MANKIND QUARTERLY
Mankind Quarterly, 66(2), 319-336 2025 Winter Edition
ISSN: 0025-2344

Technology-Based Interventions for Intimate Partner Violence: A Systematic Review

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Abstract

Intimate partner violence (IPV) affects mental health around the world. In light of the fact that victims of IPV are more likely than others to suffer from depression, anxiety and post-traumatic stress disorder (PTSD), this systematic review focuses on the outcomes of technology-based interventions for IPV survivors suffering from depression, anxiety, and PTSD. We searched databases including Pubmed, Scopus, PsychInfo and Google Scholar from 2000 to 2022 for studies examining the effectiveness of technology-based interventions in reducing depression, anxiety, and PTSD among IPV victims. Using a Cochrane quality assessment checklist, an independent researcher extracted the data and assessed its quality. In accordance with the PRISMA diagram, 16 articles were included. With regard to the varied content used in technological interventions and different types of interventions, including internet-based, computer-based and application-based, and taking account of methodological factors such as length of follow-up and sample size, technology-based interventions can significantly reduce depression, anxiety, and post-traumatic stress disorder.

Keywords: Intimate partner violence, Technology-based, Online intervention

1 Introduction

1.1 Prevalence and impact of intimate partner violence (IPV)

Globally, intimate partner violence (IPV), which the WHO (2012) defines as physical, sexual, emotional, or financial abuse and controlling behaviours by an intimate partner, is a widespread problem. One in three women worldwide experience physical or sexual violence from intimate partners (WHO, 2024). According to global estimates, about 30% of women worldwide have experienced physical and/or sexual intimate partner violence or non-partner sexual violence in their lifetime (WHO, 2021). Furthermore, approximately 38% of all murders of women are committed by an intimate partner.

Violence and abuse can have adverse effects on the victim's physical, mental, emotional, sexual, reproductive, and social health (Bramhankar & Reshmi, 2021; Costello & Greenwald, 2022; Lacey et al., 2021; Potter et al., 2021). Injuries to the head, neck and face, and chronic diseases and pain are commonly documented and are reported by a significant percentage, ranging from 35% to 94%, of survivors of IPV (Zieman et al., 2017). While secondary physical injury to IPV is common, the psychiatric consequences are substantial as well. Most victims of IPV experience long-term mental health disorders and maladjustments in their daily lives. According to a study conducted in Spain, 73% of IPV survivors had depressive symptoms, 77% showed elevated scores on trait anxiety, and 87% on state anxiety (Cirici Amell et al., 2023). Prevalence of post-traumatic stress disorder (PTSD) was also high (87%) and IPV significantly interfered with all

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aspects of 92% of survivors' lives (Cirici Amell et al., 2023). Also risk-taking behaviors such as abuse of drugs and alcohol are elevated (Stubbs & Szoeke, 2021).

Acutely, IPV, particularly physical and sexual violence, can result in fractures, traumatic brain injuries, skin lacerations, burns and, in severe cases, death (Raskin et al., 2024; Saenz & Tallman, 2024; Sun et al., 2023). Also, IPV experiences are associated with the development of PTSD, anxiety, depression, and suicidal ideation (Chandan et al., 2020; White et al., 2024). IPV survivors are three to five times more likely to report depression and anxiety than those who have not experienced IPV or experienced other traumatic events (Hind et al., 2012; Lagdon et al., 2014). Between 30 and 80 percent of individuals who have experienced IPV fulfill the criteria for PTSD (Nathanson et al., 2012). These mental health problems can have long-term and debilitating effects on IPV survivors' lives, affecting their overall functioning and quality of life. Therefore, it is important to address these common outcomes among IPV survivors and identify effective interventions considering the challenges and barriers to accessing services discussed below.

1.2 Barriers to seeking help

Despite IPV's multiple damages, many people do not report it or delay counseling. Survivors of IPV face a number of barriers to intervention including lack of knowledge about support and healthcare resources available in the community, embarrassment, fear of the perpetrator, fear of invasion of their privacy, and a fear of trusting individuals to reveal their experiences in private (Bridges et al., 2018; Heron & Eisma, 2021; Rohn & Tenkorang, 2022; Shaheen et al., 2020; Vranda et al., 2018). For individuals with financial, linguistic, cultural, and accessibility barriers, access to traditional services (such as primary care screening, shelters for battered women, safe houses, or counseling hotlines and helplines) may be limited (Henry et al., 2022). Shame and misconceptions exacerbate all of these factors (Balice et al., 2019; Heron & Eisma, 2021). Victims of violent abuse are often isolated by their perpetrators, have limited social support networks, and lack access to community services as a consequence (Balice et al., 2019; Sabri et al., 2016).

In recent years, the emergence of online psychological interventions has provided new avenues for support. A technology-based intervention can address these risk factors by providing global access to information, reporting of violent experiences, and seeking treatment for associated disorders. It is also possible to significantly reduce the costs of programs and traditional interventions by using these kinds of interventions (Fleming et al., 2018; Mehta et al., 2019). The emerging literature suggests that digital and technology-based interventions can complement traditional methods or be proposed alongside them to provide survivors with support (Bloom et al., 2016; Debnam & Kumodzi, 2021; Koziol-McLain et al., 2018; Young et al., 2018). Digital interventions address coverage gaps, challenges, and inequalities in the healthcare system more effectively than traditional interventions. There are many limitations to traditional interventions, such as the cost of care, confidentiality, privacy, geographical accessibility, and stigma. There are limitations for victims in underserved areas, especially in areas with limited healthcare services. However, digital interventions are easily accessible to victims in underserved areas. In addition, interventions can be tailored to individual needs without incurring extensive costs. It is true that digital interventions can help cover existing gaps and therapeutic challenges, but they can also create new challenges and gaps. For example, these interventions may be less effective or impossible when victims have no access to the Internet or do not feel comfortable using technology. These issues can aggravate inequalities and decrease the effectiveness of interventions.

1.3 Aims of the current review

The advent of digital technology, with the development of online psychological interventions, has shown promise in positively impacting mental health outcomes, including reducing symptoms of anxiety, depression, and PTSD. However, information about the effectiveness of these interventions in women who have experienced IPV is ambiguous in the literature.

Compared to traditional interventions, this category of intervention has shown limited effectiveness in systematic reviews. El Morr and Layal's (2020) systematic review identified information and communication technologies as suitable for disclosure and IPV prevention. Interventions based on information and

communication technologies were effective mainly in screening, disclosure, and prevention of IPV (El Morr & Layal, 2020). Linde et al. (2020) examined the effect of eHealth interventions versus standard care on reducing IPV, depression, and PTSD among women exposed to IPV until 2019 (Linde et al., 2020). There was no evidence of beneficial effects of eHealth interventions on IPV. Another study focused on feasibility and acceptability of web-based and mobile health interventions for IPV victimization prevention. Mobile health tools for IPV prevention were especially acceptable in health-care settings, on mobile phone platforms, or when connecting victims to health care. Despite evidence for efficacy compared to conventional IPV prevention approaches, benefits were limited (Anderson et al., 2019).

The Rempel et al. (2019) review concentrated on what are the online interventions available to women who have experienced IPV and potential benefits and barriers to access to information and services for women's health and safety. Findings of the study suggest that online interventions focus on the act of leaving with less emphasis on the experiences that occur after a woman leaves the relationship. They focus on the survivor's individual capacity to escape an abusive relationship. Information gaps for support after leaving an abusive relationship still need to be addressed. The Rempel et al. (2019) systematic review specifically focused on the outcomes of technology-based interventions for IPV survivors suffering from depression, anxiety, and PTSD.

Our goal is to expand our understanding of current study results with a comprehensive overview of interventions that have been used to improve symptoms of depression, anxiety, and PTSD in victims of IPV. What are the results of these interventions? Finally, we highlight gaps in the current literature and areas where further research is needed.

2 Methods

2.1 Study selection criteria

We reviewed all experimental and quasi-experimental trials that examined whether technology-based interventions improved depression, anxiety, and PTSD outcomes among IPV samples between 2000 and 2022, without language restrictions. We excluded studies for which access to the full text was not possible and participants were under 18 years.

2.2 Search strategy

The keywords were selected based on the terminologies in MESH, EMTREE, and TERM databases, as well as the keywords used in similar studies. The following keywords were used in combination and separately: ("domestic violence" OR "intimate partner violence") AND (depression OR anxiety OR PTSD OR "post-traumatic stress disorder" OR "Posttraumatic Stress Disorders") AND ("mobile platform" OR smartphone OR "web-based intervention" OR mHealth OR eHealth OR "eHealth technology" OR online OR virtual OR "telehealth service" OR "text message" OR technology OR "technology related intervention"). Pubmed and Scopus, PsychInfo and Google Scholar were used as databases. After determining the search syntax, a manual search of articles from key journals with the highest number of relevant primary studies was conducted in addition to the electronic search, as well as a review of the reference lists of retrieved articles from the electronic search. In our study, Google Scholar returned 17,500 results based on publications between 2000 and 2022. For the purpose of capturing the most relevant studies, we focused on results sorted by "relevance". As a result, we reviewed approximately the first 2,000 Google Scholar articles, rather than the first 200 to 300 mentioned in literature (Haddaway et al., 2015), due to irrelevant results after 2000 when evaluating the whole of the results.

2.3 Study selection

Using the EndNote software, the results of a search in the data management databases were merged. Following that, similar studies were reviewed and eliminated. Two reviewers independently selected articles

based on title and abstract and classified into three categories: 'included', 'probable', and 'excluded'. All articles classified as 'excluded' by both reviewers were excluded from the study. Each reviewer then reviewed the full texts of the articles classified as 'probable' and created a list. Any discrepancies were resolved using the consensus strategy after comparing the generated list.

2.4 Data extraction

Two reviewers independently extracted data from the primary studies into an Excel spreadsheet. Whenever needed, correspondence was made with the authors if the required information was not reported in the article. Among the items included in the Excel form for data extraction were the author's name, publication year, study year, country, study design, diagnostic criteria, sample size, mean age, type of intervention, duration and number of sessions of the intervention, follow-ups, primary and secondary outcomes, and measurement tools.

2.5 Quality assessment of studies

Two independent reviewers assessed the quality of studies using the Cochrane Quality Assessment Checklist for Intervention Studies. The reviewers used a consensus strategy when there were discrepancies between them. The following criteria are evaluated in this checklist to assess the quality of clinical trial studies: Random sequence generation, Allocation concealment, Blinding of participants and personnel, Blinding of outcome assessment, Incomplete outcome data, Selective outcome reporting.

3 Results

3.1 Procedure

The initial search phase yielded 39,470 studies, of which 18 duplicate studies were excluded. The titles and abstracts of the remaining 39,452 studies were screened for relevance to the research topic, but 39,409 articles were excluded. The full text of the remaining 43 studies was reviewed. A total of 27 studies were excluded because they were study protocols, did not focus on intimate partner violence, or did not focus on adults. As a result, 16 studies were included in the systematic review. Figure 1 illustrates the stages of study inclusion in the systematic review.

Overall, the studies included a total of 3320 participants. Table 1 provides more information about the presented studies. As a means of presenting the findings in more detail, the articles will be examined in terms of Sample size and location, Type of intervention, Quality of intervention, Outcomes, and User experience.

Table 1: Summary of studies included in the systematic review

Authors	Outcome	Follow-up	Frequency & duration of intervention	Type of intervention	Design*	Sample size/ type	Location	Year
Braithwaite & Fincham, 2009	Couples' satisfaction, depression, anxiety, conflict tactics, physical assault, psychological aggression, negotiation, conflict patterns (constructive communication)	8 weeks and approximately 10 months (44 weeks) post baseline	7 weeks	Computer Based Preventive Intervention/relationship focused preventive intervention (ePREP: skills training in effective communication and problem solving).	RCT	77 psychology students in romantic relationships lasting 4 months or longer.	America	2009
Braithwaite & Fincham, 2007	Anxiety, depression, positive & negative affect, conflict tactics, perceived relationship quality (mutual discussion, mutual expression, mutual negotiation), trust (predictability, dependability, faith in one's partner).	8 weeks	7 weeks	Computer-based relationship focused preventive intervention (ePREP) relative to a depression and anxiety focused computer-based preventive intervention (CBASP): Cognitive Behavioral Analysis, changing patterns of maladaptive thinking and behavior, analyzing problematic situations in their lives.	RCT	91 psychology students at a large public university.	America	2007
Constantino et al., 2015	IPV experience, anxiety, depression, anger, personal support, social support.	–	Once a week for 6 weeks.	Free-of-charge online HELPP Intervention, 6 modules in 6 weeks: (1) personal thoughts, emotions, behavior; (2) interpersonal relationships and healing in telling; (3) health in HELPP; (4) education on safety in HELPP; (5) legal matters in HELPP; (6) community and the A-B-Cs of empowerment.	RCT	32 adult females who experienced IPV during the past 18 months, now separated from perpetrator as required by law, who had obtained protection from abuse (PFA) in court prior to participating.	America	2015
Fiorillo et al., 2017	PTSD symptoms, depression, anxiety, psychological flexibility.	After six weeks intervention.	6 sessions in 6 weeks.	Six-session web-based ACT self-help for trauma: introduction and psychoeducation on interpersonal trauma and ACT, willingness and acceptance, mindfulness, defusion and self-as-context, clarifying values, committed action consistent with values.	Before and after study.	25 adult women with a history of interpersonal trauma: childhood sexual and/or physical abuse, adolescent or adult sexual assault, or partner violence.	America	2017

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Table 1: Summary of studies included in the systematic review (Continued)

Authors	Outcome	Follow-up	Frequency & duration of intervention	Type of intervention	Design*	Sample size/ type	Location	Year
Glass et al., 2022	Primary outcomes: use of 34 safety strategies, decisional conflict. Secondary outcomes: past 6-months IPV and reproductive coercion, past-week depression and suicide risk, substance misuse, preparation for decision-making.	After 6 and 12 months.	–	myPlan intervention: (1) protection, focus on increasing safety; (2) enhanced decision-making around safety; (3) reducing IPV to facilitate healing. Considers IPV survivor priorities and designs a safety plan tailored to their needs and priorities.	RCT	353 women aged 18–24 screened positive for IPV.	America	2022
Glass et al., 2017	Primary outcomes: decisional conflict, safety behaviours, repeat IPV; secondary outcomes: depression, PTSD.	After intervention, 6 and 12 months.	–	Emergency safety plans through a secure website, tailored safety action plans with recommended strategies based on participant demographics, relationship characteristics, previous safety behaviours, priorities and DA/DA-R score.	RCT	720 adult women reporting physical, sexual or emotional abuse or threats of violence by a current intimate partner in past 6 months.	America	2017
Hassija & Gray, 2011	PTSD, depression symptoms, client satisfaction.	–	Weekly sessions lasting 60–90 minutes (at least 4 sessions).	Videoconferencing trauma-focused psychotherapy services. Individual sessions of trauma-focused, evidence-based therapy based on treatment manuals for prolonged exposure therapy for PTSD or cognitive processing therapy for rape victims, plus motivational interviewing techniques to facilitate decision making regarding relationship termination.	Uncontrolled trial.	15 female clients who had experienced domestic violence (n = 12) and sexual assault (n = 3).	America	2011
Hegarty et al., 2019	Primary outcomes: self-efficacy, depression. Secondary outcomes: fear of partner, number of helpful behaviours for safety and wellbeing, cost-effectiveness, harm, social support, health service use, life events.	After 6 and 12 months.	12 months.	Safety decision aid (healthy relationships, abuse and safety, relationship priority setting, tailored action plan).	RCT	422 women screened positive for any form of intimate partner violence in the last 6 months.	Australia	2019

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Table 1: Summary of studies included in the systematic review (Continued)

Authors	Outcome	Follow-up	Frequency & duration of intervention	Type of intervention	Design*	Sample size/ type	Location	Year
Hesser et al., 2017	Interpersonal violence, aggression, relationship quality and satisfaction, anxiety & depression; process measures: emotion regulation & anger rumination, adverse events, treatment seeking.	1-year follow-up.	8 weeks.	Internet-delivered cognitive-behaviour self-help intervention incorporating self-help techniques. Homework exercises focus on building effective conflict-management skills and increasing adaptive emotion-regulation ability; psychoeducation about violence; strategies to enhance motivation to change violent behaviour; crisis strategies.	RCT	65 participants (18+ years) in a close and stable relationship (partner, marriage), recruited from the community, who had experienced aggression or interpersonal violence or abuse.	–	2017
van Rosmalen-Nooijens et al., 2013	Primary outcomes: symptoms of PTSD, depression, anxiety. Secondary outcomes: direct effects of visiting the website, increased knowledge of sexual, reproductive & relational health, decreased sexual risk taking.	–	FtV + usual care (UC); control group with minimally enhanced UC, 12 weeks.	"Feel the Vibe", an internet-based intervention consisting of: (1) providing information about family violence on the FtV website; (2) offering peer support; (3) lowering the threshold to regular health-care services.	RCT	50 adolescents (age 12–17) and young adults (age 18–25) exposed to family violence at home, who registered themselves on feel-the-vibe.nl.	Netherlands	2013
Koziol-McLain et al., 2018	Primary outcomes: depression, IPV exposure. Secondary outcomes: depression, PTSD, alcohol & drug abuse, decisional conflict, safety-seeking behaviour.	After 3, 6, and 12 months.	One year.	Web-based safety decision aid with safety priority setting, danger assessment, and an interactive process to help women develop an individually tailored action plan.	Web-based two-arm parallel RCT.	412 women who had experienced IPV in the last 6 months.	New Zealand	2018
Ford-Gilboe et al., 2020	Primary outcomes: depression, PTSD. Secondary outcomes: helpfulness of safety actions, confidence in safety planning, mastery, social support, coercive control, decisional conflict.	After intervention and after 3, 6, and 12 months.	6 weeks.	Tailored, interactive online safety and health intervention (iCAN Plan 4 Safety): interactive priorities exercise, relationship planning, danger assessment with personalised feedback, stress management.	Double-blind RCT.	462 adults (19+ years or older) who had experienced IPV in the previous 6 months.	Canada	2020
Decker et al., 2020	Primary outcomes: safety preparedness, decisional conflict, safety strategies, IPV experience. Secondary outcomes: resilience, depression, self-blame, recognition of abuse, self-efficacy, risk for severe/lethal violence, relationship quality, support service use.	After intervention and 3 months later.	–	MyPlan Kenya: educational program helping women define healthy and unhealthy relationships, develop tailored safety strategies, recognise warning signs, and access information about violence, harmful beliefs, and relevant resources.	RCT	352 women who had experienced physical or sexual IPV, or reported being afraid of their partner in the previous 3 months.	Kenya	2020

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Table 1: Summary of studies included in the systematic review (Continued)

Authors	Outcome	Follow-up	Frequency & duration of intervention	Type of intervention	Design*	Sample size/ type	Location	Year
Creech et al., 2022	Primary outcome: number of health risks. Secondary outcome: treatment use.	Two months and four months.	Day of residential or inpatient psychiatric care.	SHE, a brief computerized intervention: psychoeducation resource handouts, motivational interviewing, stages-of-change model; compared with a screen-and-referral-only control condition.	RCT	153 females aged 24–65 with history of sexual assault.	United States of America	2022
Bloom et al., 2014	Exposure to reproductive coercion, depression, PTSD, birth & infant feeding outcomes.	–	Four online sessions (early & late pregnancy, 3 and 6 months postpartum).	Internet-based individualized safety decision aid giving options about unsafe relationships impacting health in pregnancy: depression & stress during or after pregnancy, drugs, alcohol & medicines during pregnancy, breastfeeding, etc.	RCT	46 pregnant and postpartum women who experienced IPV, recruited from the community (not IPV shelters).	America	2014
Özümerzifon et al., 2022	Pre- and post-intervention surveys self-administered electronically, PTSD checklist–DSM IV, heart rate variability measurements.	–	Six weeks, 12 sessions.	Move to Move Beyond (MTMB™): virtual creative dance/movement program using movement and creativity to foster reflection and self-awareness, encouraging choice & decision-making.	RCT	45 women aged 23–48, recruited from Sanctuary for Families (SFF), a non-profit IPV service organisation.	New York City	2022

Note: * RCT, Randomised controlled trial

3.2 Sample size and location

A wide range of populations was covered in these articles, including pregnant women, university students, trauma survivors, and IPV survivors (Bloom et al., 2014, 2016; Fiorillo et al., 2017; Glass et al., 2022; Hassija & Gray, 2011). Despite the fact that the included studies were located in different countries, including Canada (Ford-Gilboe et al., 2020), USA (Bloom et al., 2014; Braithwaite & Fincham, 2007, 2009; Constantino et al., 2015; Creech et al., 2022; Fiorillo et al., 2017; Glass et al., 2017, 2022; Hassija & Gray, 2011; Özümerzifon et al., 2022), Kenya (Decker et al., 2020), Australia (Hegarty et al., 2019), New Zealand (Koziol-McLain et al., 2018) and Netherlands (van Rosmalen-Nooijens et al., 2013), the largest number of studies (10 out of 16) were conducted in the USA, reflecting the country's central role in this field. Additionally, Nairobi (Decker et al., 2020), British Columbia (Ford-Gilboe et al., 2020), Pittsburgh (Constantino et al., 2015), Arizona, Maryland, Missouri, Oregon (Constantino et al., 2015), Florida (Braithwaite & Fincham, 2009), and Wyoming (Hassija & Gray, 2011) were specific places where studies were conducted while no specifics were mentioned in the other studies. Therefore, North America has contributed most of the research in this field, with 11 articles, and Europe has contributed two articles.

Also, There was a significant variation in sample size, ranging from 15 to 720 (Glass et al., 2017; Hassija & Gray, 2011). The age range of the samples was also varied, ranging from 18 to 65 years old. Most samples were White (Braithwaite & Fincham, 2007), Asian (Constantino et al., 2015), and Black (Koziol-McLain et al., 2018), and they spoke English (Constantino et al., 2015; Decker et al., 2020; Ford-Gilboe et al., 2020; Glass et al., 2017, 2022; Hegarty et al., 2019; Koziol-McLain et al., 2018), Dutch (van Rosmalen-Nooijens et al., 2013), Spanish (Constantino et al., 2015), and Swahili (Decker et al., 2020).

3.3 Study designs

The review included fourteen RCT studies and two quasi-experimental studies (Fiorillo et al., 2017; Hassija & Gray, 2011). The target population in most RCTs included adults or youth with specific experiences, such as domestic violence or post-traumatic stress disorder. In order to analyze the data, statistical methods such as analysis of variance (ANOVA) and Cohen's d effect size were applied. Computer algorithms were used to randomize the participants, and group allocation was kept secret from the researchers and participants. Some articles included qualitative as well as quantitative analyses during the follow-up period. Most studies used questionnaires to measure outcomes, the most frequently used being CES-D (Center for Epidemiologic Studies Depression Scale) or PHQ-9 (Patient Health Questionnaire-9) (Braithwaite & Fincham, 2007; Glass et al., 2017; Hegarty et al., 2019; Koziol-McLain et al., 2018), PCL-C (PTSD Checklist-Civilian Version) (Constantino et al., 2015; Fiorillo et al., 2017; Glass et al., 2017), Decisional Conflict Scale (Glass et al., 2017, 2022; Hegarty et al., 2019; Koziol-McLain et al., 2018), and GAD-7 (Generalized Anxiety Disorder 7-item scale) (Braithwaite & Fincham, 2007; Fiorillo et al., 2017; Glass et al., 2017).

Studies of long-term follow-up indicated sustained improvements in mental health, maintenance of security and decision-making conflict, and the reduction of symptoms of mental disorders. There was a strong emphasis on the positive effects of the interventions on the safety, mental health, and overall wellbeing of participants. Publication bias was not formally assessed using statistical methods due to the small number of studies available for each outcome ($<$10), as such analyses have low statistical power and can yield misleading results. To reduce the potential for publication bias, we conducted comprehensive searches across multiple databases, manually reviewed key journals, and screened the reference lists of included studies.

3.4 Type of intervention

Interventions were implemented in a variety of platforms, including internet-based (Bloom et al., 2014; Braithwaite & Fincham, 2007, 2009; Fiorillo et al., 2017; Ford-Gilboe et al., 2020; Glass et al., 2017, 2022; Hegarty et al., 2019; Hesser et al., 2017; Koziol-McLain et al., 2018; van Rosmalen-Nooijens et al., 2013), computer-based (Braithwaite & Fincham, 2007, 2009; Creech et al., 2022; Hesser et al., 2017), and application-based (Decker et al., 2020), but most studies (10 out of 16) involved internet-based

interventions. The content goals of the interventions, in addition to the safety decision aid feature, which has been the primary goal of the interventions, include risk assessment, action plans to enhance decision-making, health improvement, social support, modules on healthy relationships, promoting psychological flexibility, health education, legal support coping strategies, modules on healthy relationships, training in effective communication techniques, problem-solving skills, enhancing relationship satisfaction, as well as promoting mental health and well-being.

Interventions have also been based on motivational interviewing and psychoeducation (Creech et al., 2022), Acceptance and Commitment Therapy (ACT) (Fiorillo et al., 2017), Dance/movement therapy (Özümerzifon et al., 2022), Cognitive Behavioral Therapy (Hesser et al., 2017), and trauma-focused psychotherapy (Hassija & Gray, 2011). In the studies, myPlan and ePERP appear to be the most notable and frequently used interventions (Decker et al., 2020; Glass et al., 2022).

Despite the fact that some studies did not mention the duration of the interventions, according to Table 1, they were usually weekly for a period of six to twelve months. Additionally, to assess the long-term effectiveness of a program, follow-up periods are often extended to six or twelve months.

3.5 Outcomes

In addition to security and decision-making problems, most studies considered mental health problems, particularly depression, anxiety, and PTSD, as targets of their interventions. Three studies used them as secondary outcomes (Braithwaite & Fincham, 2007; Hegarty et al., 2019; Koziol-McLain et al., 2018) and four studies used depression, anxiety and post-traumatic stress disorder as primary outcomes (Constantino et al., 2015; Fiorillo et al., 2017; Glass et al., 2017; Hassija & Gray, 2011). Fifteen of the studies examined depression as an outcome, of which 13 had positive results, one did not significantly reduce depression (Hegarty et al., 2019), and one did not report about changes (Bloom et al., 2014). Anxiety was the subject of five studies. All of these found positive results (Braithwaite & Fincham, 2007, 2009; Constantino et al., 2015; Fiorillo et al., 2017; Hesser et al., 2017). Eight studies were conducted with PTSD as an outcome, 6 of which reported a significant reduction in symptoms (Fiorillo et al., 2017; Ford-Gilboe et al., 2020; Glass et al., 2017; Hassija & Gray, 2011; Özümerzifon et al., 2022; van Rosmalen-Nooijens et al., 2013), while one showed no effect (Creech et al., 2022) and one did not report any effect (Bloom et al., 2014). In none of the studies were negative outcomes or increased symptoms of depression, anxiety, or post-traumatic stress disorder reported.

Regarding comparator conditions, the included trials employed varied control designs. Some compared ICT-based interventions with no intervention or a waitlist; others used treatment-as-usual/standard counseling; several used active non-ICT comparators (for example, face-to-face versions of the same program or "screen-and-referral only" controls); and a subset evaluated ICT delivered alongside usual care, comparing ICT + usual care with usual care alone. In treatment-as-usual comparisons, control participants typically received standard in-person counseling, printed materials, or referrals, without access to the ICT component. Two studies did not include a comparator arm (one before–after study and one uncontrolled trial).

3.6 User experience of interventions

Online interventions have generally been perceived as being satisfactory, accessible, useful, and effective by users, despite problems mentioned by users that included technical difficulties (Glass et al., 2022; Hassija & Gray, 2011), the challenging content (Fiorillo et al., 2017), and duration of the interventions (Braithwaite & Fincham, 2009; Hegarty et al., 2019). My Plan intervention, for example, has been met with satisfactory results in terms of availability, ease of use of the application, as well as the user-friendliness and practicality of the content. However, some users encountered technical difficulties while working with the program, which included problems with the program itself as well as Internet access (Glass et al., 2022).

Additionally, some couples found it challenging to commit to the entire duration of the ePREP program, as well as the training on effective communication skills (Braithwaite & Fincham, 2009). Users of the iCAN Plan program considered it to be effective and personalized, although some participants found the initial setup process to be complex (Ford-Gilboe et al., 2020). Several users complained that the modules in

the I-DECIDE program are lengthy (Hegarty et al., 2019). In addition, some users found the six-session web-based ACT program emotionally challenging (Fiorillo et al., 2017).

3.7 The quality of interventions

The random sequence generation method was reported in all studies except two (Constantino et al., 2015; Hassija & Gray, 2011). Most studies did not clearly indicate the blinding method, and one did not use it. In only two studies (Hegarty et al., 2019; Hesser et al., 2017), blinding was reported and selective reporting was prevented by not reporting the intervention. There was no mention of allocation concealment in any of the studies (Creech et al., 2022; Hassija & Gray, 2011; Özümerzifon et al., 2022). The least "low risk" bias violations were for random sequence generation, and the most "high risk" bias violations were for outcome assessment blinding (detection bias). The quality assessment results of the included studies are shown in Table 2.

Table 2: Quality assessment of studies

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective outcome reporting	Other potential bias
Braithwaite & Fincham, 2007	✓	✓	-	-	×	×	×
Braithwaite & Fincham, 2009	✓	✓	-	-	×	×	×
Constantino et al., 2015	×	✓	-	-	×	×	×
Fiorillo et al., 2017	NA	NA	NA	-	×	×	×
Glass et al., 2022	✓	✓	-	-	×	×	×
Glass et al., 2017	✓	✓	✓×	-	×	×	×
Hassija & Gray, 2011	×	×	×	-	×	×	×
Hegarty et al., 2019	✓	✓	✓	✓	×	×	×
Hesser et al., 2017	✓	✓	✓	✓	×	×	×
van Rosmalen-Nooijens et al., 2013	✓	NA	NA	NA	×	×	×
Koziol-McLain et al., 2018	✓	✓	✓	-	×	×	×
Ford-Gilboe et al., 2020	✓	✓	✓	×	×	×	×
Decker et al., 2020	✓	✓	✓×	×	×	×	×
Creech et al., 2022	✓	×	NA	NA	×	×	×
Bloom et al., 2014	✓	✓	-	-	×	×	×
Özümerzifon et al., 2022	✓	×	NA	NA	×	×	×

4 Discussion

This systematic review aimed to evaluate the efficacy of interventions using emerging technologies in helping victims of intimate partner violence (IPV) who suffer from anxiety, depression, and PTSD. Moreover, the study sought to determine gaps existing in the literature that require further investigation. While numerous systematic reviews have examined interventions related to IPV, encompassing various domains such as addictions (Wilson et al., 2014), women's economic empowerment (Eggers del Campo & Steinert, 2022), and behavioral, cognitive, and psychological interventions (Arroyo et al., 2017; Hameed et al., 2020; Tirado-Muñoz et al., 2014), based on our knowledge none of them have specifically focused on technology-based interventions and their influence on mental health outcomes such as depression, anxiety, and PTSD.

Among the most significant strengths of the studies are the diversity of interventions, including computer-based interventions, internet-based interventions, application-based interventions, a wide range of participants' ages, a variety of assessment tools, such as self-report and diagnosis, and the varying lengths of the interventions, ranging from a few weeks to one year. Moreover, the extensive content used in the interventions, including safety plans, mental resilience, flexibility, and problem-solving skills training, is an important strength. Another strength of the studies is the variety of approaches used in the studies, including cognitive-behavioural approaches, trauma-based approaches, and a variety of follow-up times, which all are important factors that contribute to the generalizability of the results.

Overcoming geographical barriers is one of the most important advantages of utilizing new technologies to address IPV. The availability of online platforms makes interventions more accessible to those living in remote areas and those with limited access to specialized services (Braithwaite & Fincham, 2009). By facilitating early intervention and support, these accessible online interventions reduce service gaps and facilitate early intervention. Women can also find help and support in a safe, confidential environment without fear of judgment or stigma, thereby decreasing underreporting of violence experienced by women (Bloom et al., 2014; Constantino et al., 2015; Fiorillo et al., 2017; Hassija & Gray, 2011).

Because digital interventions are crucial to connecting with victims and overcoming barriers to access, we can bridge the gap between service providers and victims, especially when access is difficult, such as during Covid-19 (Emezue, 2020).

The services for victims of IPV, typically provided in person or via transfer to short- or long-term protective facilities such as shelters and safe houses (Weeks et al., 2021), have been limited as a result of the Covid-19 pandemic, and public health regulations have been loosened. As a result, many organizations have been unable to provide in-person services and use online communication technologies such as video calls and applications to provide services (Jeyaraman & Chandan, 2020; Schafer et al., 2023; Su et al., 2022). However, there are concerns about safety, privacy, ethics, and equitable access to these interventions (Baird & Tarshis, 2022; Novitzky et al., 2023).

The included trials varied in their choice of comparator. Some evaluated ICT-based interventions against no intervention or a waitlist, others compared them with treatment-as-usual/standard counseling, and several used active non-ICT comparators (e.g., face-to-face versions of the same program or "screen-and-referral only"). In some studies, ICT was delivered alongside usual care and compared with usual care alone. Beyond clinical outcomes, many interventions were designed to support service delivery by providing digital educational content, safety planning, and remote follow-up — approaches that extend reach when in-person resources are constrained.

4.1 Study gaps for future research

It is relevant to consider factors such as inequality in access to new tools, victims' access to digital services, and the benefit of online intervention particularly in areas with limited resources. The use of new technologies can be a challenge for victims with mental or cognitive disabilities (such as mentally retarded, elderly, cognitively impaired, deaf and blind, etc.). Considering the high cost of smartphones and internet services, low-income victims are often unable to access and use these services. Furthermore, the use of such technologies requires technological literacy.

Digital interventions have not been fully explored as a means of improving access to health care in low-income areas. Future research must pay more attention to this important gap. By utilizing low-cost and low-bandwidth Technologies, future research should assess the effectiveness and feasibility of these interventions in such areas, explore hybrid interventions combining digital methods with in-person support to reach individuals in underserved areas, and conduct field studies in underserved areas where access to technology and the internet is limited to determine how they can be adapted to local conditions.

Security issues and spyware create a complex obstacle to monitoring these interventions, as well as to the use of these types of digital interventions. In light of these challenges, service providers should consider using digital interventions in conjunction with routine care, and further research is necessary to determine the safety of using technology for interventions.

To maintain safety, security, and privacy, studies have examined the use of personalized safety planning (Bloom et al., 2014; Ford-Gilboe et al., 2020), risk assessments (Glass et al., 2017), visual feedback (Bloom et al., 2014; Hassija & Gray, 2011), and victim anonymity. It is essential, however, that more attention is paid to security and the prevention of cyber abuse of people's personal information, especially in future research. PINs and passwords were an important consideration in the studies (Bloom et al., 2014; Decker et al., 2020; Glass et al., 2022), but it is critical that additional information be provided concerning the security of servers that store user information, the level of access to those servers, and the number of individuals with access to those servers to prevent cyber abuse and other potential harms.

According to Table 2, more studies achieved good performance characteristics in random sequence generation and concealment, however, incomplete data, selective reporting, and other biases were observed in other similar studies. In many studies, insufficient attention has been paid to reducing biases and ensuring the quality of the data, which may negatively affect their results. Therefore, future intervention studies should pay more attention to these issues.

There was a high concentration of articles in the review that dealt primarily with specific populations within localized contexts. For instance, a substantial number of studies (10 out of 16) were conducted in USA, while there were no related studies conducted in Asian countries. The lack of national diversity of participants and the focus on mainly English-speaking participants make it difficult to generalize the results. To ensure generalizability and applicability across cultural, social, and geographical contexts, future research should incorporate diverse samples and global perspectives. The complexities of IPV and technology-based intervention effectiveness can be better understood by studying a diverse group of participants.

Finally, it is imperative to explore the subjective experiences of individuals with online interventions. It is possible to gain a deeper understanding of victims' perspectives, emotional responses, sense of security, self-reporting behaviors, and help-seeking tendencies by using qualitative research methods. By conducting precise research of this nature, survivors of IPV can gain valuable insights into the usability, acceptability, and potential enhancements of technology-based interventions. When interventions are designed with survivors' subjective experiences in mind, they can be more effective and empowering.

4.2 Study limitations

There are several limitations to the study: The search was conducted in four databases (PubMed, Scopus, PsychInfo, Google Scholar) which, while extensive, may have missed relevant studies from other databases or grey literature. As can be seen in Table 1, due to the focus on various technological interventions, the results may not fully reflect the effects of all types of interventions. In addition, the inclusion of a wide range of interventions and methodologies may have contributed to a high level of heterogeneity, which may limit the generalizability of the results. We restricted our search to articles published between 2000 and 2022, which may have excluded older relevant studies. It is possible to eliminate these limitations in future research in order to reach robust conclusions.

4.3 Conclusion

This systematic review demonstrated technology-based interventions can significantly influence the mental health of survivors of intimate partner violence, as well as empower them and enhance their coping abilities.

Furthermore, future research can improve such interventions by addressing privacy concerns and survivors' subjective experiences of using technology-based interventions, and by conducting studies in more diverse places around the world. Also high-quality trials and replication studies with harmonizing outcome reporting are needed.

Declaration of competing interest

None.

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