Full Title: Internet-based peer support interventions for people living with HIV: A Scoping Review

Short Title: Internet-based peer support interventions for PLWHA

Stefanella Costa-Cordella^{1,2,3}, Aitana Grasso-Cladera^{1,3}, Alejandra Rossi³, Javiera Duarte^{1,2}, Flavia Guiñazu⁴, Claudia P. Cortes^{5,6}

Affiliations

¹ Centro de Estudios en Psicología Clínica y Psicoterapia (CEPPS), Facultad de Psicología, Universidad Diego Portales. Santiago, Chile.

² Instituto Milenio Depresión y Personalidad (MIDAP). Santiago, Chile.

³ Centro de Estudios en Neurociencia Humana y Neuropsicología (CENHN), Facultad de Psicología, Universidad Diego Portales. Santiago, Chile.

⁴ Web Intelligence Centre, Facultad de Ingeniería Industrial, Universidad de Chile, Santiago, Chile.

⁵ Hospital Clínico San Borja Arriarán & Fundación Arriarán, Santiago, Chile.

⁶ Departamento de Medicina, Facultad de Medicina, Universidad de Chile, Santiago, Chile.

***Corresponding author**

M.D. Claudia P. Cortes

E-mail: cpcortes@uchile.cl

Authors Contributions

SCC, FG and CC worked on the conceptualization of the article. SCC, AGC and JD performed the literature revision (research, selection, characterization, and analysis). SCC, AGC and AR wrote the manuscript. All authors reviewed and approved the final version of the manuscript.

Key words: HIV, peer support, digital health, psychosocial intervention

Abstract

Peer support interventions for people living with HIV and AIDS (PLWHA) are widely effective, but their associated time and material costs for the recipient and the health system make them reachable for only a small proportion of PLWHA.

Internet-based interventions are an effective alternative for delivering psychosocial interventions for PLWHA as they are more accessible and offer anonymity.

Currently, no reviews are focusing on internet-based interventions with peer support components. This study aims to map the existing literature on psychosocial interventions for PLWHA based on peer support and delivered through the internet.

We conducted a systematic scoping review of academic literature following PRISMA guidelines. Nine articles met our criteria, and we summarized them using a narrative synthesis method. We found internet-based peer support interventions for PLWHA are feasible and acceptable to participants and healthcare workers. We conclude that internet-based peer support interventions for PLWHA are a promising alternative to those in person.

Introduction

Human Immunodeficiency Virus (HIV) affects more than 37.7 million people worldwide and its prevalence is still increasing [1]. The primary HIV treatment is Antiretroviral Therapy (ART) which works to suppress replication of the virus resulting in improved immune response and reduced viral load. Inadequate adherence to ART is associated with morbidity and mortality [2–4].

Because of the essential role of adherence in the success of ART, a myriad of research has been carried out to understand ART adherence. Among factors that predict HIV treatment adherence, an important role has been found in psychosocial factors such as social support [5–7], HIV stigma [6,8,9], stress [10–12], and depressive symptoms [7,13,14].

Consequently, different psychosocial interventions have been developed to address treatment adherence, and they have increasingly been demonstrated to enhance HIV adherence and improve health in PLWHA [13–18].

Psychosocial interventions for PLWHA that include a peer support component have shown to be particularly effective [19–26]. Peer support is defined as the support provided by people who share life experiences [27]. Applied to interventions, peer support typically includes group meetings, support networks (either virtual or in-person) or peer-mentoring [28]. Peer support has been a common and effective strategy used in interventions for people living with stigmatized conditions [29–32]. Also, this strategy has shown to be efficient in lowering the overall costs of medical provision [31–33].

Specifically, in PLWHA, peer support interventions have shown to properly address internalized stigma [26,34–37], reduce depressive symptomatology [25] and stress [19–23], enhance the quality of life and wellness [38] and improve treatment adherence [36,39–45].

In fact, peer support interventions are recommended in official health guidelines such as the Center for Disease and Prevention [46] and the British HIV Association [47].

However, these services are rarely offered in HIV clinics due to existing structural barriers, such as a lack of mental health services and difficulties in accessing services [48,49]. Against this scenario, internet-based interventions have proliferated. These are easy to access by a high number of people, due to resource-saving and flexible delivery [50]. Additionally, Internet-based interventions offer anonymity, are easily accessible, and they are scalable [48,51–53]. Therefore, they have been suggested as an alternative to overcome the above-mentioned barriers [54,55].

Specifically for PLWHA, recent reviews of internet-based interventions for this population have found their significant impact on a range of outcomes including adherence, viral load, mental health and social support [56,57].

However, none of the reviews have focused on internet-based interventions with peer support components.

Considering the above, in this review, we aim to map the existing literature on psychosocial interventions for PLWHA based on peer support and delivered through the internet. To our knowledge, this is the first systematic effort to provide such an overview.

We opted for the Scoping Review methodology [58], considering the specificity of the subject, which requires an effort to obtain a global overview of the evidence and its gaps before the development of a more specific systematic review [59].

Methods

We conducted a systematic scoping review of the peer-reviewed academic literature. Our pre-registered protocol containing our detailed methods is available at Open Science Framework (OSF; osf.io/5bkzv).

Search strategy

We developed a search strategy following PRISMA guidelines for scoping reviews [58]. The scoping review method was chosen considering the lack of extension of the area of interest, which would be necessary for conducting a systematic review [60]. Our search terms are shown in Table 1.

Table 1. Search strategy

TS1	(mHealth) AND (HIV) AND (peer support)
TS2	(Digital health) AND (HIV) AND (peer support)
TS3	(APP) AND (peer support) AND (HIV)
TS4	Publication year: All time
TS5	Language: English and Spanish

We adapted our search string for five databases. The databases used were PubMed, Web of Science (WoS), American Psychological Association (APA), SciELO and LILACS. To supplement our broad search, we also manually reviewed the reference lists of all included

articles, as well as any 3 previous systematic reviews [57,61,62] identified through our search, and screened all articles with keywords based on our inclusion criteria. We conducted the search during August 2021.

Eligibility criteria

We included studies that met the criteria shown in Table 2. We excluded studies that reported aspects of the development of an intervention without describing the intervention's protocol and/or implementation or results. We also excluded interventions in which the peer support component was not delivered through digital health. There were cases in which the same intervention was investigated in several different studies (for example, protocol, qualitative and RCT). In those cases, we selected the study with the most robust evidence (i.e., RCT).

Table 2. Eligibility checklist

Population: People Living with HIV (Adults and Young adults)
Exposure: Psychosocial Interventions using digital health and peer support
Comparison: N/A
Outcomes: N/A
Study design: case study, RCT, qualitative studies, pilot studies, protocols for RCT, pre-post studies, comparison trials.

Article selection

The results of our database and manual searches were exported into EndNote [63]. Duplicate papers were removed, and the remaining articles were uploaded into Covidence [64]. Two reviewers (S.C.C & A.G.C) screened each article for eligibility by title and abstract. Articles that clearly failed the eligibility criteria were excluded. Later, the same two reviewers independently reviewed the full text of the remaining articles to assess eligibility. Disagreements between reviewers were resolved through an iterative consensus process involving multiple rounds of deliberative discussion.

Data extraction

We extracted detailed study characteristics and recorded them in Microsoft Excel. One author (A.G.C) extracted verbatim text from each article relevant to publication details, study aims, methods, participants, results, strengths, and limitations from all eligible studies. The verbatim

text excerpts were then uploaded into Covidence [64] where categorical variables were created and assigned by two independent reviewers (A.G.C & S.C.C). Variables were created to categorize study design, intervention goal, target population, type of technology used, method of peer-support used, and country represented in the study. All articles were retrieved, and their content was codified.

Data synthesis

We summarized the selected articles using a narrative synthesis method [65]. This method allows the analysis of records guided by clearly defined aims [66]. Specifically, we synthesized the studies' described interventions, characteristics, and findings.

Results

Our initial search yielded 234 articles, and 98 more were found in our manual search. After removal of duplicates, 183 articles were removed. Then, we screened titles and abstracts and 9 articles were included in this review (Fig 1).

[FIGURE 1]

Study characteristics

As shown in Table 3, of the total of included articles, two presented a pre-post design [68,69], two were RCT [70,71], three were pilot trials [72–74] and two were qualitative studies [75,76]. Five interventions were tailored for young adults living with HIV (YLWHA) [69–71,73,76], one of them [71] specifically to black MSM (Men who have Sex with Men) YLWHA. Similarly, one intervention focused on MSM adults [74]. The other three interventions were focused on adults, two of them [72,75] exclusively for women living with HIV (WLWHA) and one with no specific gender [68]. Regarding location, 4 of the 9 studies were conducted in the U.S [68,71,73,74], one in Kenya [69], one in South Africa [76], one in the UK [75], one in Canada [72] and one in Nigeria [70].

Table 3. Distribution of study characteristics.

Study Characteristics

Study Design	Number of studies
Randomized Control Trial	2
Pilot	3
Qualitative	2
Pre-Post	2
Target Population	
YLWHA (Black, MSM)	1
PLWHA	1
PLWHA(Black, MSM)	1
WLWHA	2
YLWHA	4
Study Location	
Nigeria	1
Canadá	1
United Kingdom	1
Cape Town	1
Kenya	1
United States	4

Further characteristics can be found in Table 4.

Table 4. Characteristics of the included interventions.

Intervention Characteristics

Study ID, design	Name	Main goal	Technology used	Peer support strategy	Target population
<i>Henwood et al., 2016</i> Qualitative	Khaya HIV Positive	Peer Support	MXit Social network platform	Instant messaging (one-on-one and chat rooms)	YLWHA
<i>Senn et al., 2017,</i> Pilot Trial	N/A	Treatment Adherence	APP	Mentorship by trained peers and SMS	PLWHA (Black, MSM)
<i>Hightow-Weidman et al., 2018,</i> Pilot Trial	AllyQuest	Treatment adherence	APP	Daily discussions; Social network	YLWHA
<i>Ghabrial, Classen, & Maggi, 2019,</i> Pilot Trial	Shared Journey	Stress and stigma.	Website	Asynchronous discussion page	WLWHA (Women)
<i>Hightow-Weidman et al., 2019,</i> RCT	HMP	Sexual Risk Behaviors	App	Forums for discussion and space to share personal multimedia files (e.g. pictures)	YLWHA (Black, MSM)
<i>Ivanova et al., 2019,</i> Pre-Post	ELIMIKA	Treatment Adherence	Web Platform	Interactive web-based peer support platform	YLWHA
<i>Hay et al., 2020,</i> Qualitative	4MNet	Social Support	WhatsApp	Peer run network	WLWHA (Women)
<i>Canan et al., 2020,</i> Pre-Post	PositiveLinks	Treatment Adherence	APP	Private, clinic-affiliated online support group	PLWHA

<i>Dulli et al., 2020,</i> RCT	SMART	Treatment Adherence; Social Support and HIV Literacy	Facebook	Structured support groups	YLWHA
-----------------------------------	-------	--	----------	---------------------------	-------

YLWHA (Young adults Living with HIV/AIDS); PLWHA (People Living with HIV/AIDS); WLWHA (Women Living with HIV/AIDS); RCT (Randomized Control Trial).

Characteristics of the Interventions

The nine reviewed studies reported nine different interventions. As shown in Table 2, most of the interventions were delivered through smartphone applications; three used a preexisting social network (e.g., Facebook), and two were provided through a website. Regarding the intervention's aims, the most common goals were to increase treatment adherence [68–70,73,74] and to foster social support [70,75,76]. Only one intervention [72] was tailored specifically to address stress and stigma, and one intervention [71] was intended to decrease risky sexual behaviors.

Technology Used

Smartphone Applications. Four interventions were delivered through specifically tailored smartphone applications (Apps): Positive Links [68]; AllyQuest [73]; HealthMpowerment (HMP) [71] and Peer-mentor messaging [74]. Positive Links, AllyQuest and HMP, included support groups with message boards or forums for discussion. Some of them offered learning resources and a space for asking questions to a health care provider. Also, some of them allowed anonymous interactions. The four apps were developed considering the target population's preferences and needs, as investigated in previous studies.

Existing Social Networks. Three interventions used existing social networking services. SMART Connections [70] uses Facebook, and the intervention is delivered through secret Facebook groups moderated by trained peers. SMART is the virtual adaptation of an in-person intervention called Positive Connections. Similarly, Khaya HIV Positive [76] was delivered through a closed group within MXit. This free instant messaging application was widespread in South Africa at the time of the intervention. Finally, 4MNet [75] is a peer-run network that uses WhatsApp groups for providing informational, emotional, and practical support to members. The three interventions involved a trained peer acting as a group moderator.

Web Platforms. Finally, two interventions were delivered through websites. ELIMIKA [69] comprises an interactive peer support platform that mirrors other common social media platforms but adds additional security to user's personal information and communication. ELIMIKA includes a blog where different actors (e.g., YLHIV, healthcare providers) can post on various HIV-related topics; a discussion section; a Q&A section with experts and private messaging. In contrast, Shared Journey [72] is an 8-week intervention delivered through a website that offers educational tools and an asynchronous discussion page.

Intervention Goals

Regarding the intervention's aims, the most common goals were to increase treatment adherence [68–70,73,74] and to foster social support [70,75,76]. Two interventions aimed, additionally, at increasing HIV literacy [69,70]. Only one intervention [72] was tailored specifically to address stress and stigma, and one intervention [71] was intended to decrease risky sexual behaviors.

Study Findings

Social Support. Although not conclusive, the three studies that measured social support found indicators of some increase in social support. The interventions 4MNet and Khaya, investigated through a qualitative design, found that participants expressed their satisfaction with the experience of support provided by interacting with their HIV-positive peers. In the Smart Connection's RCT, there were differences between the intervention and the control group regarding social support; however, these differences were not statistically significant.

Treatment Adherence. Three of the four studies measuring treatment adherence found improvements in this area. Ghabrial et al. (2019) found that higher levels of HMP app usage were positively correlated with HIV treatment adherence. There was a statistically significant positive association between the number of days logged into the app and knowledge and confidence in taking HIV medications reliably. Similarly, Ivanova et al. (2019) and Canan et al. (2020) found significant improvements in adherence after attendance to ELIMIKA and Positive Links (respectively) and these improvements were maintained in the follow-up period, after three months [69] and after 6 and 24 months [68].

HIV Literacy. The interventions SMART [70] and ELIMKA [69] aimed at increasing participant's knowledge regarding HIV. Dulli and colleagues (2020) found HIV knowledge

increased in the intervention group in comparison with the control group. In contrast, Ivanova et al. (2019) found no pre-post significant differences in this regard.

Safe sex behaviors. Only one intervention was designed to reduce risky sex behaviors, the HMP [71]. In their RCT, Hightow-Weidman and colleagues found a significant reduction in self-reported condomless anal intercourse rates among young BMSM after the intervention.

Feasibility/Acceptability. We reviewed three pilot studies exploring the feasibility of testing their intervention [72–74]. Overall, they found the interventions feasible and acceptable. AllyQuest participants found the app easy to use and navigate and not intrusive. The Senn's peer mentor messaging was feasible, and both mentors and mentees reported desiring more personalized contact.

Discussion

This study aimed to describe the existing literature on psychosocial interventions for PLWHA based on peer support and delivered online. Only nine interventions met our inclusion criteria. The interventions reviewed were diverse in their techniques, including one on one, group chats, asynchronous discussions, open and closed groups. Apps and websites were the most common technologies, and they were either tailored explicitly for the intervention or using existing ones. The most common intervention goal was to increase treatment adherence, but some interventions also aimed at reducing stress, stigma and increasing social support, safer sex behaviors and/or HIV literacy.

Also, the peer component and its role within the intervention varied among the reviewed interventions. For example, some interventions were designed to foster supportive interaction between PLWHA, while others relied on mentoring trained peers receiving professional supervision.

Overall, our findings suggest that internet-based peer support interventions for PLWHA are feasible and acceptable to participants and healthcare workers. However, our review's variety of designs and interventions and studies make it difficult to interpret the findings across all included studies. More empirical evidence is needed to understand the mechanisms that allow these interventions to work and improve the availability of services and care for PLWHA. Also, limited information exists regarding the effectiveness of these interventions. Only the findings from the SMART and HMP programs indicate that peer support internet-based interventions may be adequate to improve health outcomes in PLWHA.

The other reviewed studies show some promising but not conclusive results.

An essential advantage of the peer support interventions delivered through the internet over those delivered in person is anonymity. Almost all the reviewed interventions have the option of interacting anonymously. This was significantly valued by participants in most of the studies, consistent with previous studies indicating that people dealing with stigmatized conditions perceived anonymous online groups to be safer than in person [77,78].

Additionally, participants in some of the reviewed studies reported preferring a combination of individual (e.g., counselling) and group components. This is an important aspect to consider when designing these interventions. A cost-effective alternative might be to provide individual counselling through artificial intelligence or trained peer mentoring, which is becoming increasingly common in healthcare [79–82].

Our scoping review findings are consistent with those of Muessig et al. (2017) and Cooper et al. (2017), in which internet-based interventions for PLWHA showed to have a significant impact on health outcomes. Additionally, our results are in line with the literature supporting the effectiveness of peer support interventions for PLWHA [19–23,25,26,34–37,39,40,42–45]. However, our finding extends these results by adding preliminary evidence that peer support interventions can be successfully delivered online.

Our scoping review suffers from several limitations. First, we excluded interventions based only on SMS (Short message service), a widely spread mHealth intervention for the HIV population effective in improving treatment adherence [56] and, in some cases, social support [83]. However, they do not benefit from the internet, which allows communication to be more fluid, in groups and more anonymous. With the internet becoming increasingly accessible, SMS interventions are starting to be replaced for those internet-based, so we exclude them from the analyses [84–86]. Second, we could not perform meta-analyses of the studies data because of the wide variety of designs, methodologies, and measures employed. Third, we did not evaluate data extraction and synthesis reliability, and fourth, we excluded grey literature. Future studies might benefit from performing a more comprehensive review. It may be a fruitful next step to conduct a review on broader types of internet-based and peer support interventions (for example, tailored for different conditions or populations) and analyze them together. Nevertheless, the synthesis provided here might apply as a background for further systematic reviews. Also, our study might be helpful to the development of more internet-based peer support interventions for PLWHA, which might benefit from considering the elements mentioned here as relevant for the development of the interventions (for instance, the importance of anonymity, the support from peers, the accessibility of the internet).

Conclusions

This scoping review contributes to the growing body of literature on the effects of internet-based interventions for people living with HIV by adding evidence on the importance of the peer support component on those interventions.

The acceptability, feasibility, and preliminary evidence on the effectiveness of the interventions suggest that peer-support should be considered a treatment approach to support existing HIV internet-based treatments for people living with HIV. Our findings support the need to develop more of this kind of intervention.

Fundings

This work was funded by FONDEF ID20I10174, Agencia Nacional de Investigación y Desarrollo (Chile) and the Agencia Nacional de Investigación y Desarrollo (ANID, Chile) through FONDECYT regular N° 1190610.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

References

1. Organization WH, Others. UNAIDS report on the global AIDS epidemic 2021. Geneva, Switzerland: UNAIDS. 2021.
2. Kobin AB, Sheth NU. Levels of adherence required for virologic suppression among newer antiretroviral medications. *Ann Pharmacother*. 2011;45: 372–379.
3. Pasternak AO, de Bruin M, Jurriaans S, Bakker M, Berkhout B, Prins JM, et al. Modest nonadherence to antiretroviral therapy promotes residual HIV-1 replication in the absence of virological rebound in plasma. *J Infect Dis*. 2012;206: 1443–1452.
4. Genberg BL, Wilson IB, Bangsberg DR, Arnsten J, Goggins K, Remien RH, et al. Patterns of antiretroviral therapy adherence and impact on HIV RNA among patients in North America. *AIDS*. 2012;26: 1415–1423.
5. Okonji EF, Mukumbang FC, Orth Z, Vickerman-Delpont SA, Van Wyk B. Psychosocial support interventions for improved adherence and retention in ART care for young people living with HIV (10-24 years): a scoping review. *BMC Public Health*. 2020;20: 1841.
6. Li MJ, Murray JK, Suwanteerangkul J, Wiwatanadate P. Stigma, social support, and treatment adherence among HIV-positive patients in Chiang Mai, Thailand. *AIDS Educ Prev*. 2014;26: 471–483.
7. Mao Y, Qiao S, Li X, Zhao Q, Zhou Y, Shen Z. Depression, Social Support, and Adherence to Antiretroviral Therapy Among People Living With HIV in Guangxi, China: A Longitudinal Study. *AIDS Educ Prev*. 2019;31: 38–50.
8. Kalichman SC, Mathews C, Banas E, Kalichman MO. Treatment adherence in HIV stigmatized environments in South Africa: stigma avoidance and medication management. *Int J STD AIDS*. 2019;30: 362–370.
9. Katz IT, Ryu AE, Onuegbu AG, Psaros C, Weiser SD, Bangsberg DR, et al. Impact of HIV-related stigma on treatment adherence: systematic review and meta-synthesis. *J Int AIDS Soc*. 2013;16: 18640.
10. Benoit AC, Burchell AN, O'Brien KK, Raboud J, Gardner S, Light L, et al. Examining the association between stress and antiretroviral therapy adherence among women living with HIV in Toronto, Ontario. *HIV Res Clin Pract*. 2020;21: 45–55.
11. Blashill AJ, Perry N, Safren SA. Mental health: a focus on stress, coping, and mental illness as it relates to treatment retention, adherence, and other health outcomes. *Curr HIV/AIDS Rep*. 2011;8: 215–222.
12. Bottonari KA, Roberts JE, Ciesla JA, Hewitt RG. Life stress and adherence to antiretroviral therapy among HIV-positive individuals: a preliminary investigation. *AIDS Patient Care STDS*. 2005;19: 719–727.
13. Amico KR, Fisher WA, Cornman DH, Shuper PA, Redding CG, Konkole-Parker DJ, et al. Visual analog scale of ART adherence: association with 3-day self-report and

adherence barriers. *J Acquir Immune Defic Syndr*. 2006;42: 455–459.

14. Sin NL, DiMatteo MR. Depression treatment enhances adherence to antiretroviral therapy: a meta-analysis. *Ann Behav Med*. 2014;47: 259–269.
15. Bhochhibhoya A, Harrison S, Yonce S, Friedman DB, Ghimire PS, Li X. A systematic review of psychosocial interventions for older adults living with HIV. *AIDS Care*. 2021;33: 971–982.
16. Tran BX, Vu GT, Ha GH, Phan HT, Latkin CA, H-Ho CS, et al. Global Mapping of Interventions to Improve the Quality of Life of People Living with HIV/AIDS: Implications for Priority Settings. *AIDS Rev*. 2020;23: 91–102.
17. Spaan P, van Luenen S, Garnefski N, Kraaij V. Psychosocial interventions enhance HIV medication adherence: A systematic review and meta-analysis. *J Health Psychol*. 2020;25: 1326–1340.
18. Langebeek N, Gisolf EH, Reiss P, Vervoort SC, Hafsteinsdóttir TB, Richter C, et al. Predictors and correlates of adherence to combination antiretroviral therapy (ART) for chronic HIV infection: a meta-analysis. *BMC Med*. 2014;12: 142.
19. Berger S, Schad T, von Wyl V, Ehlert U, Zellweger C, Furrer H, et al. Effects of cognitive behavioral stress management on HIV-1 RNA, CD4 cell counts and psychosocial parameters of HIV-infected persons. *AIDS*. 2008;22: 767–775.
20. Brown JL, Venable PA, Carey MP, Elin L. Computerized stress management training for HIV+ women: a pilot intervention study. *AIDS Care*. 2011;23: 1525–1532.
21. Carrico AW, Antoni MH, Duran RE, Ironson G, Penedo F, Fletcher MA, et al. Reductions in depressed mood and denial coping during cognitive behavioral stress management with HIV-Positive gay men treated with HAART. *Ann Behav Med*. 2006;31: 155–164.
22. Duncan LG, Moskowitz JT, Neillands TB, Dilworth SE, Hecht FM, Johnson MO. Mindfulness-based stress reduction for HIV treatment side effects: a randomized, wait-list controlled trial. *J Pain Symptom Manage*. 2012;43: 161–171.
23. Gayner B, Esplen MJ, DeRoche P, Wong J, Bishop S, Kavanagh L, et al. A randomized controlled trial of mindfulness-based stress reduction to manage affective symptoms and improve quality of life in gay men living with HIV. *J Behav Med*. 2012;35: 272–285.
24. Berg RC, Page S, Øgård-Repål A. The effectiveness of peer-support for people living with HIV: A systematic review and meta-analysis. *PLoS One*. 2021;16: e0252623.
25. van Luenen S, Garnefski N, Spinhoven P, Spaan P, Dusseldorp E, Kraaij V. The Benefits of Psychosocial Interventions for Mental Health in People Living with HIV: A Systematic Review and Meta-analysis. *AIDS Behav*. 2018;22: 9–42.
26. Embuldeniya G, Veinot P, Bell E, Bell M, Nyhof-Young J, Sale JEM, et al. The experience and impact of chronic disease peer support interventions: a qualitative synthesis. *Patient Educ Couns*. 2013;92: 3–12.

27. Mead S, Hilton D, Curtis L. Peer support: a theoretical perspective. *Psychiatr Rehabil J*. 2001;25: 134–141.
28. Dennis C-L. Peer support within a health care context: a concept analysis. *Int J Nurs Stud*. 2003;40: 321–332.
29. Burke E, Pyle M, Machin K, Varese F, Morrison AP. The effects of peer support on empowerment, self-efficacy, and internalized stigma: A narrative synthesis and meta-analysis. *Stigma and Health*. 2019;4: 337–356.
30. Repper J, Carter T. A review of the literature on peer support in mental health services. *J Ment Health*. 2011;20: 392–411.
31. Johansson T, Keller S, Sönnichsen AC, Weitgasser R. Cost analysis of a peer support programme for patients with type 2 diabetes: a secondary analysis of a controlled trial. *Eur J Public Health*. 2017;27: 256–261.
32. Graffy J, Holman D, Simmons D, Others. Can peer support be cost saving? An economic evaluation of RAPSID: a randomized controlled trial of peer support in diabetes compared to usual care alone in East of England communities. *BMJ Open Diabetes Research and Care*. 2017;5: e000328.
33. Positively UK. National Standards of Peer Support in HIV. 2017.
34. Chime OH, Arinze-Onyia SU, Ossai EN. Examining the effect of peer-support on self-stigma among persons living with HIV/AIDS. *Pan Afr Med J*. 2019;34: 200.
35. Victoryna F, Yona S, Waluyo A. The relationship between stigma, family acceptance, peer support and stress level among HIV-positive men who have sex with men (MSM) in Medan, North Sumatera, Indonesia. *Enferm Clin*. 2019;29 Suppl 2: 219–222.
36. Denison JA, Burke VM, Miti S, Nonyane BAS, Frimpong C, Merrill KG, et al. Project YES! Youth Engaging for Success: A randomized controlled trial assessing the impact of a clinic-based peer mentoring program on viral suppression, adherence and internalized stigma among HIV-positive youth (15-24 years) in Ndola, Zambia. *PLoS One*. 2020;15: e0230703.
37. Mburu G, Ram M, Skovdal M, Bitira D, Hodgson I, Mwai GW, et al. Resisting and challenging stigma in Uganda: the role of support groups of people living with HIV. *J Int AIDS Soc*. 2013;16: 18636.
38. Van Tam V, Larsson M, Pharris A, Diedrichs B, Nguyen HP, Nguyen CTK, et al. Peer support and improved quality of life among persons living with HIV on antiretroviral treatment: a randomised controlled trial from north-eastern Vietnam. *Health Qual Life Outcomes*. 2012;10: 53.
39. Balfour L, Kowal J, Silverman A, Tasca GA, Angel JB, Macpherson PA, et al. A randomized controlled psycho-education intervention trial: Improving psychological readiness for successful HIV medication adherence and reducing depression before initiating HAART. *AIDS Care*. 2006;18: 830–838.
40. Murphy DA, Lu MC, Martin D, Hoffman D, Marelich WD. Results of a pilot

intervention trial to improve antiretroviral adherence among HIV-positive patients. *J Assoc Nurses AIDS Care*. 2002;13: 57–69.

41. Peltzer K, Ramlagan S, Jones D, Weiss SM, Fomundam H, Chanetsa L. Efficacy of a lay health worker led group antiretroviral medication adherence training among non-adherent HIV-positive patients in KwaZulu-Natal, South Africa: results from a randomized trial. *SAHARA-J: Journal of Social Aspects of HIV/AIDS*. 2012;9: 218–226.
42. Safren SA, O’Cleirigh C, Tan JY, Raminani SR, Reilly LC, Otto MW, et al. A randomized controlled trial of cognitive behavioral therapy for adherence and depression (CBT-AD) in HIV-infected individuals. *Health Psychol*. 2009;28: 1–10.
43. Safren SA, O’Cleirigh CM, Bullis JR, Otto MW, Stein MD, Pollack MH. Cognitive behavioral therapy for adherence and depression (CBT-AD) in HIV-infected injection drug users: a randomized controlled trial. *J Consult Clin Psychol*. 2012;80: 404–415.
44. Simoni JM, Wiebe JS, Saucedo JA, Huh D, Sanchez G, Longoria V, et al. A preliminary RCT of CBT-AD for adherence and depression among HIV-positive Latinos on the U.S.-Mexico border: The Nuevo día study. *AIDS Behav*. 2013;17: 2816–2829.
45. Hersch RK, Cook RF, Billings DW, Kaplan S, Murray D, Safren S, et al. Test of a web-based program to improve adherence to HIV medications. *AIDS Behav*. 2013;17: 2963–2976.
46. Division of HIV/AIDS Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Centers for Disease Control and Prevention. Peer Support in HIV. In: Center for Disease Control and Prevention [Internet]. 2 Aug 2021 [cited 13 Sep 2021]. Available: <https://www.cdc.gov/hiv/effective-interventions/treat/peer-support?Sort=Title%3A%3Aasc&Intervention%20Name=Peer%20Support>
47. British HIV Association. Standards of Care in HIV. Available: <https://www.bhiva.org/file/KrfaFqLZRIBhg/BHIVA-Standards-of-Care-2018.pdf>
48. Griffiths F, Lindenmeyer A, Powell J, Lowe P, Thorogood M. Why are health care interventions delivered over the internet? A systematic review of the published literature. *J Med Internet Res*. 2006;8: e10.
49. Patel V, Chowdhary N, Rahman A, Verdeli H. Improving access to psychological treatments: lessons from developing countries. *Behav Res Ther*. 2011;49: 523–528.
50. Bennett-Levy J. *Oxford Guide to Low Intensity CBT Interventions*. OUP Oxford; 2010.
51. Carroll KM, Rounsaville BJ. Computer-assisted therapy in psychiatry: be brave-it’s a new world. *Curr Psychiatry Rep*. 2010;12: 426–432.
52. Moock J. Support from the Internet for Individuals with Mental Disorders: Advantages and Disadvantages of e-Mental Health Service Delivery. *Front Public Health*. 2014;2: 65.
53. Andersson G, Titov N. Advantages and limitations of Internet-based interventions for common mental disorders. *World Psychiatry*. 2014;13: 4–11.

54. Muñoz RF, Bunge EL, Chen K, Schueller SM, Bravin JI, Shaughnessy EA, et al. Massive Open Online Interventions: A Novel Model for Delivering Behavioral-Health Services Worldwide. *Clin Psychol Sci*. 2016;4: 194–205.
55. Mohr DC, Schueller SM, Araya R, Gureje O, Montague E. Mental health technologies and the needs of cultural groups. *Lancet Psychiatry*. 2014;1: 326–327.
56. Cooper V, Clatworthy J, Whetham J, Consortium E. MHealth interventions to support self-management in HIV: A systematic review. *Open AIDS J*. 2017;11: 119–132.
57. Muessig KE, LeGrand S, Horvath KJ, Bauermeister JA, Hightow-Weidman LB. Recent mobile health interventions to support medication adherence among HIV-positive MSM. *Curr Opin HIV AIDS*. 2017;12: 432–441.
58. Tricco AC, Lillie E, Zarin W, O’Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med*. 2018;169: 467–473.
59. Munn Z, Peters MDJ, Stern C, Tufanaru C, McArthur A, Aromataris E. Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Med Res Methodol*. 2018;18: 1–7.
60. Arksey H, O’Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol*. 2005;8: 19–32.
61. Duthely LM, Sanchez-Covarrubias AP. Digitized HIV/AIDS Treatment Adherence Interventions: A Review of Recent SMS/Texting Mobile Health Applications and Implications for Theory and Practice. *Front Commun (Lausanne)*. 2020;5. doi:10.3389/fcomm.2020.530164
62. Maloney KM, Bratcher A, Wilkerson R, Sullivan PS. Electronic and other new media technology interventions for HIV care and prevention: a systematic review. *J Int AIDS Soc*. 2020;23: e25439.
63. The EndNote Team. EndNote. 2013.
64. Health Innovation V. Covidence systematic review software, Veritas Health Innovation. 2017.
65. Popay J, Roberts H, Sowden A, Petticrew M, Arai L, Rodgers M, et al. Guidance on the conduct of narrative synthesis in systematic reviews. A product from the ESRC methods programme Version. 2006;1: b92.
66. Kastner M, Tricco AC, Soobiah C, Lillie E, Perrier L, Horsley T, et al. What is the most appropriate knowledge synthesis method to conduct a review? Protocol for a scoping review. *BMC Med Res Methodol*. 2012;12: 1–10.
67. Page MJ, Moher D, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. PRISMA 2020 explanation and elaboration: updated guidance and exemplars for reporting systematic reviews. *BMJ*. 2021;372: n160.
68. Canan CE, Waselewski ME, Waldman ALD, Reynolds G, Flickinger TE, Cohn WF, et

- al. Long term impact of PositiveLinks: Clinic-deployed mobile technology to improve engagement with HIV care. *PLoS One*. 2020;15: e0226870.
69. Ivanova O, Wambua S, Mwaisaka J, Bossier T, Thiongo M, Michielsen K, et al. Evaluation of the ELIMIKA Pilot Project: Improving ART Adherence among HIV Positive Youth Using an eHealth Intervention in Mombasa, Kenya. *Afr J Reprod Health*. 2019;23: 100–110.
 70. Dulli L, Ridgeway K, Packer C, Murray KR, Mumuni T, Plourde KF, et al. A Social Media–Based Support Group for Youth Living With HIV in Nigeria (SMART Connections): Randomized Controlled Trial. *J Med Internet Res*. 2020;22: e18343.
 71. Hightow-Weidman LB, LeGrand S, Muessig KE, Simmons RA, Soni K, Choi SK, et al. A Randomized Trial of an Online Risk Reduction Intervention for Young Black MSM. *AIDS Behav*. 2019;23: 1166–1177.
 72. Ghabrial MA, Classen CC, Maggi JD. Professionally Moderated, Psychoeducational, Web-Based Support for Women Living with HIV: An Exploratory Study. *J HIV AIDS Soc Serv*. 2019;18: 1–25.
 73. Hightow-Weidman L, Muessig K, Knudtson K, Srivatsa M, Lawrence E, LeGrand S, et al. A gamified smartphone app to support engagement in care and medication adherence for HIV-positive young men who have sex with men (AllyQuest): development and pilot study. *JMIR public health and surveillance*. 2018;4: e8923.
 74. Senn TE, Braksmajer A, Coury-Doniger P, Urban MA, Rossi A, Carey MP. Development and Preliminary Pilot Testing of a Peer Support Text Messaging Intervention for HIV-Infected Black Men Who Have Sex With Men. *J Acquir Immune Defic Syndr*. 2017;74 Suppl 2: S121–S127.
 75. Hay K, Kwardem L, Welbourn A, Namiba A, Tariq S, Coventry L, et al. “Support for the supporters”: a qualitative study of the use of WhatsApp by and for mentor mothers with HIV in the UK. *AIDS Care*. 2020;32: 127–135.
 76. Henwood R, Patten G, Barnett W, Hwang B, Metcalf C, Hacking D, et al. Acceptability and use of a virtual support group for HIV-positive youth in Khayelitsha, Cape Town using the Mxit social networking platform. *AIDS Care*. 2016;28: 898–903.
 77. Coursaris CK, Liu M. An analysis of social support exchanges in online HIV/AIDS self-help groups. *Comput Human Behav*. 2009;25: 911–918.
 78. Rains SA. The implications of stigma and anonymity for self-disclosure in health blogs. *Health Commun*. 2014;29: 23–31.
 79. Beres LK, Narasimhan M, Robinson J, Welbourn A, Kennedy CE. Non-specialist psychosocial support interventions for women living with HIV: A systematic review. *AIDS Care*. 2017;29: 1079–1087.
 80. Chinoda S, Mutsinze A, Simms V, Beji-Chauke R, Verhey R, Robinson J, et al. Effectiveness of a peer-led adolescent mental health intervention on HIV virological suppression and mental health in Zimbabwe: protocol of a cluster-randomised trial. *Glob Ment Health (Camb)*. 2020;7: e23.

81. Lu Q, You J, Man J, Loh A, Young L. Evaluating a culturally tailored peer-mentoring and education pilot intervention among Chinese breast cancer survivors using a mixed-methods approach. *Oncol Nurs Forum*. 2014;41: 629–637.
82. Premji S. Mobile health in maternal and newborn care: fuzzy logic. *Int J Environ Res Public Health*. 2014;11: 6494–6503.
83. Uhrig JD, Lewis MA, Bann CM, Harris JL, Furberg RD, Coomes CM, et al. Addressing HIV knowledge, risk reduction, social support, and patient involvement using SMS: results of a proof-of-concept study. *J Health Commun*. 2012;17 Suppl 1: 128–145.
84. Muench F, Baumel A. More Than a Text Message: Dismantling Digital Triggers to Curate Behavior Change in Patient-Centered Health Interventions. *J Med Internet Res*. 2017;19: e147.
85. Donkin L, Christensen H, Naismith SL, Neal B, Hickie IB, Glozier N. A systematic review of the impact of adherence on the effectiveness of e-therapies. *J Med Internet Res*. 2011;13: e52.
86. Iribarren SJ, Brown W 3rd, Giguere R, Stone P, Schnall R, Staggers N, et al. Scoping review and evaluation of SMS/text messaging platforms for mHealth projects or clinical interventions. *Int J Med Inform*. 2017;101: 28–40.