaborative, community-engaged approach ensures that the Sentinel digital mental health intervention is culturally adapted and contextually relevant for frontline and trauma-exposed occupational groups in each location.

In each country, regional research teams will work closely with community health partners, including local clinicians, mental health practitioners, and representatives from frontline services. These partnerships facilitate the co-creation of intervention content, ensuring that it aligns with the specific cultural, linguistic, and occupational contexts of the target populations. Engaging local stakeholders in this manner enhances the intervention's acceptability and effectiveness, as it incorporates the lived experiences and insights of those directly involved in frontline work [21]. This approach aligns with principles of community-based participatory research (CBPR), which emphasise equitable collaboration between researchers and community members throughout the research process [22]. By involving community health partners in all phases of the study, from design and implementation to evaluation and dissemination, the research fosters mutual learning and capacity building, ultimately contributing to more sustainable and impactful health interventions [23]. The international scope of the study allows for comparative analyses across diverse settings, providing insights into how cultural and contextual factors influence the implementation and outcomes of digital mental health interventions. This knowledge will inform the development of best practices for adapting such interventions to various global contexts, thereby enhancing their scalability and effectiveness in addressing the mental health needs of frontline workers worldwide [24].

Participants

The study aims to recruit 100 participants at each of the three international sites—Saudi Arabia, South Africa, and Ukraine, resulting in a total sample size of 300 participants.

SPInclusion Criteria: Participants must be frontline professionals aged 18 years or older who are proficient in the local language(s) of the respective study site and who are actively employed or engaged in professional practice during the study period, with a minimum of six months' experience in their current role. These individuals must also have been exposed to trauma or acute stress or related challenges as part of their professional duties. Frontline professionals are defined as individuals working in roles that involve direct interaction with the public or vulnerable populations, such as healthcare workers, emergency responders, social workers, and other essential service providers. Proficiency in the local language is essential to ensure comprehension of the intervention content and accurate completion of study assessments. We will seek funding for digital devices and resources to support individuals who lack access to digital devices or reliable internet connectivity to ensure inclusivity and widespread accessibility.

Exclusion Criteria: Individuals will be excluded from the study if they are experiencing an acute mental health crisis that requires immediate clinical intervention. This criterion is established to prioritise participant safety, as the Sentinel intervention is not designed to address acute psychiatric emergencies.

Recruitment: Recruitment will be conducted through a combination of online and offline methods to ensure broad reach and inclusivity [25]. Online strategies may include targeted advertisements on social media platforms, professional networks, and organisational websites. Offline recruitment may involve collaboration with local organisations, distribution of informational materials, and direct outreach to potential participants through professional associations and community events. This multifaceted approach aims to engage a diverse cohort of frontline professionals, reflecting the varied populations that the Sentinel intervention is intended to serve.

By employing these inclusion and exclusion criteria and comprehensive recruitment strategies, the study seeks to assemble a representative sample of frontline professionals to evaluate the effectiveness and cultural adaptability of the Sentinel digital mental health intervention.

Measures

The study will, via Qualtrics, present several validated measures (See Table 2), including the Short Warwick Edinburgh Mental Well-being Scale (SWEMWBS), Depression, Anxiety, Stress Scale (DASS-21), Burnout Measure - Short Version (BM-SV), Post-Traumatic Growth Inventory (PTGI-SF), Mobile App Rating Scale (MARS), Neuroception of Psychological Safety Scale (NPSS), International Physical Activity Questionnaire– Short Form (IPAQ-SF), and qualitative interviews post-intervention. All psychometric tools and interview guides will be translated and culturally adapted for use in each implementation site, following best practice for forward–backward translation and validation to ensure linguistic accuracy and conceptual equivalence. This will support meaningful cross-cultural comparisons and ensure relevance and acceptability of the tools across diverse occupational and socio-cultural contexts.

Table 2.

Study Measures

Measure	Description	No. of Questions	Author(s)
Short Warwick Edinburgh Mental Well-being Scale (SWEMWBS)	Measures subjective mental well-being	7	[26]
Depression, Anxiety, Stress Scale (DASS-21)	Evaluates mental health distress	21	[27]
Burnout Measure - Short Version (BM-SV)	Assesses burnout across diverse occupational and community contexts	21	[28]
Post-Traumatic Growth Inventory (PTGI-SF)	Measures post-traumatic growth	10	[29]
Mobile App Rating Scale (MARS)	Assesses the quality of mobile health apps	29	[30]
Neuroception of Psychological Safety Scale (NPSS)	Captures psychological safety	29	[31]
International Physical Activity Questionnaire – Short Form (IPAQ-SF)	Assesses intensity of physical activity and sitting time	7	[32]

Translation and Localisation Process

The localisation of the Sentinel digital mental health intervention will incorporate culturally and linguistically tailored adaptations for Arabic-speaking, South African (isiXhosa, Afrikaans), and Ukrainian frontline professionals. For the Arabic version, the translation process is ongoing and will incorporate co-designed terminology for trauma-related concepts, ensuring that psychological terms resonate with the target audience's cultural and linguistic context. This approach acknowledges that direct translations may not capture the nuances of trauma experiences in Arabic-speaking cultures [33]. Additionally, local idioms for stress, safety, and body-based practices will be integrated to make the intervention more relatable and meaningful [34]. The interface and content will be adapted to accommodate right-to-left formatting, aligning with the reading habits of Arabic-speaking users [35]. Visual elements will be selected and designed to reflect cultural norms, values, and environments familiar to the target audience (e.g. appropriate representation of regional dress, settings, and tone), enhancing relatability and engagement. In South Africa, the adaptation will include translations into English, Afrikaans and isiXhosa, recognising the linguistic diversity of the region. The content will incorporate local narratives and collectivist metaphors, reflecting the communal experiences and values prevalent in South African societies [36]. Similar to the adaptations for Arabic-speaking users, commensurate visual adaptations will be made to represent regional variations for South African users, ensuring that the intervention resonates with users' daily lives and professional contexts.

The Ukrainian adaptation will involve the use of trauma-sensitive language that reflects current socio-political realities, acknowledging the unique challenges faced by Ukrainian frontline professionals. Careful translation of psychosocial concepts will be undertaken to ensure cultural and clinical accuracy. Visual design will be consistent with regional aesthetics and norms, enhancing the intervention's relevance and effectiveness. Translation efforts will involve collaboration between mental health professionals and linguists to ensure that the content is both culturally appropriate and clinically sound. By addressing these linguistic and cultural considerations, the Sentinel intervention aims to provide accessible, relevant, and effective support for the mental health of frontline professionals across diverse populations. This culturally sensitive approach is essential for ensuring that digital mental health interventions are both usable and impactful in varied contexts.

Ethical Considerations

Ethical approval for the study will be obtained from the relevant institutional and/or provincial ethics review boards in each participating country (i.e. Saudi Arabia, South Africa, and Ukraine) prior to the commencement of any research activities. This ensures adherence to international ethical standards, including the Declaration of Helsinki, and compliance with local regulations [37]. Informed consent will be obtained electronically from all participants. Participants will receive comprehensive information about the study's objectives, procedures, potential risks and benefits, data handling practices, and their rights, including the right to withdraw their data from the study without penalty. Survey data collected through Qualtrics will initially be pseudonymised, meaning that responses will be linked to participant identifiers using encrypted codes to enable follow-up or withdrawal during the data collection period. Following a two-week window after data collection is completed, survey responses will be fully anonymised by removing all identifiable information, after which point data can no longer be withdrawn.

For qualitative interviews, participants will also be informed of a two-week window following their interview in which they can request the withdrawal of their data. Interview recordings will be securely stored and labelled using pseudonyms during this period. Transcription and anonymisation of interview data—including the removal of names, locations, and other identifying details—will

occur only after this withdrawal period has passed. This approach ensures that participants retain meaningful control over their data while preserving the rigour of subsequent analysis.

Interviews may be conducted either in person or online, depending on participant preference, local access, and logistical considerations. To ensure participant wellbeing across both formats, a trauma-informed distress protocol will be developed to address the specific needs of in-person and remote settings. This will include procedures for recognising signs of emotional distress, pausing or discontinuing interviews if needed, offering immediate support resources, and following up with participants where appropriate. Researchers involved in data collection will be trained in trauma-informed interviewing practices and cultural competence, with supervision and debriefing available to mitigate vicarious stress.

All data collected during the study will be securely stored on encrypted servers with access restricted to authorised members of the research team. Anonymisation will involve removing or coding personal identifiers to prevent the identification of individual participants. These measures align with best practices in data protection and confidentiality, ensuring compliance with ethical guidelines and legal requirements [38].

The study will incorporate trauma-informed principles to safeguard the wellbeing of both participants and researchers [39]. This includes ensuring that participation is voluntary and empowering, and that the research environment fosters psychological safety. Participants will have access to culturally relevant support resources, and the research team will work closely with the PPI group to ensure that distress protocols are contextually appropriate and responsive to the needs of each study site. By embedding these ethical and trauma-informed practices into the study design, the research aims to uphold the highest standards of integrity, protect the rights and wellbeing of all involved, and contribute valuable knowledge to the field of digital mental health interventions.

Analysis and data monitoring

Quantitative data collected through standardised instruments (i.e. SWEMWBS, DASS-21, BM-SV, PTGI-SF, MARS, NPSS, and IPAQ-SF) will be analysed using descriptive and inferential statistics to explore usability, acceptability, and preliminary psychological outcomes within and across study sites. Where appropriate, subgroup analyses may be conducted to identify contextual or demographic variations. Qualitative data from post-intervention interviews will be analysed using reflexive thematic analysis [40]. This approach is well-suited for exploring complex, context-dependent experiences and is grounded in an interpretivist paradigm. Transcripts will be read repeatedly for familiarisation, then coded inductively using NVivo or equivalent software. Codes will be developed into themes through iterative reflection, with attention paid to both semantic and latent meanings. To ensure rigour, the research team will engage in reflexive journaling and regular analytic discussions to challenge assumptions and support theme development [41]. Cross-site comparisons will be used to explore shared and culturally specific experiences related to intervention use, engagement, and perceived impact. Given the nature of the study as a feasibility protocol for a digital mental health intervention, no formal Data Safety Monitoring Board will be established. However, internal monitoring procedures will be implemented [42]. Each country site will designate a local research coordinator responsible for overseeing adherence to the protocol, participant safety, and data integrity [43]. The lead study team at the University of Strathclyde will conduct monthly virtual check-ins with site teams to review progress, address challenges, and ensure consistency in data collection and reporting. All research activities will be subject to institutional ethical oversight, and any protocol deviations or adverse events will be documented and reported to the relevant ethics committees in accordance with local regulatory requirements.

Anticipated Outcomes

The anticipated outcomes include high levels of user engagement, usability, and acceptability within each local setting. By integrating culturally specific narratives, idioms, and visual elements, the intervention is expected to resonate with users' lived and living experiences, thereby enhancing its relevance and impact [3]. This approach aligns with growing evidence that culturally adapted digital mental health interventions are more acceptable and efficacious among diverse populations.

Quantitative data will be collected using validated psychometric instruments that have been professionally translated and culturally adapted for use in Arabic, isiXhosa, Afrikaans, and Ukrainian. This ensures semantic, conceptual, and experiential equivalence across sites, supporting meaningful cross-cultural comparisons of psychological impact.

In addition to these quantitative outcomes, the study will generate rich qualitative data exploring users' perceptions of value, relevance, and suggested improvements. These insights will guide iterative refinements of the app to ensure that content and interaction pathways are responsive to the specific needs and cultural contexts of frontline professionals in each region.

Findings will contribute to the growing evidence base on effective strategies for localising digital mental health tools in LMICs and non-Western contexts, helping to address the global mental health treatment gap [44]. By documenting both process and outcome data, this study will provide practical guidance for future initiatives seeking to culturally adapt and implement digital mental health interventions in diverse socio-political settings.

Timeline

The proposed study is structured into four sequential phases, each designed to ensure the cultural and linguistic adaptation, usability, and effectiveness of the Sentinel digital mental health intervention across diverse contexts. This initial phase involves engaging with local stakeholders, including frontline professionals, mental health practitioners, and community representatives in Saudi Arabia, South Africa, and Ukraine. Through workshops and consultations, the study will gather insights into cultural nuances, language preferences, and contextual factors that influence mental health perceptions and app usability. These insights will inform the subsequent translation and adaptation processes. Building on the insights from Phase 1, the Sentinel app will be translated into Arabic, isiXhosa, Afrikaans, and Ukrainian. This process will involve professional translators and local mental health experts to ensure linguistic accuracy and cultural relevance. Linguistic validation will include back-translation and pilot testing with native speakers to refine terminology and ensure clarity. In phase 3, the translated versions of the app will undergo localisation to align with cultural norms, values, and user expectations. This includes adapting visual elements, user interface design, and content to reflect regional aesthetics and practices. User adaptation will be informed by feedback from pilot users to enhance engagement and acceptability. The final phase involves conducting a six-week pilot feasibility trial with 100 frontline professionals at each site. Participants will use the localised version of the Sentinel app, and data will be collected on usability, acceptability, and psychological impact using validated measures. Post-trial interviews will gather qualitative feedback to identify areas for improvement and inform future iterations of the app (see Table 3).

Table 3.

Timeline of Study Phases

Phase	Activities	Timeline
1	Stakeholder engagement and cultural insight workshops	Months 1–3
2	Translation and linguistic validation	Months 4–6
3	Localisation and user adaptation	Months 7–9
4	Pilot feasibility trial and post-trial interviews	Months 10–15

This structured timeline ensures a comprehensive approach to developing and evaluating culturally adapted digital mental health interventions, contributing valuable insights into effective localisation strategies in diverse settings.

Discussion

This protocol presents a comprehensive and participatory framework for the co-creation, translation, and localisation of the Sentinel digital mental health intervention across three culturally and linguistically diverse settings. The methodology foregrounds community engagement and iterative design, acknowledging the importance of culturally relevant adaptations in enhancing the accessibility, usability, and effectiveness of digital mental health tools [2,3]. Cultural adaptation of digital health interventions is increasingly recognised as essential for improving mental health outcomes among underserved populations, particularly in LMICs and non-Western contexts [12,18]. Despite the growing emphasis on co-design and PPI, empirical guidance on operationalising these processes in international digital health projects remains limited [13,14]. This study directly addresses that gap by outlining a structured and context-responsive approach to localisation, grounded in the lived experiences of frontline professionals.

By prioritising stakeholder engagement from the outset, the protocol operationalises key principles of community-based participatory research [22], ensuring that local knowledge and socio-cultural insights are embedded within the intervention design. This approach not only enhances cultural resonance and acceptability but also promotes equity in health research and fosters greater ownership among users [21]. Furthermore, by incorporating linguistic validation procedures, such as forward–backward translation and expert panel reviews, the study aligns with international best practices for translation of health interventions [45]. Importantly, the inclusion of trauma-informed principles throughout the study acknowledges the ethical imperative of minimising harm in research with populations who may be experiencing ongoing stress or adversity [32]. The provision of researcher training and participant safeguarding protocols underscores a commitment to psychological safety, a particularly salient consideration in humanitarian and high-risk occupational contexts [6,19]. In addition to the primary feasibility outcomes, the study will provide valuable insights into how digital interventions are perceived and used in distinct cultural settings. Prior research suggests that visual and narrative elements that reflect local realities can significantly enhance user engagement and emotional connection with digital mental health tools [34,46]. By integrating culturally specific metaphors, idioms, and design elements, Sentinel seeks to move beyond simple translation toward a holistic model of localisation that accounts for semantic, conceptual, and experiential relevance [33]. The international scope of the project also allows for comparative analysis, offering a unique opportunity to explore how socio-cultural, political, and linguistic variables shape the implementation and reception of digital mental health interventions. Such findings can inform global health equity strategies and guide future adaptations in similarly complex environments [17,24]. Crucially, the study's participatory and iterative design means that important lessons will be derived from these processes, including what works and what challenges emerge when co-producing and localising digital interventions in diverse contexts. These lessons will be systematically captured and shared as part of the project's dissemination strategy to support the development of future research practice in this area. This includes practical guidance for integrating

trauma-informed principles, participatory methods, and cultural adaptation in digital health research and development, particularly within low-resource or conflict-affected settings.

Finally, the dissemination strategy embedded in this protocol reflects best practices in knowledge translation, ensuring that findings are communicated in ways that are accessible, impactful, and relevant across sectors. Dissemination activities will include academic publications in peer-reviewed journals, presentations at international conferences, and the development of policy briefs tailored to health system leaders and decision-makers. To ensure community reach, the research team will also produce plain-language summaries, short videos, and infographics co-designed with PPI contributors and local stakeholders. These will be disseminated through institutional websites, social media platforms, and community partner networks. In settings where digital access is limited, printed materials and community dialogues will be used to support inclusive engagement. By involving PPI contributors in shaping dissemination outputs and delivery formats, the study enhances the likelihood that its findings will be understood and utilised by frontline professionals, community partners, and policy audiences alike. This multi-layered dissemination approach strengthens the potential for policy influence and real-world application of research findings, particularly in contexts where digital innovation is rapidly expanding but remains unevenly accessible [15]. In sum, this protocol offers a robust and ethically grounded roadmap for the localisation of digital mental health interventions. It contributes novel insights into participatory design processes, linguistic and cultural adaptation, and the practical challenges of implementing digital tools in varied global contexts. The anticipated outcomes will not only support the refinement of Sentinel but will also advance the broader field of digital mental health through evidence-based localisation practices.

Conclusion

This protocol outlines a participatory, trauma-informed, and culturally responsive approach to the co-creation and localisation of a digital mental health intervention for frontline professionals in diverse global contexts. Through the integration of linguistic validation, cultural adaptation, and stakeholder engagement, the study aims to ensure that the Sentinel app is not only contextually relevant but also ethically grounded and practically useful across a range of socio-economic and linguistic settings. By developing partnerships in Saudi Arabia, South Africa, and Ukraine, the project embraces a comparative, cross-cultural lens that will yield insights into how digital mental health tools can be meaningfully adapted to meet the needs of diverse populations. The inclusion of Arabic, isiXhosa, Afrikaans, and Ukrainian translations reflects a commitment to linguistic inclusivity, while the emphasis on PPI reinforces the user-centred ethos that underpins the study. Importantly, the research will generate a rich set of insights into the practical and ethical dimensions of localisation, what facilitates successful co-creation, where challenges arise, and how trauma-informed and culturally sensitive methods can be operationalised across settings. These lessons will be captured and disseminated to inform future digital mental health projects, with the goal of advancing global best practices in equitable and effective intervention design. In doing so, this research contributes to a growing evidence base on digital mental health localisation and offers practical guidance for future initiatives operating in low-resource, conflict-affected, and culturally diverse settings. The anticipated outcomes (i.e. enhanced engagement, acceptability, and perceived utility) will support the development of more equitable and sustainable digital mental health solutions globally. Ultimately, the study seeks to inform best practices for adapting and scaling digital interventions in ways that respect local contexts while maintaining fidelity to trauma-informed, evidence-based care.

Ethics Approval and Consent to Participate

Ethical approval will be obtained from the relevant institutional and/or provincial ethics review boards in Saudi Arabia, South Africa, and Ukraine prior to the commencement of research activities.

The study will adhere to the principles of the Declaration of Helsinki.

All participants will provide electronic informed consent prior to enrolment. They will receive detailed information about the study's purpose, procedures, potential risks and benefits, confidentiality protections, and their right to withdraw without penalty. For survey and interview components, participants will be offered a two-week withdrawal period before data are fully anonymised. Trauma-informed distress protocols will be implemented to safeguard participant wellbeing.

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Conflicts of Interest

Dr Nicola Cogan is Chief Scientific Officer of Sentinel and is affiliated with the University of Strathclyde, which has a royalties agreement with Sentinel. Dr Alison Kirk and Dr William Hodgson are also affiliated with the University of Strathclyde under this royalties agreement.

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