ACTIVATE: Efficacy and cost-effectiveness of a digital health, smartphone-based app to reduce harmful gambling and PTSD symptoms among veterans

Final Report (2025)

Swansea University

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Download ACT Vet

GET IT ON Google Play

https://play.google.com/store/apps/details?id=noots.swansea

Download on the App Store

https://apps.apple.com/gb/app/act-vet/id6474731055

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CONTENTS

Executive Summary

This pilot study evaluated ACT Vet, a smartphone-delivered Acceptance and Commitment Therapy (ACT) application (app) designed for UK Armed Forces veterans experiencing post-traumatic stress disorder (PTSD) and gambling harm. The app, co-designed with veterans and experts, delivers a structured, self-guided programme to build upon psychological flexibility through the core ACT components. The app included ACT modules, breathing exercises, reflection prompts, and support signposting. Outcome measures were collected across five time points. A total of 250 people completed screening, with 79 eligible veterans and 35 starting the intervention. Of these, 24 completed sufficient data for analysis.

Key Findings:

- Psychological flexibility significantly increased.
- PTSD symptoms significantly reduced.
- Scores on gambling urges halved.
- Mediation analysis showed that increased psychological flexibility reduced gambling urges by firstly reducing negative PTSD symptoms.
- Secondary outcomes showed improvements in alcohol use, quality of life, suicidality, and loneliness.
- App usability was rated highly.

Qualitative interviews highlighted the app's simplicity, helpful structure, and calming features. Veterans valued its ease of access and support during distressing moments. Suggestions for improvement included clearer task tracking and more diverse imagery.

ACT Vet is a promising digital tool for veterans with PTSD and gambling harm, with early evidence of feasibility, engagement, and clinical benefit. A full Randomised Controlled Trial is now recommended, alongside continued development and exploration of NHS and third-sector integration.

Introduction

Gambling is a popular activity in the UK, with nearly 48% of adults participating in some form of gambling (Gambling Commission, 2023). For many, it is a form of entertainment, but for others, it can lead to significant harm. Gambling harm refers to the wide range of negative consequences that can arise from gambling, not just for individuals but also for families, communities, and society more broadly (Hilbrecht et al., 2020; Wardle et al., 2024). These harms may include mental health problems, financial hardship, relationship breakdown, homelessness, and even suicide. Importantly, gambling harm can occur even at low levels of gambling. Research shows that people who experience mild gambling-related harm are at higher risk of more severe harm over time (Currie et al., 2021). The ripple effect extends beyond the gambler, affected others (e.g., partners, children, friends, family) often report distress, anxiety, financial strain, and emotional hardship as a result of someone else's gambling (Azemi et al., 2023).

In terms of public spending, the estimated cost of gambling-related harm ranges from £1.05 to £1.77 billion per year (Public Health England, 2023). The largest direct cost to the government is from healthcare (£119.5 million), with additional societal costs related to homelessness, unemployment, addiction support, and contact with the criminal justice system. Clearly, addressing gambling harm is not just a public health priority, it is also a pressing economic and social concern.

Veterans are a particularly vulnerable group when it comes to gambling harm. Recent evidence shows that UK veterans are over 10 times more likely to experience problem gambling compared to the general population (Dighton et al., 2023). Studies suggest that gambling among veterans may be driven by a number of factors, including exposure to trauma, the stress of transitioning to civilian life, and military culture itself where gambling is often normalised (Champion et al., 2022). Slot machines, betting, and other forms of gambling are common on military bases, and gambling may become a routine part of life during and after service.

Veterans experiencing gambling harm are also more likely to come into contact with health and social care services, rely on benefits, and interact with the criminal justice system (Harris et al., 2021). These challenges do not exist in isolation, they often occur alongside serious mental health problems, such as post-traumatic stress disorder (PTSD). PTSD is a mental health condition that can develop after exposure to a traumatic event, such as combat, serious injury, or witnessing death. It affects thoughts, emotions, and behaviours and is often associated with flashbacks, nightmares, emotional numbness, and hyper-vigilance. PTSD is more common among military personnel due to the nature of their experiences, particularly those involving combat or deployment.

Veterans experiencing PTSD may turn to gambling as a way to escape or numb distressing emotions, especially if they cannot talk about or process their trauma (Etuk et al., 2020; Moore & Grubbs, 2021). While gambling may provide temporary relief, over time it can create a cycle of avoidance and worsening mental health (Neophytou et al., 2023). The relationship between PTSD and gambling is complex, each problem may intensify the other, making recovery even more difficult (Grubbs & Chapman, 2019; Dighton et al., 2025). Emerging evidence shows that PTSD can predict gambling severity, and without appropriate intervention, the combination of PTSD and gambling harm can lead to devastating outcomes, including social isolation, addiction, and suicide risk (Akbar et al., 2022; Armoon et al., 2023). This raises the need for a “transdiagnostic” approach to treating PTSD symptoms and gambling harm when they occur together.

Acceptance and Commitment Therapy (ACT) is a form of behavioural therapy that has been shown to help people manage a wide range of mental health concerns, including PTSD, anxiety, depression, and addictive behaviours (Donahue et al., 2024). Unlike traditional therapies that try to directly reduce symptoms of distress, ACT focuses on helping individuals build psychological flexibility, the ability to accept difficult thoughts and feelings, while continuing to act in line with personal values and goals. ACT involves six key components:

- Acceptance of inner experiences
- Cognitive defusion (stepping away from thoughts)
- Mindfulness (being present)

- Self-as-context (viewing oneself with compassion)
- Values clarification
- Committed action

These processes help individuals break the cycle of avoidance, which is especially relevant for PTSD and gambling harm. Veterans with PTSD may try to suppress or avoid distressing memories or emotions, and gambling often becomes an unhealthy way of coping. ACT helps individuals engage with their experiences in a different way, not by getting rid of the painful thoughts, but changing how they relate to them.

ACT has been found to be acceptable and effective in veteran populations, including those with treatment-resistant PTSD and substance use disorders (Meyer et al., 2018; Wharton et al., 2019; Karlin et al., 2013). The US Department of Veterans Affairs has developed manuals for use in clinical practice with veterans (Settles et al., 2017). Recent studies also suggest that ACT may be just as effective as CBT, with the added benefit of promoting long-term behaviour change and values-based living (Pfund et al., 2021).

Despite the availability of evidence-based therapies, many veterans do not seek help. A recent NHS survey found that over half of UK veterans struggle to reach out for mental health support (NHS, 2024). Barriers include stigma, military attitudes towards mental health, lack of awareness, long waiting times, and limited access to veteran-specific services (Randles & Finnegan, 2022; Royal College of Psychiatrists, 2022). Digital tools like smartphone applications may offer a solution. They are private, accessible, and convenient, and can be used outside clinical settings. Apps can provide structured therapeutic content and guided exercises, often at no cost. Several studies have shown that veterans are open to using mental health apps, and apps like PTSD Coach, ACT Coach, and DrinksRation have been positively received (Leightley et al., 2022; Linardon, 2020; Possemato et al., 2017; Thompson et al., 2021). However, many existing apps are not tailored to veterans, lack proper evaluation, or require payment. In addition, very few apps address the combined challenges of PTSD and gambling harm, a critical gap in current support options.

Aim and Hypotheses

The aim of the present pilot study was to evaluate an ACT-based digital intervention - ACT Vet - for UK veterans experiencing PTSD and gambling harm. Our hypotheses were that following the 10-week intervention:

1. Participants will show an increase in psychological flexibility scores, and PTSD symptoms and gambling urges will decrease.
2. The relationship between psychological flexibility and gambling urges will be explained by changes in PTSD symptoms.

This is because gambling may function as a coping tool for distressing symptoms. By providing people with the skills to tolerate and manage these emotions, they will have less need to escape them, lessening urges to gamble.

ACT Vet Development

ACT Vet Design and Development Plan

The development of the ACT Vet app was guided by a combination of veteran input and a comprehensive review of existing digital tools for mental health and gambling support. Veterans with lived experience of PTSD and/or gambling harm were actively involved throughout the development process. Their feedback was integrated at key stages, helping to refine both content and functionality to ensure the app was accessible, relevant, and supportive.

In the early stages of development, we conducted a comparative assessment of existing smartphone applications that offered mental health support, ACT-based therapy, or gambling recovery tools. This included mainstream apps such as Gambling Therapy, Recovery Me, ACT Coach, and Gambling Addiction Calendar. Each app was scored against key criteria, such as ease of use, visual appeal, use of evidence-based therapy, customisation, and signposting to services.

Scores: 0 = Features Not Included; 5 = Features Strongly Included/Good Quality

	SPRING	GAMBLING ADDICTION CALENDAR	GAMBLING THERAPY	RECOVERY ME	ACT ON IT	ACT COACH	ACT COMPANION
MILITARY OR VETERAN SPECIFIC	0	0	0	0	0	5	0
COMPLETELY FREE	5	2	5	2	5	5	2
EASY TO LOGIN AND SET UP AN ACCOUNT	4	5	5	5	5	5	5
USES VALIDATED SCALES	5	0	3	0	N/A	0	0
THERAPY-BASED	0	0	3	5	5	5	5
CLEAR INSTRUCTIONS OF HOW APP WORKS	4	3	4	4	5	5	2
ATTRACTIVE VISUALS	5	4	3	5	4	3	5
NICE USE OF IMAGES	5	4	2	4	5	4	4

BALANCE OF TEXT	3	4	2	4	4	4	4
CUSTOMISATION FOR A PERSONAL EXPERIENCE	0	5	0	0	0	0	0
SENDS REGULAR REMINDERS/MESSAGES	0	4	0	4	0	0	5
TRACKS PROGRESS WITH VISUALS OF PROGRESS	5	5	0	5	N/A	4	4
USE OF AUDIO	0	0	3	?	5	5	5
USE OF VIDEO	0	0	0	?	5	0	0
COMMUNITY SECTION	0	5	0	4	0	0	0
JOURNAL SECTION	5	0	0	5	0	5	0
SIGNPOSTING TO OTHER SERVICES	5	0	5	5	5	0	0
DIRECT LINK TO SOS	0	5	5	4	0	0	0
TOTAL SCORES	46	46	40	56	48	50	41

While several apps demonstrated strengths, such as ACT Coach's therapy-based content or Recovery Me's journaling features, none were developed specifically for veterans. Importantly, no existing app combined military relevance with ACT therapy and a structured, personalised delivery approach. This assessment highlighted a gap in the market and shaped or development priorities, particularly the need for a trauma-informed, veteran-centred app that integrates psychological therapy with usability and support features. The resulting ACT Vet design and development plan focused on building a digital tool tailored for UK Armed Forces veterans, with the following key features identified as important:

- **Account Management**: users could manage personal and application settings, including notification preferences, logout timing, data sharing, and the ability to withdraw from the study. Users set up a personal account (with optional username) and could access the participant information sheet and consent forms at any time.
- **Questionnaires**: a secure questionnaire system was built into the app to collect participants' responses and transmit them to the backend server for monitoring and evaluation.
- **ACT Therapy:** the app delivers a structured ACT-based therapy programme across six core modules, informed by focus groups with ACT clinicians, researchers, and

veterans with lived experience. It was debated how best to present the scripts as the core component of the intervention: video, audio, animation or illustration. It was decided, mainly due to connectivity issues, that the scripts would be illustrated with accompanying text. Each step would read like chapters of a storybook, and the screens would swipe from right to left. The scripts for each Module/Step were revisited after feedback from ACT experts and therapists. Each step is spaced five days apart, with automated push notifications to encourage completion and reflection. Each of the 6 Steps included clear navigation, engaging visuals, and scripts grounded in ACT principles.

- **Supplementary Components**: A breathing exercise was added to be used alongside the ACT content, and as a standalone tool. A "BRIEF" module became available after completing all core modules, offering rapid support in moments of distress.
- **Personalised Messaging**: tailored push notifications remind users to engage with the app and reflect on their progress. These were designed to reinforce ACT principles and promote self-reflection between modules.
- **Signposting to Support**: a dedicated section on the dashboard links to relevant support services, including mental health, gambling, and lifestyle support organisations. This includes clickable phone numbers and links. An SOS button was planned to offer immediate connection to key support organisations such as Combat Stress and Anonymind.
- **Community and SOS Features (Not included)**: a community feature and SOS emergency contact functionality were designed but not implemented in the initial release due to time constraints and concerns around safeguarding, confidentiality, and moderation logistics.

Application Information Architecture

- **User Management:** application user data is stored in an appropriate manner.
- **User Engagement**: engagement information is tracked to give us information on the digital footprint of users.
- **Information Tracking**: tracking includes how often the application is opened, how long the app is used for, which section of the app is used the most, the

disengagement point, if a user does not get to the end of the programme, which modules are visited and revisited the most frequently.

- **Project management:** all functions are monitored to ensure they operate smoothly, and that all collected data is stored securely.
- **Questionnaire management**: Various carefully selected scales are administered at specific time points. Reminders to complete the scales will be sent via timed push notifications. All data is monitored, over the duration of application use, and those in the research sample form the group that our reports and recommendations are based on.

Platform

Accessible via both Apple and Android devices.

Software and Management

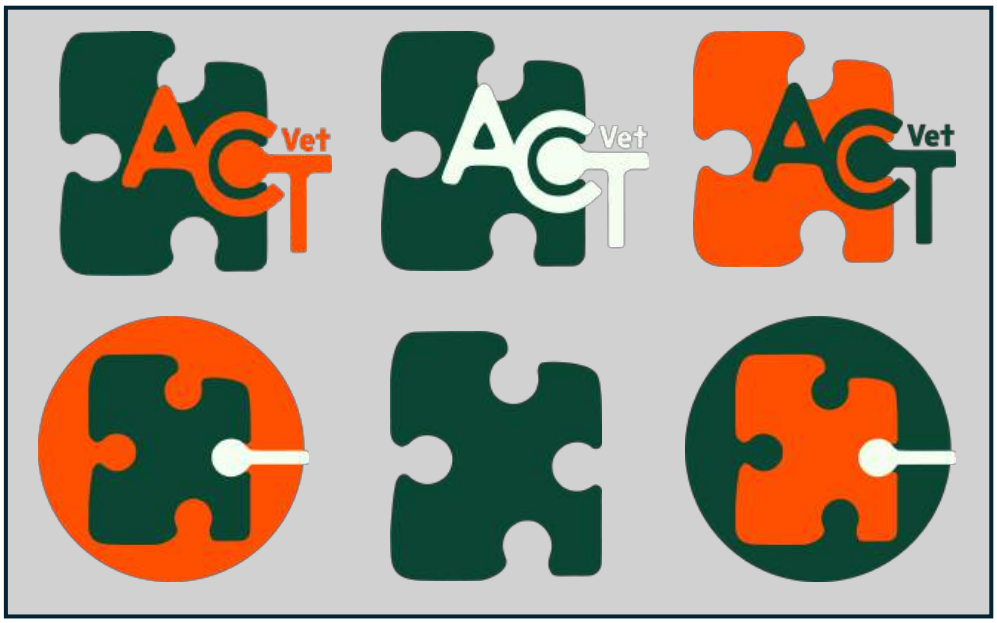
The management portal was designed to facilitate user management and monitoring. The portal was developed using NodeJS, HTML and CSS. The specific functionality of the portal was as follows:

- **User management:** Management of users, review questionnaire responses, user schedules and trigger specific actions.
- **Project management:** Review who has signed up to a project, generate QR codes and obtain top-level user statistics.
- **Global notifications:** Manage and send global notification to user specific projects.

King's College London developed the application using Capacitor, which is based on TypeScript, HTML and CSS. Capacitor is an open-source library for app development and has zero costs associated with it. The application was hosted via Google Firebase with the API services provided via a NodeJS server. Data was downloaded on a local server (Networked Attacked Storage Device) every week with each backup stored temporally and aggregated into a final dataset.

Design and Branding

To achieve the design, a third-party stakeholder “Otter Lunn Creative” created a series of fine-line illustrations to bring the metaphors and key components to life. We and the content creator worked collaboratively on the application screens within a digital whiteboard called Miro. As well as producing the fine line imagery the content creator produced a full branding pack, which gave us colours and type-facing ideas. The imagery they selected on the mood boards was also intended to reflect the theme of the intervention.



Brand Guidelines Sheet

Primary Logo

USAGE: This should be used first if space allows for it. Use it on websites, footers, stationery, signage etc.

Secondary Logo

USAGE: For when the primary logo doesn't fit in the required space. Used on websites, printed materials and larger elements.

Submark Logo

USAGE: For when the primary logo doesn't fit in the required space. Used on websites & printed materials.

Logo Mark

USAGE: Social media profile pictures, stamps, favicon etc. Use this when your other variations simply won't fit.

Colour Palette

CMYK:
They are the colours used in printed materials.

RGB:
This is used on-screen and for web design.

HEX Code:
This colour code is used on-screen and for web design.

PRIMARY COLOURS

FOREST GREEN
Primary Colour
CMYK C: 88 M: 45 Y: 78 K: 50
RGB R: 11 G: 70 B: 52
HEX #0b4634

SAFETY ORANGE
Primary Colour
CMYK C: 0 M: 83 Y: 100 K: 0
RGB R: 255 G: 80 B: 1
HEX #ff5001

MINT LANE
Primary Colour
CMYK C: 3 M: 0 Y: 6 K: 0
RGB R: 245 G: 255 B: 241
HEX #f5fff1

SECONDARY COLOURS

NAVY DEEP
Secondary Colour
CMYK C: 97 M: 78 Y: 46 K: 45
RGB R: 15 G: 46 B: 72
HEX #0f2e48

LIME GREEN
Secondary Colour
CMYK C: 48 M: 0 Y: 73 K: 0
RGB R: 140 G: 204 B: 114
HEX #8ccc72

BLUE GREY
Secondary Colour
CMYK C: 70 M: 56 Y: 48 K: 25
RGB R: 0 G: 0 B: 0
HEX #4f5961

FROSTY BLUE
Secondary Colour
CMYK C: 31 M: 0 Y: 1 K: 0
RGB R: 161 G: 234 B: 255
HEX #a1eaff

Primary Font

Jost SemiBold

USAGE: The primary font is your default typeface & should be used within headers & titles.

ABCDEFGHIJKLMN
OPQRSTUVWXYZ

abcdefghijklmn
opqrstuvwxyz

Secondary Font

Jost Medium

USAGE: The secondary font compliments your primary font. This will be used on subheadings.

ABCDEFGHIJKLMN
OPQRSTUVWXYZ

abcdefghijklmn
opqrstuvwxyz

Body Font

Open Sans

USAGE: This compliments the primary & secondary font. This should be used within body copy.

ABCDEFGHIJKLM
NOPQRSTUVWXYZ

abcdefghijklm
nopqrstuvwxyz

ACT Vet

The ACT Vet smartphone application is a self-guided veteran-specific mental health tool, grounded in Acceptance and Commitment Therapy (ACT). The interface is intentionally designed as simple, structured, and accessible, with calming visuals and a consistent user experience to support engagement.

- **Design and Layout:** the app features a clean and minimalistic interface with veteran-specific colours.
- **ACT Modules:** clearly labelled with a short title, making navigation easy.
- **Module Progression**: modules are unlocked every five days to encourage reflection and prevent users from rushing through the content.
- **User Journey**: users are welcomed to each step with a breathing exercise, visually guided with calming animations to promote a mindful state before each session.
- **BRIEF Module:** opens at the end of the six steps, acts as a quick reference to ACT tools for ongoing support.
- **External Support:** a "Support" tab offers immediate access to relevant helplines.
- **Push Notification:** inform participants of newly available modules or incomplete questionnaires, enhancing adherence without being intrusive.
- **Questionnaires:** the app automatically provides the questionnaires (when due) to users upon opening the app.

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Introduction

Firstly, we are immensely grateful for your participation in this project. We appreciate you are giving up your time and we hope you find your involvement in this study to be helpful.

This app is going to show you a type of therapy that has had success with veterans. We hope that you find it helpful for gambling difficulties.

We understand that many of you experience overwhelming feelings. That all the knowledge and experience that life and the military had set you up for, is not matching what is going on in your day-to-day life. You wake up just wanting life to go your way. For life to happen as you imagine. You feel that you are constantly coping with life, maybe treading water mentally, instead of living your life. You just want to live your life and enjoy it!

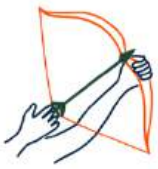
< 0/7 >

Support Dashboard Profile

Step 1

The six underlying components (or steps) of ACT are interlinked so there isn't necessarily a perfect place to start. We are starting with the component or step that focuses on how your thoughts may be linked to certain events.

Everyone experiences thoughts because we are thinking all the time. Have you ever considered whether your thoughts were linked to your actions, and how that works?



Often, we experience an emotion, that sparks a thought, that leads to an action. Like an

< 1/23 >

Support Dashboard Profile

Step 3

More often than not we have our minds in the past or the future for a variety of reasons. We look forward to a future event or relive a nice past memory. We may just spot something that reminds us of something else and then our minds wander off.

It's really common for us to be worried about something that happened in the past, and we don't want to repeat it in the future. So, we worry about some future event, based on the past, which is a natural response. Either way, our minds are not in the 'here and now'.

< 1/7 >

Support Dashboard Profile

Step 2

This step focuses on acceptance, which is a key component of ACT.

To understand acceptance it is useful to think about its opposite – avoidance.

It is usually the case that people avoid things because they don't want to re-experience something that causes them psychological pain (e.g., anxiety or fear).

Avoidance can actually be quite attractive – making you feel all nice and comfortable, in avoiding the thing that causes you uncomfortable feelings and thoughts.

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Support Dashboard Profile

Step 5

This step is for your values – what do you choose?

With ACT you are encouraged to think about what really matters to you. What you choose to pursue.

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Support Dashboard Profile

Step 4

This step is focused on the 'self in context' – all your selves are you

This step is about considering yourself in specific contexts. The 'self in context' is a hard one to explain and it's sometimes the component of ACT that people struggle to get their head around.

< 1/8 >

Support Dashboard Profile

Step 6

This step is focused on committing to action – your pursuit of what you value

This is the last of the six steps. This step discusses the role that commitment plays in working towards the things you value and the life you would like to have.

Commitment to action generally means 'doing'. It means being prepared to keep doing things or moving forward towards your target. It also means you acknowledge that it may get hard or uncomfortable along the way, but that is ok. You are ok with things sometimes being hard because life can be hard, and some suffering is normal.

< 1/13 >

Support Dashboard Profile

Brief

Maybe right now you are feeling really overwhelmed with your thoughts and feelings so let's start with a breathing exercise to bring some calm. Inhale deeply, acknowledging the sensation of the breath entering your body; notice the breath in your nose and your chest. Hold it for a moment, then exhale slowly, fully aware of how the breath physically leaves your body. Repeat this cycle, focusing on the sense of calm with each breath.

In a moment of feeling overwhelmed, we would ask you to focus on what you really want out of life because we cannot emphasise enough the power of focusing on what you really care about. Ask yourself "what do I really want; really honestly?" Think beyond material or superficial things. Imagine what it is you value. Picture that. Imagine how you would feel if you had what you cared about. Would you be happier, more settled, more content or feel more connected to others perhaps?

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Support Dashboard Profile

Website

To support the ACT Vet app and enhance participant engagement, a dedicated project website was developed in collaboration with Thomas Design and hosted via Fast Hosts. The website served as a hub for the community, stakeholders, and policymakers, offering clear, accessible information about the app, the research, and how to participate.

Purpose:

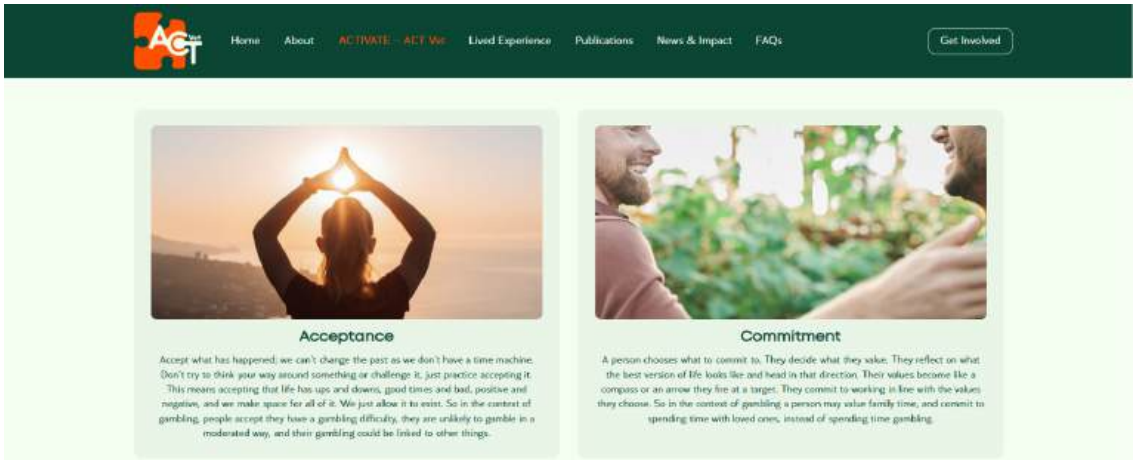
The ACT Vet website was designed as an information portal to:

- Recruit and inform potential participants.
- Share project updates and research findings.
- Acknowledge stakeholder contributions.
- Support transparency and ethical research.
- Encourage continued engagement from the veteran community.

Website Structure and Content:

- **Home Page:** a dynamic landing page featuring a clear call for participants, screenshots of the app's interface, an introduction to the project, and direct links to other key pages.
- **About Page:** introduced the research team and institutional affiliations. Acknowledged contributions from stakeholders and individuals with lived experience. Provided contextual information about the project's place within broader initiatives (e.g., MilGAM, GREAT Network). Highlighted the funder, the Office for Veterans' Affairs (OVA).
- **ACT Vet Page:** offered a detailed background of the ACT Vet app, its development timeline, and collaborative input from organisations including Combat Stress and King's College London. Outlined ethical approval, participant eligibility, what participants could expect, and compensation for taking part. Included links to the Participant Information Sheet, consent form, and app download.
- **Publications Page:** listed relevant peer-reviewed and non-peer-reviewed outputs related to the ACT Vet project.

- **News & Impact Page:** functioned as a project blog, updating users on conference presentations, media coverage, and emerging indicators of impact.
- **Lived Experience Page:** highlighted the central role of lived experience in the development and refinement of the app, showcasing feedback gathered from veterans and experts.
- **Get Involved Page:** encouraged participation and explained the importance of veteran involvement in shaping effective, relevant interventions. Reassured users of anonymity and data security. Contained contact form and links to the Information Sheet and consent documents.
- **Universal Website Features:** direct download link for the ACT Vet app. Social media links for ongoing engagement. Disclaimer and safeguarding notices (e.g., signposting to 999, Samaritans, Combat Stress). ACT Vet branding and institutional logos. Easy navigation via a consistent header and footer layout.



Testing and Simplifying ACT Vet Content

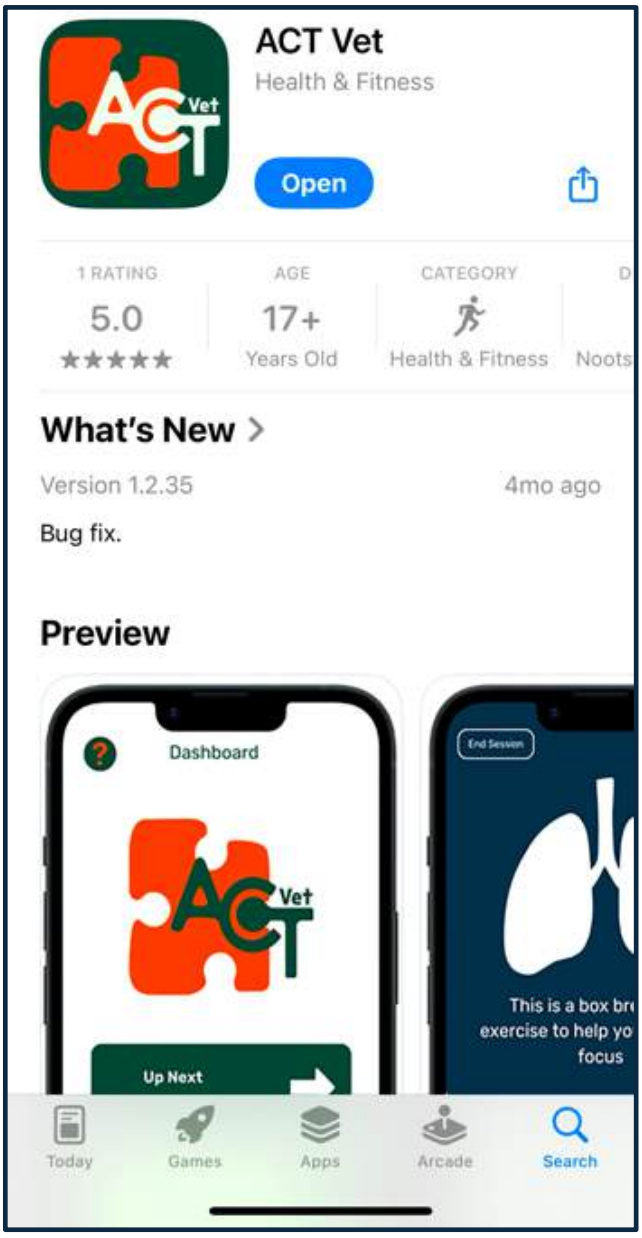
Changes were made to the application and website, prior to the app's launch, to ensure readability, user experience, engagement, and quality. Cognitive walkthroughs of the application were conducted by the research team to test the functionality and usability before launch. Issues such as unclear imagery, paragraph spacing, and text overlaps were identified and resolved prior to launch. As an example:

Step 1

Page	Potential Changes
1	Space after full stop ".We" Space between "yourthoughts" Space between "arrowtravelling".
5	The progress tracker is not functioning correctly. Seems to be stuck in an infinite loop rather than updating per page. If it is working as intended, it feels like a timer or countdown and might cause participants to rush.
14	Two large paragraphs that could be broken down further?
18	Move the graphic upwards above the final paragraph to help split up the text, but also to view the full graphic without having to scroll down.
21	Put "Let's try this exercise:" in bold? Or, include a background to emphasize it's a task, rather than just text to be read.
22	Break the first paragraph down further. Thinking as it's the end of the module, a large chunk might be difficult to read at this stage.

Application Launch

ACT Vet was submitted to the Apple iOS App Store and Google Play Store in June 2024 and was available to publicly download in July 2024. Each of the respective stores allowed potential users to preview the application before downloading.



Research Methods and Recruitment

With the development and design of ACT Vet in place, the next step was to begin evaluating its use in a real-world setting. This required planning around participant recruitment, eligibility screening, and data collection. The research study used a 10-week pre/post-test research study to evaluate the impact of the ACT Vet app on psychological flexibility, PTSD symptoms, and gambling urges in UK Armed Forces veterans. All participants received the same intervention via the self-guided app, with outcome measures / questionnaires collected at five time points.

Ethical Approval

The study received ethical approval from Swansea University School of Psychology Research Ethics Committee (1-2023-6798-6614). All participants provided informed consent.

The Research Study

Participants who expressed interest in the study were first directed to an online eligibility questionnaire. See **Recruitment** section for details on how participants were recruited. To be eligible, individuals needed to confirm that they:

- Were over 18
- Lived in the UK
- A former member of the UK Armed Forces (and could provide their service number)
- Used a smartphone (and, if so, what type)
- Shared their email address.
- Scored 33 or above on the PTSD Checklist for DSM-5 (PCL-5) and/or scored 1 or above on the Problem Gambling Severity Index (PGSI).

Those who met the eligibility criteria were contacted via email, provided with an individual code, and instructed to download and begin using the app. Upon logging into the app, participants were guided through the Baseline assessment, which included demographic questions and all outcome measures.

The demographics questions asked for:

- Age
- Gender/Sex
- Ethnicity
- Country of residence
- Level of education
- Living situation
- Employment status
- Employment type
- Military branch
- Time served
- Highest rank achieved
- Number of deployments
- Information on medical discharge.

After they had completed these, participants were introduced to ACT Vet via a short "Introduction" module, explaining how to use the app, how ACT works, and what to expect.

ACT Vet was used as a self-guided, illustrated digital intervention programme based on the six ACT principles. Participants were guided through each 15-minute module or "Step" that unlocked every five days to encourage reflection between sessions. Each module featured:

- A short, 3-minute breathing exercise to begin.
- ACT script, presented as an illustrated digital story.
- Prompts to consider how the content applied to the participants' own experiences.

The six core steps were completed after approximately four weeks of app-use. After this, participants gained access to a BRIEF module which was a condensed version of the intervention designed for quick use and ongoing self-support. They were encouraged to continue using any part of the app content as needed for the remainder of the 10-week

programme. Push notifications were used to alert participants to newly available modules and questionnaires, and to encourage reflection between steps.

In order to determine the effectiveness of ACT Vet in reducing symptoms of PTSD and gambling harm, while increasing psychological flexibility, data were collected across five timepoints: Baseline (Week 0), Week 2, Week 4, Week 6, and Week 10. Most data collection occurred in the app itself; Week 10 follow-up data were collected using Qualtrics and sent via email. A measure of psychological flexibility, PTSD symptom severity, and gambling urges were provided at every timepoint. These were the primary outcomes. Secondary outcomes included anxiety, alcohol use, quality of life, suicidality and loneliness, and app usability. These measures were provided at different timepoints.

Primary Outcome Measures

Factor	Measure
Psychological Flexibility	The *Psy-Flex.* This included 6 items regarding psychological experiences rated on a scale of 1 (very seldom) to 5 (very often). All items were summed to create a total PsyFlex score.
PTSD Symptoms	The *PCL-5,* on which participants scored how often they had been bothered by problems over a certain period, on a scale of 0 (not at all) to 4 (extremely).
Gambling symptoms	The *Gambling Symptom Assessment Scale* (GSAS) provided 12 different items referring to gambling behaviours. Each item was measured on a 5-point Likert scale, ranging from 0 (no symptoms) to 4 (extreme symptoms), and items were summed to create a total GSAS score, from 0 to 48.

Secondary Outcome Measures

Factor	Measure
Anxiety	The 7-item *Generalised Anxiety Disorder Questionnaire (GAD-7).* Participants rated how often they had been impacted by a series of problems, using a scale of 0 (not at all) to 3 (nearly every day). All items were summed to create a total GAD-7 score.
Alcohol Use	Alcohol consumption was captured by the *Alcohol Use Disorders Identification Test-Concise* (AUDIT-C). Scores ranged from 0 to 12, where the cut-off for low-risk drinking is a score of 3, and severe risk is 8 or above.
Suicidality and Social Isolation	Suicidality and social isolation, respectively, were assessed with questions derived from the *Adult Psychiatric Morbidity Study* (APMS). Two questions asked about past-year suicidality, while one question asked about loneliness, with the dichotomous response options of "yes" or "no".
Quality of Life	Quality of life was assessed with the *EQ-5D-5L*. Participants rated their health in terms of mobility, self-care, usual activities, pain/discomfort, and anxiety/depression using a scale ranging from 0 (no problems) to 4 (extreme problems). These items were summed to create a perspective of perceived health, a higher score suggests worse health.
Usability	For app usability, the 18-item *mHealth App Usability Questionnaire* (MAUQ; Zhou et al., 2019) assessed ACT Vet's ease of use, acceptability, information, and health management on a 7-point scale, ranging from 1 (disagree) to 7 (agree).

	RESEARCH STUDY WEEKS										
	0 (B)	1	2	3	4	5	6	7	8	9	10
Demographics	X										
Psychological Flexibility (Psy-Flex)	X		X		X		X				X
PTSD (PCL-5)	X		X		X		X				X
Anxiety (GAD-7)	X						X				X
Alcohol Use (AUDIT-C)	X										X
Suicide/Loneliness (APMS)	X		X		X		X				X
Gambling Severity (SF-PGSI)			X		X		X				X
Gambling Urges (GSAS)	X		X		X		X				X
Quality Of Life (EQ-5D)	X										X
Usability (MAUQ)											X

Interviews

To complement our quantitative findings and better understand veterans' lived experience, semi-structured interviews were conducted with a sub-sample of ACT Vet users. Interviews were conducted via telephone or secure video conferencing, lasting approximately 30 minutes. Participants were invited to take part at the end of the research study. The interview schedule covered three topics:

- Mental health and intervention experience
- Usability and engagement
- Suggestions for improvement.

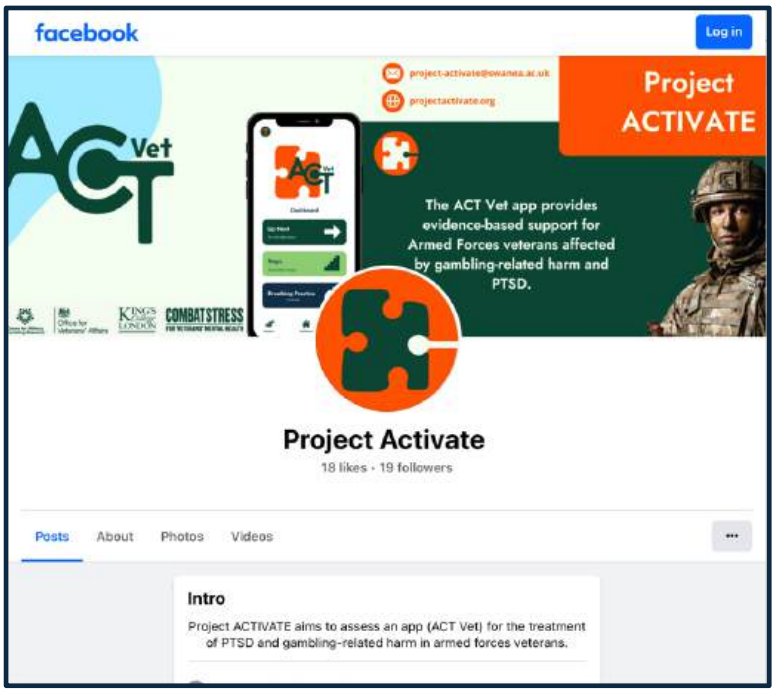
Participants were reminded that there were no right or wrong answers and that the purpose of the interview was to inform future development and refinement of ACT Vet. All interviews were audio-recorded, transcribed verbatim, and analysed using thematic analysis following Braun and Clarke's reflexive approach. An inductive approach was used to identify recurring patterns across transcripts, focusing on user experience and perceived therapeutic value.

Recruitment

Recruitment occurred between July and October 2024. Participants were invited to take part in the 10-week research program to test ACT Vet. A link to our eligibility questionnaire was provided using the below recruitment sources, interested people could complete this questionnaire.

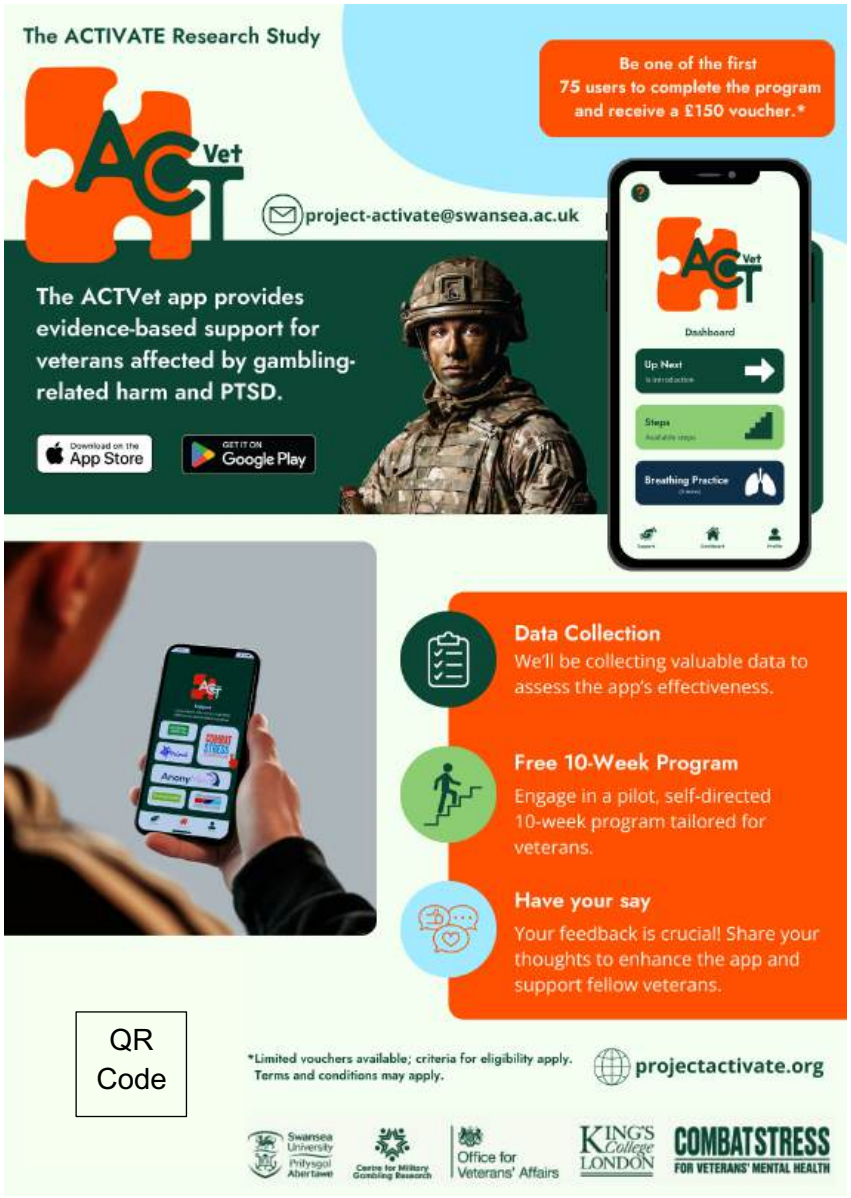
Online Recruitment

The primary recruitment strategies included online engagement, providing study details and links across social media sites: Facebook, X (Twitter), and Instagram. Individual project pages across each site (Facebook, X, Instagram) were created (from May 2024) with the purpose of information sharing using blog-type posts and project recruitment. Paid Facebook advertisements were used, as they have been considered a useful recruitment tool in similar veteran-specific app-based recruitment efforts. These advertisements were run for a total of 27 days. Audience criteria were those interested in: Armed Forces Day (United Kingdom); Veterans' benefits (military) or Army men; School/University: British Army and Employers: RAF Regiment; Royal Marines; Veteran; HM Armed Forces; Royal Navy or British Army. Additionally, Prolific (an online recruitment platform) was used to screen potential participants who were UK military veterans aged 18 or over. Our dedicated website also housed information and links relating to participating in the study.



Other Recruitment Strategies

Email addresses were collected from organisation websites and study details were sent. The research team carried out face-to-face meetings and visits with organisations such as the Forces in Mind Trust, National Health Service (NHS) West Midlands Gambling Clinic, The Royal British Legion, Combat Stress, Help for Heroes, Beacon Counselling Trust, GamFam, and GamCare. Physical and digital flyers were created and circulated among organisations. Members of the research team also had personal contacts they used, including details of veterans who had previously agreed to participate in the research. Any veteran who agreed to take part was asked to encourage others who may have benefited from participating (snowball sampling).



The information regarding the recruitment source for each participant was documented and provided a unique identifier, allowing the research team to track where participants had viewed and accessed the eligibility questionnaire (e.g. Facebook, Prolific, website). If eligible, previous military service numbers were also confirmed before proceeding to ensure the integrity of the data. Unless provided by the recruitment platform, demographic information was collected at the Baseline time point. Finally, it was advertised that on completion of the 10-week programme, each participant would be offered a high street voucher of £150 for their time.

Paid Advertising Results

	Paid Facebook Ads	Prolific
Total Cost	£282.60	£157.50
Clicks/Submissions	1421	71
Cost Per Click/Submission	£0.49	£0.75
Eligible Consent	14 veterans	50 veterans

Unpaid Advertising Results

Source	Eligible Consent
Facebook (unpaid)	7 veterans
X/Instagram	0 veterans
Website	4 veterans
Email	1 veteran
Unknown	1 veteran
Face to face	2 veterans

Recruitment Results

A total of 250 people completed the eligibility questionnaire. Of these, 114 were excluded for not completing all survey questions and a further 57 respondents provided questionable responses (i.e., spam/bot, contained errors in veterans' service numbers or email addresses, were not based in the UK, or did not meet eligibility for either gambling harm or PTSD symptom severity). In total, there was an eligible sample of 79 veterans that were contacted via email and sent individual codes to access the ACT Vet app. 40 veterans accessed or opened the app, while 35 veterans completed the initial Baseline measures in the app. After beginning participation, one veteran formally withdrew from the research study and a further 7 veterans either completed only Baseline measures or no

questionnaires. Rates of dropouts and completions varied across the multi-week intervention. 25 veterans completed Week 2, 21 completed Week 4, 16 completed Week 6, and 24 completed Week 10. 13 veterans completed all questionnaires.

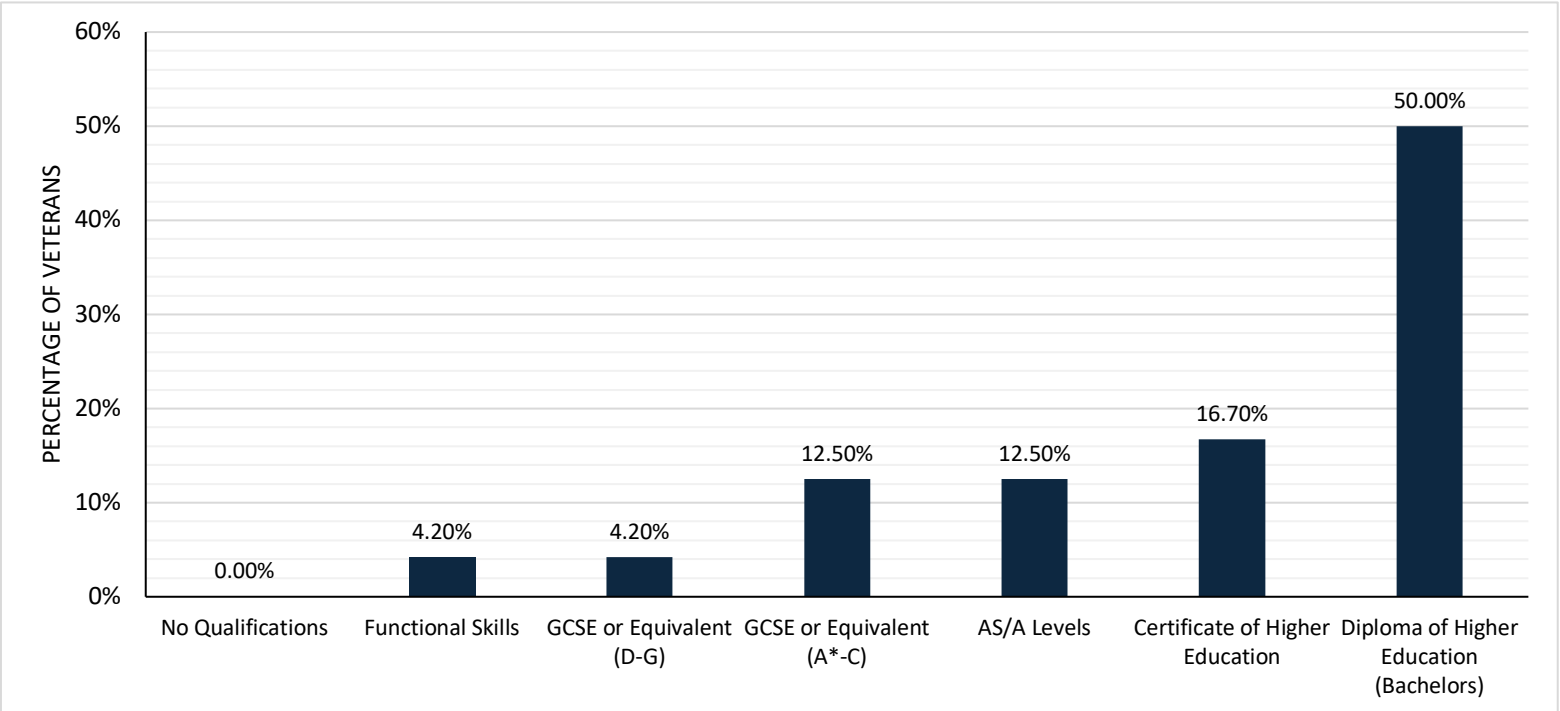
The Final Sample (quantitative): There was a total of 24 veterans that were included in our analysis.

Participant Characteristics

The mean age of participants was 45.79 years. There were 21 males, 2 females, and 1 undisclosed.

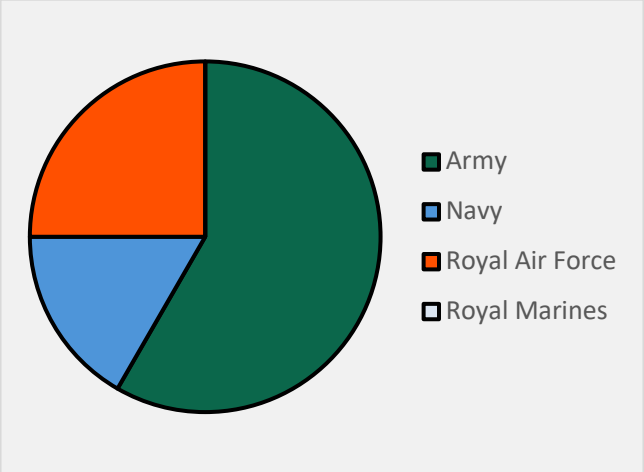
Education and Employment

- 50% of participants had a Bachelor's-level qualification.
- 75% were currently employed.
- The most common job types were Skilled Labourer and Managerial roles (25% each).
- 29% worked in roles not easily categorised (e.g., freelance or mixed roles).



Military Characteristics:

- Most participants had served in the British Army (58%), followed by the Royal Air Force (25%), and Royal Navy (17%).
- Average length of service was 10 years (range: 3-27 years).
- Participants had been deployed an average of 3.6 times (range: 0-12 deployments).
- 8% had received a medical discharge.



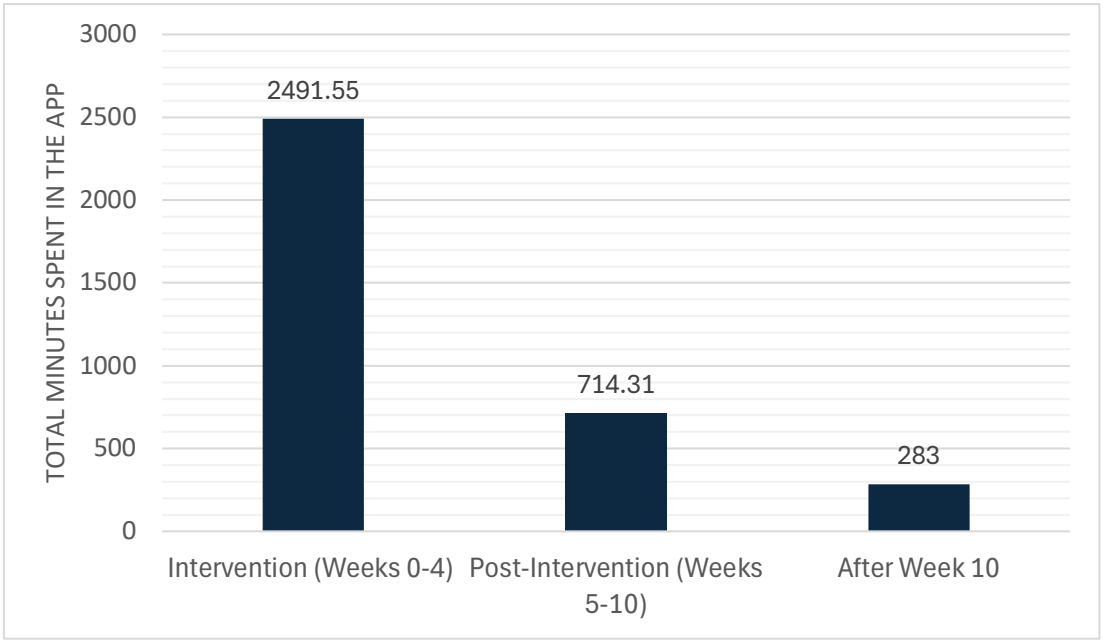
Pre-screening Symptom Severity:

- The average PTSD score (PCL-5) on the eligibility questionnaire was 40.9, above the clinical threshold for probable PTSD of 33.
- The average gambling harm score (PGSI) was 5.5, indicating moderate levels of gambling harm.
- All participants met the criteria for PTSD symptoms, gambling harm, or both.

Quantitative Findings

Engagement and App Usage

- Engagement metrics showed that participants engaged with ACT Vet over a 10-week period, with the main intervention content delivered across the first 4 weeks.
- On average, participants were active in the app for 14.9 weeks (SD = 4.3).
- Engagement was highest during the intervention phase (Weeks 0-4), and 63% of revisits of steps/modules occurring during this period.
- Activity declined over time but continued beyond Week 10 for some users.
- Popular features included the breathing exercises and the “Support” tab, which were frequently revisited.
- The mean session length was 4.37 minutes during the intervention; maximum session length was over 49 minutes.
- The total number of minutes spent in the app, across participants, was highest during the intervention phase, but usage continued once all app content had been completed.



Primary Outcomes

Psychological Flexibility

- Psychological flexibility increased from a mean of 20.1 at Baseline to 23.3 at Week 10, and this was statistically significant ($p < .001$).
- Improvements were most apparent after the intervention phase, indicating that ACT-related skills were developed over time.

PTSD Symptoms

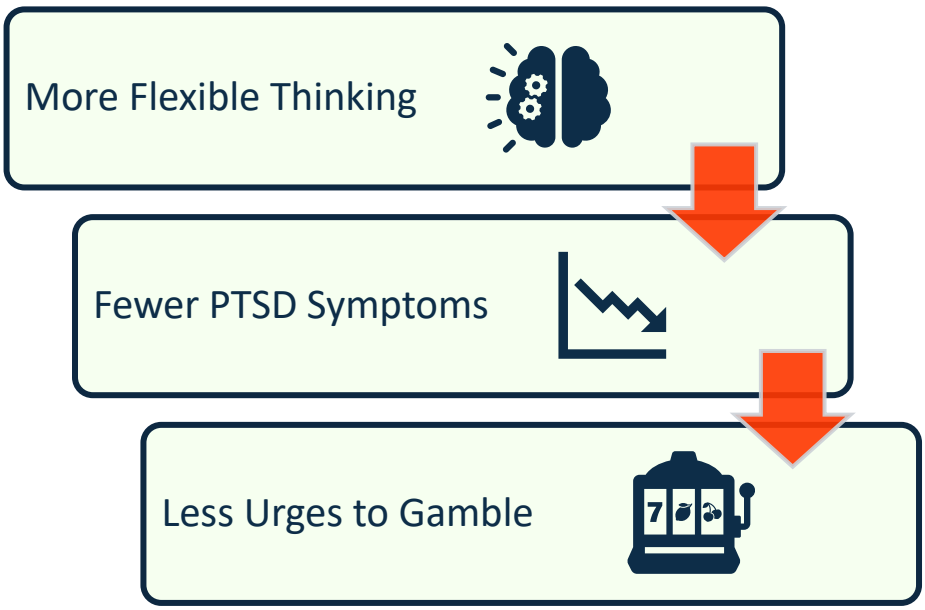
- PTSD symptoms decreased from Baseline to every subsequent time point ($p < .001$).
- Mean symptom severity dropped from 39.7 to 24.4, a clinically meaningful reduction.

Gambling Urges

- Gambling urges also significantly decreased from Baseline to Week 10 ($p < .001$).
- Mean scores fell from 18.9 to 8.5.

Mediation Analysis

- A mediation model tested the mechanism of change; that improvements in psychological flexibility would help PTSD symptoms, which in turn, would reduce urges to gamble.
- Results supported this model. The indirect effect of psychological flexibility, through PTSD symptoms, on gambling urges was significant.



Secondary Outcomes

Alcohol Use

- Scores on the AUDIT-C decreased from Baseline to Week 10 ($p < .001$), suggesting a reduction in risky drinking behaviours.

Quality of Life

- Participants reported a statistically significant improvement in overall self-rated health on the visual analogue scale ($p = .035$); scores increased from 68.8 at Baseline to 74.5 at Week 10.
- Changes in the composite score across the five health domains were not significant.

Anxiety Symptoms

- There were no significant changes in observed anxiety scores across the time points ($p > .05$)

Suicidality and Loneliness

- Thoughts of suicide declined from 45.8% at Baseline to 20.8% at Week 10.
- Reported suicide attempts were rare.
- Reports of feeling lonely or isolated “much of the time” or “all of the time” decline from 50% at Baseline to 25% at Week 10.

	Baseline	Week 2	Week 4	Week 6	Week 10
THOUGHTS OF SUICIDE					
YES	45.8%	39.1%	55.0%	43.8%	20.8%
NO	54.2%	60.9%	45.0%	56.3%	79.2%
TOTAL RESPONSES	24	23	20	16	24
ATTEMPTS OF SUICIDE					
YES	16.7%	8.7%	5.0%	12.5%	4.2%
NO	83.3%	91.3%	95.0%	87.5%	95.8%
TOTAL RESPONSES	24	23	20	16	24
FEELING LONELY & ISOLATED					
NOT AT ALL	4.2%	8.7%	5.0%	6.3%	12.5%
NOT USUALLY	45.8%	56.5%	65.0%	56.3%	62.5%
MUCH OF THE TIME	29.2%	8.7%	20.0%	12.5%	8.3%
ALMOST ALL OF THE TIME	20.8%	26.1%	10.0%	25.0%	16.7%
TOTAL RESPONSES	24	23	20	16	24

App Usability

ACT Vet received a high average rating of 6.09 out of 7, indicating excellent user satisfaction. Participants rated the app as easy to use, useful for managing their well-being, and well-organised.

Qualitative Findings

Six participants agreed to participate in an interview to share their experience of using ACT Vet during the research study. Thematic analysis identified two overarching domains: 1. Intervention Experience, and 2. Usability and Design. The findings offer valuable context to support and explain the observed quantitative outcomes and highlight areas for future improvement.

Intervention Experience

Navigating ACT: One Step at a Time Participants appreciated the structured, step-by-step design of ACT vet which supported their learning and engagement with ACT principles. The progressive format allowed users to build understanding over time and revisit content as needed.	"It just made me engage, because it was like task-oriented, and I thought ooh, I'll want to take in the information and complete it." "I loved how they introduced you to the steps gradually."
Deliberate Self-Reflection Many participants reported that ACT Vet encouraged them to reflect on their behaviours, motivations, and emotional patterns, particularly in relation to gambling and PTSD. The app provided a safe space for looking inward.	"I also think it's given me a lot of like encouragement to be introspective and look at myself and think why do I get such a thrill from gambling?" "It taught me how to take myself out of that mindset… and look at it with a different perspective."
Breathing Through Stress The app's built-in mindfulness and breathing exercises were frequently highlighted as particularly useful during moments of distress. These techniques helped participants feel calm and re-centred.	"But once I was doing the breathing exercises, I found myself really, really calm, you know." "It helped me stay centred and focused."
Digital ACT: Easy to Access Support Participants valued the convenience of having therapeutic support available on their phones. The app offered a sense of ongoing access to guidance when it was most needed.	"You can be in a bit of a bad headspace and… just sort of go back to it and read through it again and re-ground yourself." "Just having it there on my phone… it's straight into the app."

Usability and Design

Straightforward Digital Support Participants consistently described the app as easy to use and praised its simple and intuitive interface. The clean layout and unclutter design helped reduce cognitive burden.	"Its strength was in its simplicity to use and its intuitiveness." "It's just really easy to use."
Mindful Reminders Automated notifications were seen as helpful prompts that encouraged continued engagement. In some cases, these reminders helped participants pause during a busy day and re-engage with wellbeing practices.	"I've sort of like been sat here and I've got a prompt and I've sat and done the three-minute breathing exercise." "I liked the messages every day… it just reminds you it's there."
Optimising Digital Journeys Several participants noted areas where the app's navigation could be improved. Suggestions included clearer signposting of completed steps, integration of task tracking, and more intuitive access to support resources.	"It doesn't say well you've completed this. I was like 'has there been a glitch?'" "There should be another part of the app… like tasks to do, with a little red dot or something." "I didn't realise that when you tapped on them [support tabs], they revealed the information."
Veteran-Centric Visual Identity While some participants were content with the visual presentation, others felt the app's colours and imagery could be improved to better reflect the diversity of veteran experiences. Suggestions included avoiding overuse of military-style visuals and incorporating more inclusive imagery.	"For some veterans, I don't know, me personally, it's like a busman's holiday, even if I go into an Army and Navy store, or surplus store and like oh my god, more camouflage." "Having a few female pictures in there… the images were a bit simplistic."

Overall, qualitative findings suggest that ACT vet was viewed as accessible, easy-to-use, and psychologically beneficial. Veterans described engaging meaningfully with ACT content, especially with the breathing exercises, and many reported increased reflections on their behaviours and coping strategies. Suggestions for improvement centred around visual presentation, clarity of navigation, and expanded guidance on task completion and external support. These insights will be invaluable in shaping future development and optimisation of the app.

Discussion

The current pilot study demonstrated that ACT Vet was associated with significant improvements in psychological flexibility, PTSD symptoms, and gambling urges amongst UK Armed Forces veterans. These outcomes align with the study's core hypotheses, suggesting that ACT Vet effectively engaged its target mechanisms. The mediation analysis further supported the underlying model of ACT: increased psychological flexibility appeared to reduce PTSD symptoms, which in turn, lowered gambling urges. This reflects ACT's core aim, to support people in accepting distressing thoughts and feelings while committing to meaningful behaviour. These findings reinforce ACT Vet's potential as a digital intervention that can address overlapping psychological challenges through a single mechanism of change.

Qualitative data provided further insight into how participants experienced the app. Veterans described the intervention as calming, reflective, and easy to engage with, particularly valuing its step-by-step structure, breathing exercises, and ease of access. Notably, participants highlighted ACT Vet's simplicity as a strength, a contrast to overstimulating platforms, which may be particularly important for individuals managing trauma symptoms. Some usability concerns were raised, including the need for better signposting, visual diversity, and clearer task progression, which will inform future development.

These findings are consistent with the emerging research on ACT's effectiveness in trauma-affected and veteran populations, as well as the broader push for digital mental health tools that are accessible, low-cost, and capable of reaching underserved groups. Importantly, the results support UK Government and NHS ambitions to expand access to mental health care and reduce gambling-related harm (e.g., NHS Long Term Plan).

Implications and Recommendations

- ACT Vet could serve as a low-cost, easily accessible early intervention for veterans experiencing PTSD and gambling-related harm, particularly for those who are not yet engaged with clinical services.
- With optimisation, ACT Vet could be integrated into NHS digital mental health platforms, military transition programmes, or third-sector veteran services (e.g., Combat Stress).
- Given the barriers to help-seeking among veterans, ACT Vet may offer a private, non-stigmatising route into mental health care, potentially serving as a bridge to further support.
- Apps offer scalability and minimal cost-per-user. Reductions in gambling, PTSD symptoms, and alcohol use may lower downstream public service costs over time.
- The pilot provides a strong foundation for a full Randomised Controlled Trial (RCT), ideally including economic evaluation and long-term follow-ups. It also highlights the need to explore implementation models in NHS and community settings.

Strengths and Limitations

The pilot study has several strengths:

- The combination of quantitative outcomes, app analytics, and qualitative feedback provided a robust picture of feasibility and engagement.
- The findings aligned with ACT theory and contributed to growing evidence on transdiagnostic digital therapy.
- ACT Vet was ultimately shaped by individuals with lived experience, ensuring its relevancy and acceptability.

However, limitations should be acknowledged:

- As a pilot, the sample size was small and participant dropout over time meant missing data and issues with statistical power.
- Without a control group, causal inference cannot be confirmed, that is, whether ACT Vet caused improvements in psychological outcomes or if this was due to other factors.

- The Psy-Flex scale, while pragmatic for digital use and able to detect change in short periods of time, may not capture the full complexity of psychological flexibility compared to longer measures.
- Participants were self-selecting, often recruited online, and may not reflect harder-to-reach or less digitally literate veterans.

Next Steps and Future Directions

The pilot lays the foundations for scale-up and further evaluation:

- Based on user feedback, ACT Vet should be updated to include clearer task tracking, improved visuals, expanded support signposting, and more inclusive branding.
- A Randomised Controlled Trial is needed to test effectiveness at scale, ideally incorporating economic evaluation and service use outcomes.
- Working with NHS digital services, veteran support charities, and commissioners to explore integration into service pathways.
- Given ACT Vet's ability to help multiple psychological symptoms, ACT Vet could be adapted for other high-risk groups facing trauma, addiction, or poor access to care.
- Support is sought to progress along the Medical Research Council's complex intervention framework, from pilot to feasibility top full-scale effectiveness testing.

Conclusion

ACT Vet is a novel, scalable, and user-accepted digital intervention for veterans experiencing PTSD and gambling harm. This pilot study provides encouraging evidence that ACT Vet supports key psychological processes associated with recovery, and that veterans find it accessible, calming, and personally meaningful. With further development and evaluation, ACT Vet has the potential to fill a critical gap in digital mental health care, offering timely and cost-effective support for vulnerable members of the veteran community. Its integration into NHS pathways or veteran-specific services could play a role in reducing service burden and improving long-term outcomes. This pilot study provides a compelling foundation for scaling to a full Randomised Controlled Trial, and for working toward national implementation through cross-sector collaboration.

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