

# **Leveraging Social Media and Crowdsourcing: Effective Strategies for Recruiting Military Veterans for Digital PTSD and Gambling Support**

Conor Heath, Jess M Williams, Daniel Leightley, Dominic Murphy, Simon Dymond

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# Leveraging Social Media and Crowdsourcing: Effective Strategies for Recruiting Military Veterans for Digital PTSD and Gambling Support

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## Abstract

**Background:** Emerging evidence indicates that military veterans are at increased risk of post-traumatic stress disorder (PTSD) compared to the general population. PTSD is often comorbid with harmful and problematic patterns of gambling and together can represent a treatment challenge. Behavioural therapies such as Acceptance and Commitment Therapy (ACT) show promise in treating these disorders, especially if combined with mobile health (mHealth) interventions to circumvent the known help-seeking barriers faced by veterans. To date, however, recruitment for mHealth interventions has been challenging and may impact intervention feasibility.

**Objective:** Here, we describe strategies used to recruit UK military veterans with comorbid PTSD and harmful gambling to a smartphone-based digital intervention, "ACT Vet".

**Methods:** Several strategies were used such as social media (Facebook) advertising, online participant recruitment platforms, project-specific website building, collaboration with veterans' charities and organisations, and incentives.

**Results:** Results showed that over 27 days, recruitment through Facebook accounted for 21 eligible veterans (seven unpaid, 14 paid advertising), while Prolific accounted for 50. Additional strategies recruited eight eligible veterans. In total, 79 eligible military veterans were recruited for ACT Vet, with 25 completing the full programme. However, difficulties such as low advertisement conversion rate, participant and data attrition occurred throughout the study.

**Conclusions:** Our findings illustrate the effectiveness of social media and online platform-based initiatives in recruiting veterans with PTSD and harmful gambling. We conclude by recommending that future research should consider establishing an online presence for effective digital intervention recruitment with diverse branding to attract representative samples of veterans for mHealth research.

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## Abstract

Emerging evidence indicates that military veterans are at increased risk of post-traumatic stress disorder (PTSD) compared to the general population. PTSD is often comorbid with harmful and problematic patterns of gambling and together can represent a treatment challenge. Behavioural therapies such as Acceptance and Commitment Therapy (ACT) show promise in treating these disorders, especially if combined with mobile health (mHealth) interventions to circumvent the known help-seeking barriers faced by veterans. To date, however, recruitment for mHealth interventions has been challenging and may impact intervention feasibility. Here, we describe strategies used to recruit UK military veterans with comorbid PTSD and harmful gambling to a smartphone-based digital intervention, "ACT Vet". Several strategies were used such as social media (Facebook) advertising, online participant recruitment platforms, project-specific website building, collaboration with veterans' charities and organisations, and incentives. Results showed that over 27 days, recruitment through Facebook accounted for 21 eligible veterans (seven unpaid, 14 paid advertising), while Prolific accounted for 50. Additional strategies recruited eight eligible veterans. In total, 79 eligible military veterans were recruited for ACT Vet, with 25 completing the full programme. However, difficulties such as low advertisement conversion rate, participant and data attrition occurred throughout the study. Our findings illustrate the effectiveness of social media- and online platform-based initiatives in recruiting veterans with PTSD and harmful gambling. We conclude by recommending that future research should consider establishing an online presence for effective digital intervention recruitment with diverse branding to attract representative samples of veterans for mHealth research.

**Keywords:** Military veteran; Gambling; PTSD; ACT; Mobile health; Smartphone; Social media; Crowdsourcing; Recruitment.

## Introduction

Military veterans may face barriers when accessing help and support for difficulties related to mental health that can last up to 11 years post-service (Clary et al., 2023; Gribble et al., 2019; Murphy et al., 2019). Among veterans, post-traumatic stress disorder (PTSD) is often prevalent alongside challenges related to anxiety, alcohol misuse, and depression which contribute to poorer well-being (Binks & Cambridge, 2018; Stevelink et al., 2018). Moreover, veterans are also more likely to engage in and experience avoidance behaviours, including harmful gambling behaviours motivated by escape/avoidance of distress (Etuk et al., 2020; Stefanovics et al., 2022; Roberts et al., 2020; Dighton et al., 2023). Recently, Dighton et al. (2023) highlighted that veterans may engage in gambling as a coping mechanism for distressing PTSD symptoms. They argued that increased gambling behaviours may lead to harmful gambling (gambling disorder), defined as problematic gambling behaviours which causes ongoing distress (American Psychiatric Association, 2013), and likely to have an impact on the individual and wider health and wellbeing systems that aim to provide support (Wardle et al., 2019). There is therefore an urgent need for improved access to efficacious treatment or interventions which may help to manage comorbid mental health challenges like PTSD and gambling harm.

Promising therapeutic interventions for military veterans experiencing PTSD and comorbid harmful gambling include third-wave, mindfulness approaches like Acceptance and Commitment Therapy (ACT) (Donahue et al., 2024; Goldberg et al., 2020; Hitch et al., 2023; Romaniuk et al., 2024). ACT contains six core principles defined as being present in the moment, identifying important values, committing to action, the self as context, cognitive defusion, and acceptance (Hayes et al., 2006). These principles focus on building psychological flexibility, the capacity to adapt and manage distress in accordance with valued goals (Cherry et al., 2021; Hayes et al., 2006). There is also growing evidence for the feasibility and acceptability of mobile health (mHealth) interventions for PTSD, depression, alcohol misuse, and mental health (Farzandipour et al., 2024;

Leightley et al., 2022; Parkes et al., 2023). Such applications embed forms of therapeutic support (e.g., ACT) using smartphones which allows quick access to independent support, supplemented by regular notifications which may help with therapy engagement (Williamson et al., 2022). A meta-analysis by Linardon (2020) revealed that smartphone-based applications could be effective in building acceptance and mindfulness skills (key elements of ACT). In addition, Farzandipour et al. (2024) suggested that applications may reduce self-reported PTSD symptoms. Yet, while Hawker et al. (2025) suggested that gambling-related applications could be accepted as an intervention, there is a lack of evidence-based treatment testing in many applications that are currently available (Brownlow, 2021; McCurdy et al., 2023). Thus, evidence-based ACT mHealth applications may provide timely and easy-to-access help for military veterans suffering from comorbid gambling-related harms and mental health difficulties.

When designing and evaluating interventions, feasibility trials, including those involving treatment for gambling in military veterans and non-veterans with mental health mHealth applications tend to experience recruitment challenges and show high rates of attrition (Goetter et al., 2015; Pfund et al., 2021; Torous et al., 2023). Combined recruitment strategies, such as social media advertising, emailing, printing flyers, offering incentives, and collaboration with relevant organisations are recommended when recruiting and retaining participants in evaluations of mHealth interventions (Kidd et al., 2023; Moungui et al., 2024; Torous et al., 2020). Further, advertising using social media platforms such as Facebook may be particularly useful in reaching individuals considered as “hard-to-reach” like veterans (Moungui et al., 2024; Pedersen et al., 2015; Williamson et al., 2023). Previous studies have shown that while high rates of dropout still occur, recruitment for mHealth interventions using paid social media advertising may be more cost-effective and can target “hard-to-reach” populations effectively (Aily et al., 2023; Williamson et al., 2023; Wozney et al., 2019). Thus, social media could help to counter recruitment challenges faced during feasibility trials.

In addition, Pickering and Blaszczynski (2020) raised concerns regarding the quality of data

and increased risk of bias from gambling research using online crowdsourcing platforms such as Amazon Mechanical Turk (Amazon, n.d.), Qualtrics (Silver Lake, n.d.), and Prolific (Prolific Academic, n.d.). However, Russell et al. (2022) argued that they can be effective in recruiting specific hard-to-reach groups given that stringent data quality checks are conducted to reduce potential biases (Russell et al., 2022). These checks could include eligibility screening and validating data quality, such as military service numbers, which are unique identifiers to military populations. Prolific can provide high-quality data while being a cost-effective recruitment strategy (Douglas et al., 2023; Stanton et al., 2022). Therefore, the combination of online crowdsourcing, social media advertising, and traditional recruitment (face-to-face meetings, emails, flyers), may be effective for recruiting hard-to-reach and vulnerable populations, such as military veterans in the United Kingdom (UK) with comorbid diagnoses of PTSD and harmful gambling (gambling disorder). To date, however, little is known about the relative effectiveness of these recruitment strategies.

Here, we sought to compare these recruitment methods in a pilot study designed to evaluate a 10-week app-based ACT intervention for UK military veterans experiencing PTSD and harmful gambling. Veterans were screened for PTSD severity using the Patient Checklist (PCL-5; Weathers et al., 2013) with scores of 20 or above conferring study eligibility. Veterans experiencing gambling harms were screened using the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001) with scores of one or above for eligibility, indicating some form of gambling harm (Williams et al., 2025). Drawing from the work of Williamson et al. (2023) conducted with UK military veterans and alcohol use, the aim of the present article was to define and reflect on the recruitment strategies and make recommendations for future studies recruiting military veterans with co-occurring PTSD and harmful gambling.

## Method

### 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 (Figure 1a). Paid Facebook advertisements were used, as they have been considered a useful recruitment tool in similar veteran-specific app-based recruitment efforts (Williamson et al., 2023). 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. Figure 1b shows the imagery and copy used for the advertisement.

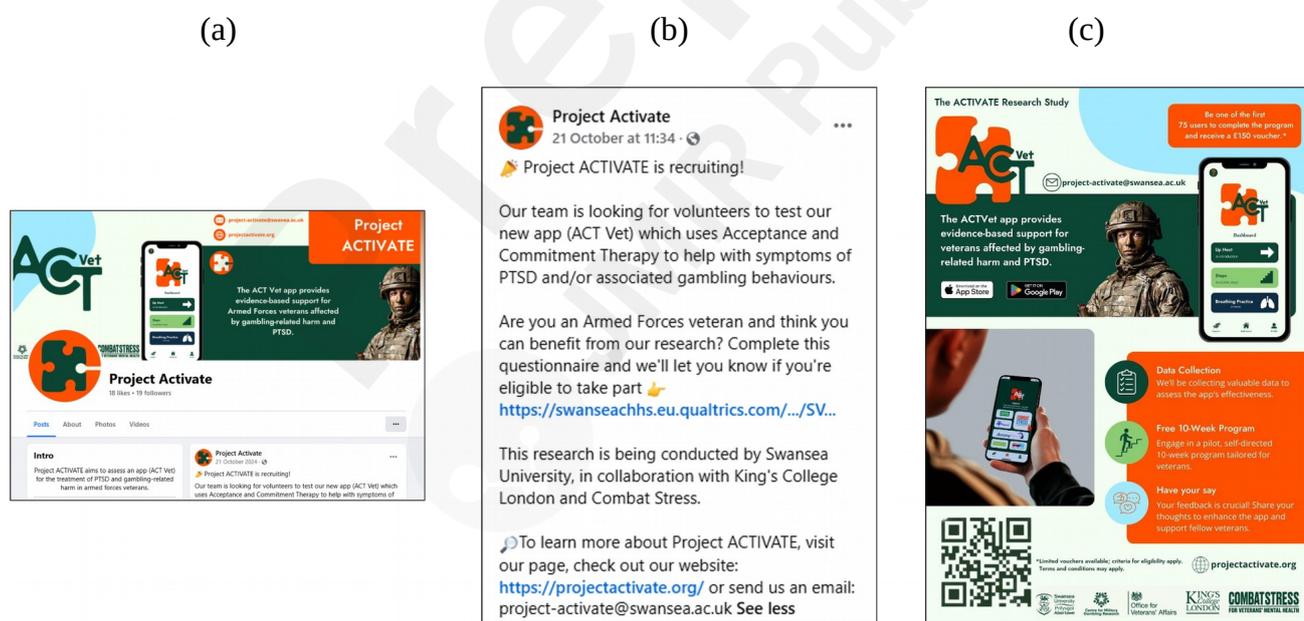
Additionally, Prolific (an online recruitment platform) was used to screen potential participants who were UK military veterans aged 18 or over. A dedicated website was also created that housed information and links relating to participating in the study

### 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 (Figure 1c) 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 pre-screen 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 (\$189.77) for their time.

Figure 1. Example of the Website Project Page (a), Paid Advertisement (b), and Flyer (c) for ACT Vet



## Analysis

Means and standard deviations were reported for continuous variables, while percentages and

frequencies were reported for categorical variables. Advertisement length, cost, reach, clicks/submissions, shares and reactions were also reported.

## Results

### Online Recruitment

#### *Facebook*

From the dedicated Facebook page, posts were circulated in veteran and gambling-related groups. Paid advertisements were also circulated separately for a total of 27 days, to reach veterans or those with connections to veterans in the UK, aged 18-65. Facebook campaign Key Performance Indicators (KPIs) show the performance and cost-breakdown of each advertisement campaign and can be seen in Table 1.

The first paid campaign was run as a test for three days and reached 1,132 people (9.9% female, 90.1% male), of which 30.0% were between 35 to 44 years of age, with 1,114 viewing on mobile devices.

The second advert reached a total of 14,682 people (24.9% female, 75.1% male), of which 30% were between 55 to 64 years of age, with 12,263 viewing on mobile devices.

The third advert reached a total of 117,085 people (60.5% female, 39.5% male); 30% were 65 and over, with 67,326 being reached using the audience network (third-party apps such as Instagram or mobile games).

Facebook accounted for seven participants who were eligible and consented through organic (without paid advertising) page or post interactions with an additional 14 who were eligible and consented through paid advertising, which cost on average £20.19 (\$25.54) per consent. Recruitment outcomes from paid Facebook advertising can be seen in Table 2. In total, Facebook accounted for 21 eligible participants. Unless provided by the recruitment platform, demographic information was only collected at the baseline time point.

Table 1. *Key Performance Indicators (KPI) for ACT Vet Paid Facebook Advertising*

<b>Paid Advertisement Campaign</b>			
<b>KPI</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>Advert Length</b>			
	3 days	14 days	10 days
<b>Cost</b>			
	£5.00 (\$6.33)	£100.00 (\$126.51)	£177.70 (\$224.81)
<b>Total Reach</b>			
	1,132 people	14,682 people	117,085 people
<b>Link Clicks</b>			
	61	506	854
<b>Cost Per Click</b>			
	£0.08 (\$0.10)	£0.20 (\$0.25)	£0.21 (\$0.27)
<b>Post Shares</b>			
	2	14	1
<b>Post Reactions</b>			
	1	12	2

## ***X (Formerly Twitter)***

Additionally, a dedicated X page was created and amassed 170 followers. The page consisted of 32 posts related to recruitment advertising and blog-type posts showing the research team's activity. The largest engagement was found from a blog-related post, with 419 views, followed by a recruitment advert with 328 views. No participants were directly recruited.

## ***Instagram***

An Instagram page was also created which resulted in 16 followers. The page consisted of four posts designed to raise awareness of the project and recruit participants. The largest engagement came from six likes on a post circulating project awareness. No participants were directly recruited.

## ***Prolific***

The study also utilised Prolific. The built-in screening criteria of "UK military veteran" and "aged 18 or over" was applied, revealing a total of 287 eligible participants who had been active in the past 90 days on Prolific. The study recruitment target was set at 150 participants. Sensitive content warnings were given as the study involved topics related to mental health. Participants were paid £0.75 (\$0.95), the equivalent to £9.00 (\$11.39) per hour, for the five minutes it took to complete the pre-screen questionnaire. The total cost (including fees and VAT) for the screen was £157.50 (\$199.25). From this screening, 71 submissions were made (63 male, 8 female), with a mean age of 45 years old (SD = 13.24). Of these, 50 participants met the eligibility criteria and consented to be sent app codes which cost on average £3.15 (\$3.99) per consent. Table 2 shows the total recruitment outcomes from Prolific. Recruitment ceased without meeting the target of 150 participants due to time constraints.

Table 2. Total Recruitment Outcomes Across Paid Facebook Advertising and Prolific

	<b>Paid Facebook Advertising</b>	<b>Prolific</b>
<b>Total Cost</b>	£282.60 (\$357.52)	£157.50 (\$199.25)
<b>Clicks/Submissions</b>	1421	71
<b>Cost Per Click/Submission</b>	£0.49 (\$0.62)	£0.75 (\$0.95)
<b>Eligible Consent</b>	14	50

### **Website**

The project-specific website (including domain hosting) was used as a platform for project dissemination and recruitment, which was launched on January 8th, 2024, and continued to function until project end. Four eligible participants completed the pre-screen questionnaire through the website and consented to be sent app codes.

### **Other Recruitment Strategies**

#### **Email**

A database of emails was created from web searches and around 200 emails were sent to charities, clinical networks, and individuals associated with military veterans, gambling, or the NHS. One eligible participant was recruited using email and consented to be sent app codes.

## ***Face to Face***

Throughout recruitment, a total of 15 in-person veteran, charity, or clinical meetings (in person and online), related to military veterans or gambling across the UK were contacted or visited. Contact with organisations was vital to raise awareness of the study and interacting with the veteran community. One eligible participant consented to be sent app codes directly from a face-to-face meeting, while another participant consented to be sent app codes via word of mouth after a meeting.

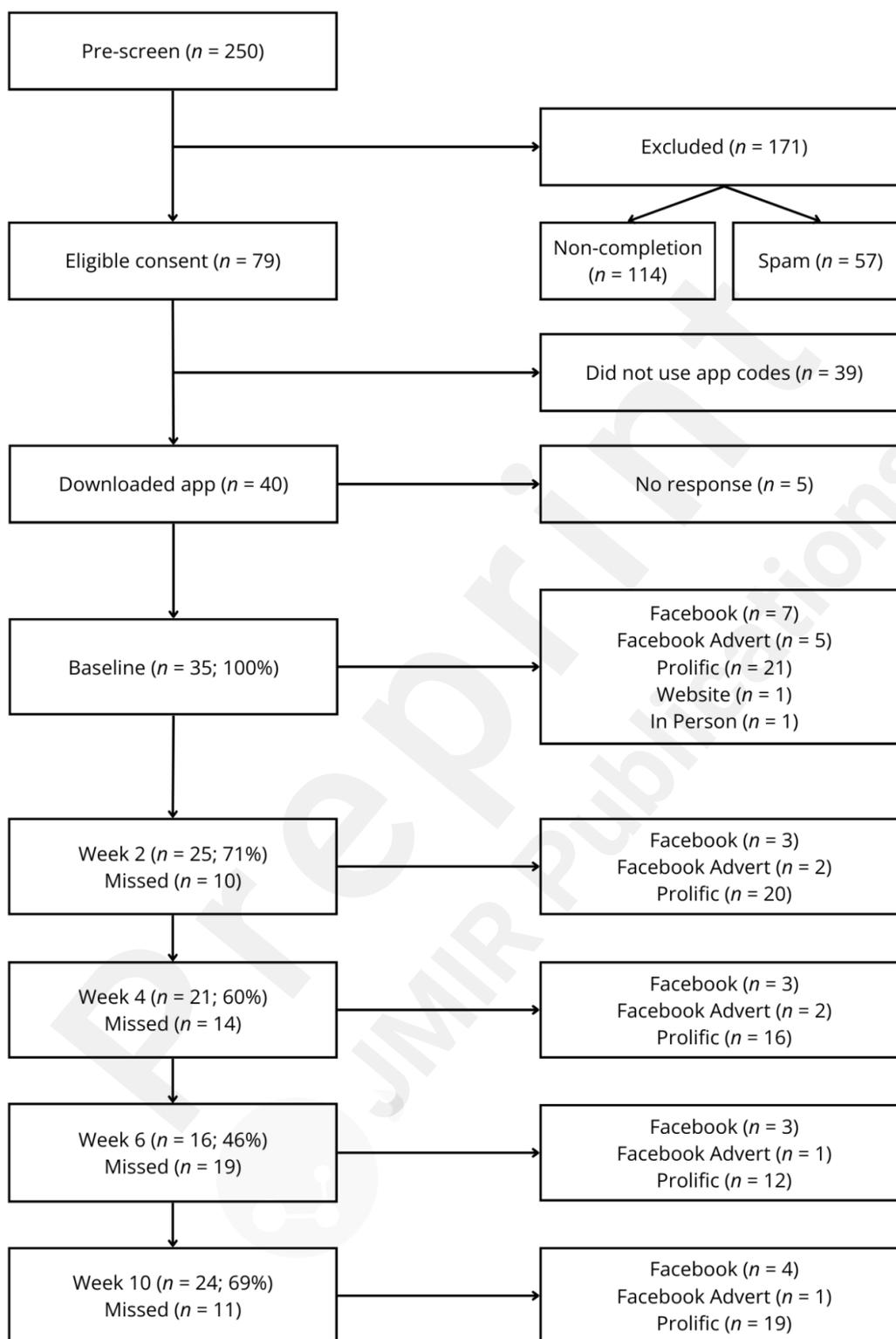
## ***Unknown***

One participant accessed the pre-screen questionnaire directly and the strategy could not be identified.

## **Study Attrition**

Figure 2 shows the attrition from initial screening through to Week 10. Additionally, completed time points are split by recruitment source (Figure 2). A total of 35 participants (31 male, three female, and one undisclosed) completed in-app baseline time points and one participant formally withdrew from the study. The mean age was 44.77 years (SD = 10.89), all of white British ethnicity, with 48.57% having a diagnosis of PTSD, and none having a DSM-5 diagnosis of gambling disorder. A total of 24 participants (21 male, two female, one undisclosed) finished Week 10 time points and had a mean age of 45.29 years (SD = 10.70).

Figure 2. Study Attrition and Recruitment Source Throughout Project Time Points



**Note.**

Facebook Advert indicates paid advertising, compared to unpaid Facebook recruitment.

## Discussion

This article outlined recruitment strategies used for ACT Vet, a smartphone digital intervention for UK military veterans with PTSD and harmful gambling. Overall, Facebook (both unpaid and paid advertising) and Prolific were the most effective strategies for recruiting eligible participants. The combined alternative recruitment methods (hub visits, meetings, emails, website) allowed for building interdisciplinary networks between researchers, service users, and practitioners but resulted in few participants. Challenges throughout recruitment remained and included low conversion rates from social media advertising, spam/bots, ineligible participants, participant attrition, and missing questionnaire time points.

Social media was effective in recruiting eligible participants, aligning with previous findings (Aily et al., 2023; Moungui et al., 2024; Williamson et al., 2023; Wozney et al., 2019). In this study, although we only ran brief advertisement campaigns, Facebook outperformed traditional strategies in the recruitment of eligible veterans. However, there was a noteworthy difference between link clicks to eligible consent using paid Facebook advertising. The majority of those who showed initial interest by clicking the advertisement link did not proceed through to eligible consent. Even so, evident from these results and highlighted by Aily et al. (2023), a low conversion rate from Facebook paid advertising can still contribute to a cost-effective recruitment strategy.

Prolific was also effective in recruiting eligible military veterans. The majority of those recruited who also completed final questionnaire time points were via Prolific and helped the study to access secondary categories of groups which may be hard to reach (Russell et al., 2022). Prolific was also the most cost-effective compared to all other strategies. This is in line with previous works which argued that Prolific can be cost-effective and reliable for high-quality data (Douglas et al., 2023; Stanton et al., 2022). Together, our study shows that the combination of Facebook and Prolific has a role in recruiting for clinical research, particularly military veterans with co-occurring PTSD and harmful gambling.

## Challenges

Notwithstanding the above advantages to the approaches employed, we did encounter some recruitment and retention challenges. Few veterans were recruited through strategies such as face-to-face meetings, emails, or visits to organisations. Veterans can take up to 11 years to access support services and may face significant barriers and stigmatisation when accessing treatment (Clary et al., 2023; Murphy et al., 2019), which may have contributed towards the limited interaction observed here. However, due to the anonymous nature of the study, it was difficult to measure whether more veterans were recruited as a result of our in-person visits and then later accessed the online information. For this reason, it is advisable that future digital or online interventions should maintain a physical presence among service users, charities, and hubs to build in-person networks and raise further awareness.

In addition, the reliance on social media resulted in a large number of spam responses and unreliable data which may have contributed to the large attrition rate. Even in those eligible participants, close to half did not respond after requesting and being sent individualised app codes and did not go on to complete baseline measurements. These participants could not be contacted and therefore were considered to have withdrawn. Similar instances of attrition were noted by UK-based military veteran digital interventions that used social media for recruitment (Leightley et al., 2022; Parkes et al., 2023) and are considered a key challenge in clinical mHealth research. As recommended by Parkes et al. (2023), future works using social media for recruitment should also ensure additional strategies and resources are made available to counteract any attrition from social media recruitment.

A final retention challenge came from data attrition when participants did not complete all required questionnaires when requested. As a result, this led to variation between programme time and data points. In this study, there was an overall decrease in completion of all measures from baseline through each time point, yet the final week, Week 10, had more completions than interim

weeks like Weeks 4 and 6. One reason for this could be that participants stopped using ACT Vet after all steps had been completed in-app by the Week 4 questionnaire time point. While push notifications and email reminders were sent, the study still experienced a decrease in completed measures during those weeks. The opportunity to provide Week 10 data was provided using an email link after a lengthy period, while also being the final time point, which may have resulted in an increased response rate. Thus, if the programme length extends past the intervention length (i.e., in study designs with extended follow-up), attrition is likely to occur without targeted initiatives to increase engagement.

### **Limitations**

There were some limitations to the methods we employed. Firstly, participants recruited through Prolific were self-selected, which may increase the likelihood of bias and decrease the likelihood of obtaining a representative sample (Pickering & Blaszczynski, 2021). Despite this, data integrity measures were implemented throughout, such as requiring service numbers as evidence of veteran status and validating data quality. Secondly, the range of colours, imagery, and designs used for the project-specific branding may have resembled army branding (i.e., army green and camouflage). There is a possibility that this branding may have impacted recruitment of veterans from other services such as the Royal Navy and the Royal Air Force, both of which have unique colours and branding. Finally, 89% of all eligible recruited participants were male, which resulted in an underrepresentation of female veterans. Although female representation in the regular UK Armed Forces is increasing yearly (11.7% female; Ministry of Defence, 2024), the veteran criteria for ACT Vet likely resulted in a sample that reflects representation in the UK Armed Forces, as previously noted by Williamson et al. (2023). Further, males are considered at high risk of harmful gambling (Tran et al., 2024), which may have contributed to the variances seen.

## Conclusion

In conclusion, our findings showed the effectiveness of social media and online platforms compared to additional recruitment strategies in line with previous findings and recommendations for mHealth recruitment (Aily et al., 2023; Moungui et al., 2024; Wozney et al., 2019), particularly for military veterans (Williamson et al., 2023). Furthermore, these findings can be extended to populations with comorbid conditions such as veterans also with both PTSD and harmful gambling. Here, we offer some key recommendations for future recruitment efforts. Firstly, organise face-to-face meetings and visits as early as possible to strengthen interdisciplinary relationships and networks, but do not solely rely on these for recruitment. Secondly, build a strong online presence across various platforms and utilise unpaid and paid strategies. This will assist in project awareness and recruitment from populations that may be hard to reach, such as those suffering from PTSD and harmful gambling. Finally, increased efforts should be made to diversify branding and advertising. For military veteran research, this should reflect all three UK regular Armed Forces services (Army, Royal Navy, Royal Air Force), which, in turn, may also lead to an increase in participation from female veterans with comorbid disorders. It is hoped that these findings inform future recruitment initiatives in veteran, gambling, and mHealth research more broadly.

## Author Contributions

Conceptualization: CH, JMW, DL, DM, SD.

Data Curation: CH, JMW.

Methodology: CH, JMW.

Investigation: CH, JMW.

Supervision: SD.

Writing - original draft: CH.

Writing - review & editing: CH, JMW, DL, DM, SD.

Funding acquisition: SD, DL, DM.

### **Conflicts of Interest**

CH, JMW, DM, and SD have no disclosures. DL is a reservist in the UK Armed Forces. This work has been undertaken as part of his civilian employment.

### **Abbreviations**

ACT: acceptance and commitment therapy

DSM-5: diagnostic and statistical manual of mental disorders, fifth edition

KPI: key performance indicators

mHealth: mobile health

NHS: national health service

PCL-5: patient checklist

PGSI: problem gambling severity index

PTSD: post-traumatic stress disorder

UK: United Kingdom

### **Data Availability**

The datasets generated or analysed during this study are not publicly available due to the sensitive nature of the data but are available from the corresponding author on reasonable request.

### **Funding**

This study is funded by an award from the Office for Veterans' Affairs, Veterans' Health Innovation Fund.

## References

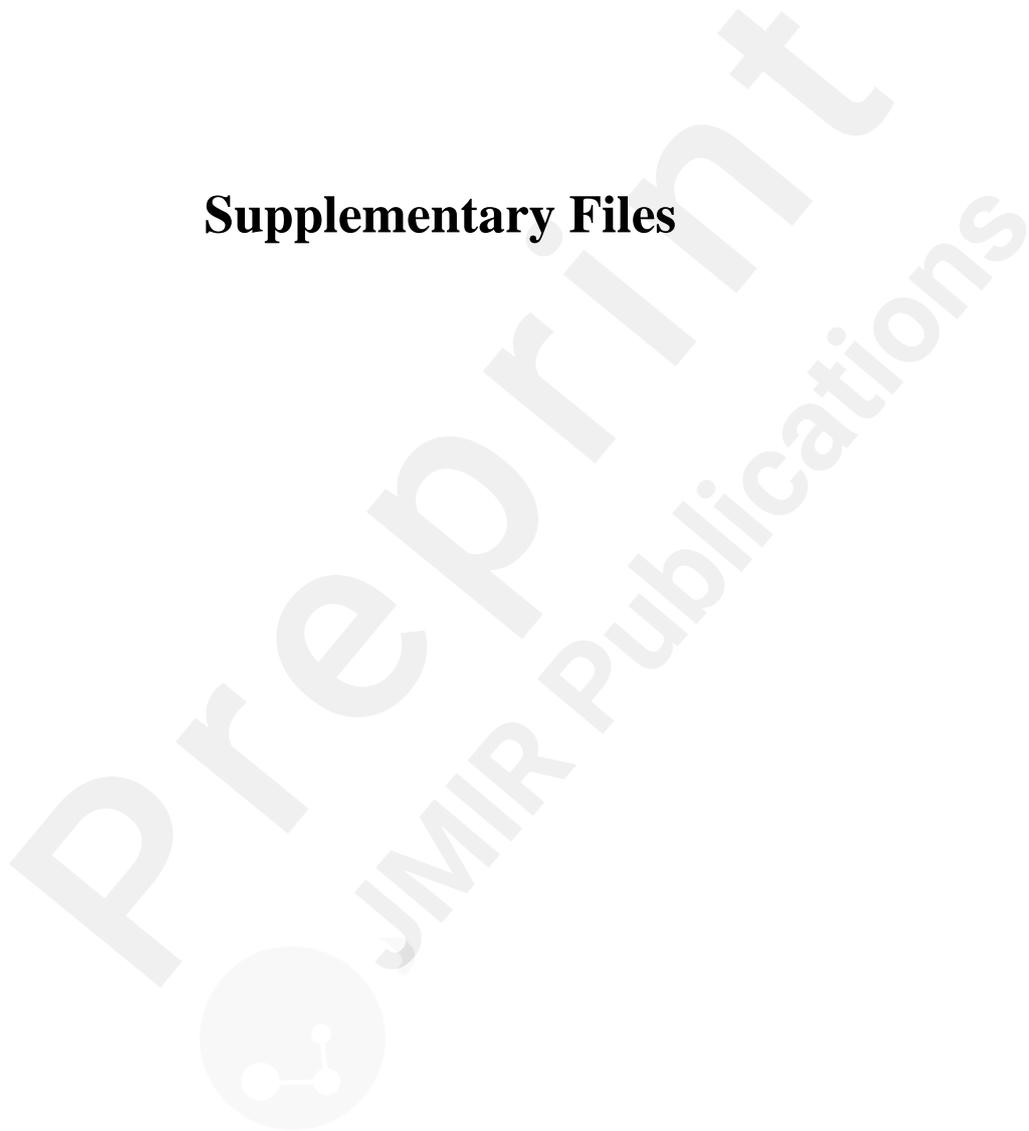
- Aily, J. B., Copson, J., Voinier, D., Jakiela, J., Hinman, R., Grosch, M., Noonan, C., Armellini, M., Schmitt, L., White, M., & White, D. (2023). Understanding recruitment yield from social media advertisements and associated costs of a telehealth randomized controlled trial: descriptive study. *Journal of Medical Internet Research*, 25, e41358. <https://doi.org/10.2196/41358>
- Amazon. (n.d.). *Amazon Mechanical Turk* [computer software]. Amazon Web Services. <https://www.mturk.com>
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5<sup>th</sup> ed.). American Psychiatric Association. <https://doi.org/10.1176/appi.books.9780890425596>
- Binks, E., & Cambridge, S. (2018). The transition experiences of British military veterans. *Political Psychology*, 39(1), 125–142. <https://doi.org/10.1111/pops.12399>
- Brownlow, L. (2021). A Review of mHealth Gambling Apps in Australia. *Journal of Gambling Issues*, 47. <https://doi.org/10.4309/jgi.2021.47.1>
- Cherry, K. M., Vander Hoeven, E., Patterson, T. S., & Lumley, M. N. (2021). Defining and measuring “psychological flexibility”: A narrative scoping review of diverse flexibility and rigidity constructs and perspectives. *Clinical Psychology Review*, 84, 101973. <https://doi.org/10.1016/j.cpr.2021.101973>
- Clary, K. L., Pena, S., & Smith, D. C. (2023). Masculinity and stigma among emerging adult military members and veterans: implications for encouraging help-seeking. *Current Psychology*, 42(6), 4422-4438. <https://doi.org/10.1007/s12144-021-01768-7>
- Dighton, G., Kitchiner, N., Larcombe, J., Rogers, R. D., & Dymond, S. (2023). Gambling problems among United Kingdom armed forces veterans: Associations with gambling motivation and posttraumatic stress disorder. *International Gambling Studies*, 23, 35-56. <https://doi.org/10.1080/14459795.2022.2063923>

- Donahue, M. L., Fruge, J. E., Andresen, F. J., & Twohig, M. P. (2024). Acceptance and commitment therapy (ACT) among US veterans: A systematic review. *Journal of Contextual Behavioral Science*, 100731. <https://doi.org/10.1016/j.jcbs.2024.100731>
- Douglas, B. D., Ewell, P. J., & Brauer, M. (2023). Data quality in online human-subjects research: Comparisons between MTurk, Prolific, CloudResearch, Qualtrics, and SONA. *Plos One*, 18(3), e0279720. <https://doi.org/10.1371/journal.pone.0279720>
- Etuk, R., Shirk, S. D., Grubbs, J., & Kraus, S. W. (2020). Gambling Problems in US Military Veterans. *Current Addiction Reports*, 7(2), 210–228. <https://doi.org/10.1007/s40429-020-00310-2>
- Farzandipour, M., Sharif, R., & Anvari, S. (2024). Effects of mhealth applications on military personnel's physical and mental health: A systematic review. *Military Psychology*, 1-9. <https://doi.org/10.1080/08995605.2024.2336640>
- Ferris, J., & Wynne, H. (2001). The Canadian Problem Gambling Index: Final report. *Canadian Centre on Substance Abuse*, 38.
- Goetter, E. M., Bui, E., Ojserkis, R. A., Zakarian, R. J., Brendel, R. W., & Simon, N. M. (2015). A systematic review of dropout from psychotherapy for posttraumatic stress disorder among Iraq and Afghanistan combat veterans. *Journal of Traumatic Stress*, 28(5), 401-409. <https://doi.org/10.1002/jts.22038>
- Goldberg, S. B., Riordan, K. M., Sun, S., Kearney, D. J., & Simpson, T. L. (2020). Efficacy and acceptability of mindfulness-based interventions for military veterans: A systematic review and meta-analysis. *Journal of Psychosomatic Research*, 138, 110232. <https://doi.org/10.1016/j.jpsychores.2020.110232>
- Gribble, R., Wessely, S., Klein, S., Alexander, D. A., Dandeker, C., & Fear, N. T. (2019). Who is a 'veteran'? Understanding definitions of the term among the British public: a research note. *The RUSI Journal*, 164(7), 10-17. <https://doi.org/10.1080/03071847.2019.1700683>
- Hawker, C. O., Merkouris, S. S., Thomas, A. C., Rodda, S. N., Cowlshaw, S., & Dowling, N. A. (2025). The General Acceptability and Use of Smartphone App-Delivered Interventions for Gambling in Australia. *Journal of Gambling Studies*, 1-21. <https://doi.org/10.1007/s10899-024-10373-9>
- Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes and outcomes. *Behaviour Research and Therapy*, 44(1), 1-25. <https://doi.org/10.1016/j.brat.2005.06.006>
- Hitch, C., Leightley, D., Murphy, D., Trompeter, N., & Dymond, S. (2023). Acceptance and commitment therapy for co-occurring gambling disorder and posttraumatic stress disorder. *European Journal of Psychotraumatology*, 14(1). <https://doi.org/10.1080/20008066.2023.2178203>
- Kidd, B., McCormack, J. C., Newcombe, D., Garner, K., O'Shea, A., & Humphrey, G. (2023). Recruitment and Retention in mhealth Interventions for Addiction and Problematic Substance Use: A Systematic Review. *MedRxiv*, 2023-09. <https://doi.org/10.1101/2023.09.09.23295094>
- Leightley, D., Williamson, C., Rona, R. J., Carr, E., Shearer, J., Davis, J. P., Simms, A., Fear, N. T., Goodwin, L., & Murphy, D. (2022). Evaluating the Efficacy of the Drinks:Ration Mobile App to Reduce Alcohol Consumption in a Help-Seeking Military Veteran Population: Randomized Controlled Trial. *JMIR mHealth and uHealth*, 10(6), e38991. <https://doi.org/10.2196/38991>
- Linardon, J. (2020). Can acceptance, mindfulness, and self-compassion be learned by smartphone apps? A systematic and meta-analytic review of randomized controlled trials. *Behavior Therapy*, 51(4), 646-658. <https://doi.org/10.1016/j.beth.2019.10.002>
- McCurdy, L. Y., Loya, J. M., Hart-Derrick, V. R., Young, G. C., Kiluk, B. D., & Potenza, M. N. (2023). Smartphone Apps for Problem Gambling: a Review of Content and Quality. *Current Addiction Reports*, 10(2), 178-186. <https://doi.org/10.1007/s40429-023-00479-2>

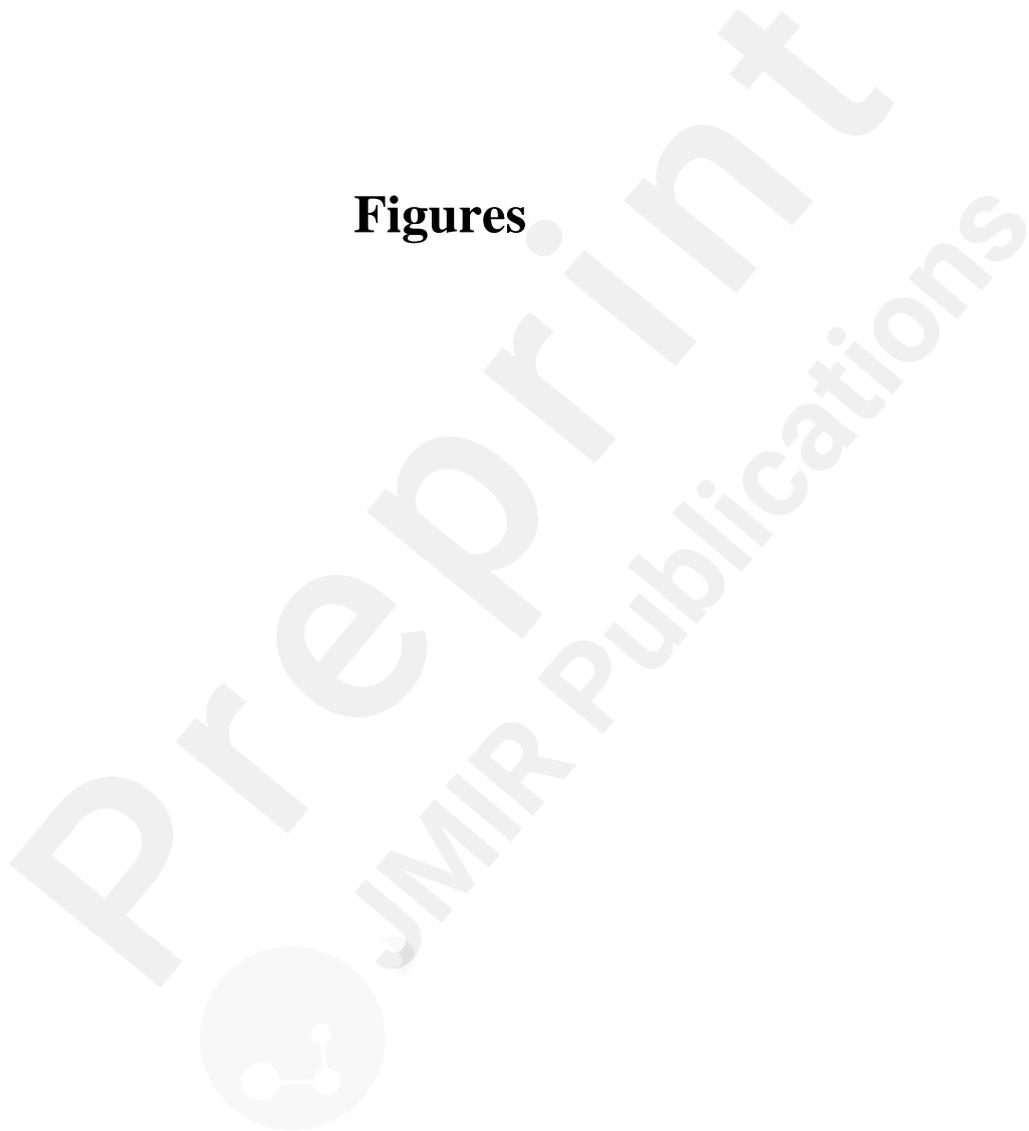
- Ministry of Defence. (2024). *UK Armed Forces Biannual Diversity Statistics: April 2024*. <https://www.gov.uk/government/statistics/uk-armed-forces-biannual-diversity-statistics-april-2024/uk-armed-forces-biannual-diversity-statistics-april-2024>
- Moungui, H. C., Nana-Djeunga, H. C., Anyiang, C. F., Cano, M., Ruiz Postigo, J. A., & Carrion, C. (2024). Dissemination strategies for mHealth apps: systematic review. *JMIR mHealth and uHealth*, 12, e50293. <https://doi.org/10.2196/50293>
- Murphy, D., Ashwick, R., Palmer, E., & Busuttill, W. (2019). Describing the profile of a population of UK veterans seeking support for mental health difficulties. *Journal of Mental Health*, 28(6), 654-661. <https://doi.org/10.1080/09638237.2017.1385739>
- Parkes, S., Croak, B., Brooks, S. K., Stevelink, S. A., Leightley, D., Fear, N. T., Rafferty, L., & Greenberg, N. (2023). Evaluating a Smartphone App (MeT4VeT) to Support the Mental Health of UK Armed Forces Veterans: Feasibility Randomized Controlled Trial. *JMIR Mental Health*, 10(1), e46508. <https://doi.org/10.2196/46508>
- Pedersen, E. R., Helmuth, E. D., Marshall, G. N., Schell, T. L., PunKay, M., & Kurz, J. (2015). Using facebook to recruit young adult veterans: online mental health research. *JMIR Research Protocols*, 4(2), e3996. <https://doi.org/10.2196/resprot.3996>
- Pfund, R. A., Peter, S. C., McAfee, N. W., Ginley, M. K., Whelan, J. P., & Meyers, A. W. (2021). Dropout from face-to-face, multi-session psychological treatments for problem and disordered gambling: A systematic review and meta-analysis. *Psychology of Addictive Behaviors*, 35(8), 901. <https://doi.org/10.1037/adb0000710>
- Pickering, D., & Blaszczynski, A. (2021). Paid online convenience samples in gambling studies: Questionable data quality. *International Gambling Studies*, 21(3), 516-536. <https://doi.org/10.1080/14459795.2021.1884735>
- Prolific Academic (n.d.). *Prolific* [computer software]. Prolific Academic. <https://www.prolific.com/>
- Roberts, E., Dighton, G., Fossey, M., Hogan, L., Kitchiner, N., Rogers, R. D., & Dymond, S. (2020). Gambling problems and military-and health-related behaviour in UK armed forces veterans. *Military Behavioral Health*, 8(2), 212-221. <https://doi.org/10.1080/21635781.2019.1644263>
- Romaniuk, M., Saunders-Dow, E., Brown, K., & Batterham, P. J. (2024). Feasibility, acceptability, and initial outcomes of a psychological adjustment and reintegration program for transitioned military veterans. *BMC Psychology*, 12(1), 1-17. <https://doi.org/10.1186/s40359-024-02097-7>
- Russell, A. M., Browne, M., Hing, N., Rockloff, M., & Newall, P. (2022). Are any samples representative or unbiased? Reply to Pickering and Blaszczynski. *International Gambling Studies*, 22(1), 102-113. <https://doi.org/10.1080/14459795.2021.1973535>
- Silver Lake (n.d.). *Qualtrics XM Platform* [computer software]. Silver Lake. <https://www.qualtrics.com>
- Stanton, K., Carpenter, R. W., Nance, M., Sturgeon, T., & Villalongo Andino, M. (2022). A multisample demonstration of using the prolific platform for repeated assessment and psychometric substance use research. *Experimental and Clinical Psychopharmacology*, 30(4), 432. <https://doi.org/10.1037/pha0000545>
- Stefanovics, E. A., Potenza, M. N., Tsai, J., & Pietrzak, R. H. (2022). Prevalence and clinical characteristics of recreational and at-risk/problematic gambling in a national sample of U.S. military veterans. *Journal of Gambling Studies*. <https://doi.org/10.1007/s10899-022-10165-z>
- Stevelink, S. A., Jones, M., Hull, L., Pernet, D., MacCrimmon, S., Goodwin, L., MacManus, D., Murphy, D., Jones, N., Greenberg, N., Rona, R. J., Fear, N. T., & Wessely, S. (2018). Mental health outcomes at the end of the British involvement in the Iraq and Afghanistan conflicts: a cohort study. *The British Journal of Psychiatry*, 213(6), 690-697. <https://doi.org/10.1192/bjp.2018.175>
- Torous, J., Lipschitz, J., Ng, M., & Firth, J. (2020). Dropout rates in clinical trials of smartphone

- apps for depressive symptoms: a systematic review and meta-analysis. *Journal of Affective Disorders*, 263, 413-419. <https://doi.org/10.1016/j.jad.2019.11.167>
- Tran, L. T., Wardle, H., Colledge-Frisby, S., Taylor, S., Lynch, M., Rehm, J., Volberg, R., Marionneau, V., Saxena, S., Bunn, C., Farrell, M., & Degenhardt, L. (2024). The prevalence of gambling and problematic gambling: a systematic review and meta-analysis. *The Lancet Public Health*. [https://doi.org/10.1016/S2468-2667\(24\)00126-9](https://doi.org/10.1016/S2468-2667(24)00126-9)
- Wardle, H., Reith, G., Langham, E., & Rogers, R. D. (2019). Gambling and public health: we need policy action to prevent harm. *BMJ*, 365. <https://doi.org/10.1136/bmj.11807>
- Weathers, F., Litz, B., Keane, T., Palmieri, P., Marx, B., & Schnurr, P. (2013). The PTSD Checklist for DSM-5 (PCL-5). *Scale available from the National Centre for PTSD*. <https://www.ptsd.va.gov/professional/assessment/adult-sr/ptsd-checklist.asp>
- Williams, J. M., Heath, C., Leightley, D., Murphy, D., & Dymond, S. (2025). *Smartphone app-delivered Acceptance and Commitment Therapy (ACT) for post-traumatic stress disorder and gambling harm in veterans: A pilot study* [Manuscript in preparation]. School of Psychology, Swansea University.
- Williamson, C., Rona, R. J., Simms, A., Fear, N. T., Goodwin, L., Murphy, D., & Leightley, D. (2023). Recruiting military veterans into alcohol misuse research: The role of social media and Facebook advertising. *Telemedicine and e-Health*, 29(1), 93-101. <https://doi.org/10.1089/tmj.2021.0587>
- Williamson, C., White, K., Rona, R. J., Simms, A., Fear, N. T., Goodwin, L., Murphy, D., & Leightley, D. (2022). Smartphone-based alcohol interventions: a systematic review on the role of notifications in changing behaviors toward alcohol. *Substance Abuse*, 43(1), 1231-1244. <https://doi.org/10.1080/08897077.2022.2074595>
- Wozney, L., Turner, K., Rose-Davis, B., & McGrath, P. J. (2019). Facebook ads to the rescue? Recruiting a hard to reach population into an Internet-based behavioral health intervention trial. *Internet Interventions*, 17, 100246. <https://doi.org/10.1016/j.invent.2019.100246>

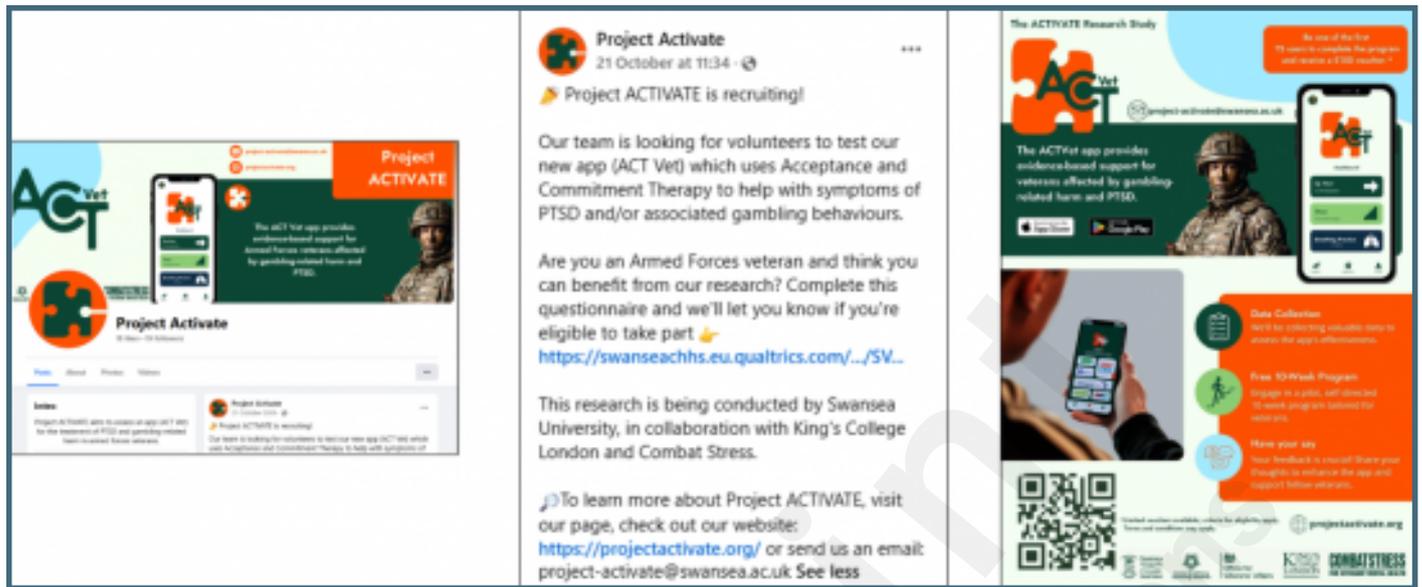
## Supplementary Files



## Figures



Example of the website project page (a), paid advertisement (b), and flyer (c) for ACT Vet.



Study attrition and recruitment source throughout project time points.

