Improving mental health and wellbeing among sexual and gender minorities using digital interventions: a systematic review

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Background:

High burden of mental disorders among sexual minorities including lesbian, gay, bisexual, and transgender population is well documented. Digital platforms are increasingly being used by sexual minorities to communicate with each other, but there is no systematic review of digital interventions that can improve mental health among sexual minorities. This systematic review identified and evaluated the digital interventions for mental health among different sexual minorities.

Methodology:

We searched literature from six major databases and included studies published in the English language, describing interventions that have a component to improve mental health among any of the sexual minorities delivered through any of the digital platforms, and reporting mental health outcomes.

Results:

Among 1936 citations, only 11 studies fulfilled our criteria. In those studies, most (n=9) interventions were implemented in the U.S. The interventions included varying components including on increasing acceptance and affirmation, increase social support and health education, cognitive behavioral therapy to manage stress, depression, anxiety and other mental health conditions. Only 6 studies had randomized control design. Most of the studies reported reduction in bi/homonegativity and increased affirmation, decreased smoking and substance abuse, improved coping skills, reduced level of depression, anxiety, and stress among participants in the intervention groups.

Conclusion:

To our knowledge, this is the first systematic review that evaluated digital intervention for mental health among sexual and gender minorities. Despite a low number of studies and heterogeneity across studies, the findings suggest potential improvements in mental health among sexual and gender minorities using digital interventions.

Introduction

Sexual and gender minorities including lesbian, gay, bisexual, and transgender individuals experience higher psychosocial stress, exclusion, marginalization, and prejudice compared to the heterosexual individuals. ¹Such psychosocial challenges predispose them to poor mental health and well-being.² Scientific evidence from empirical studies has been synthesized in several systematic reviews and meta-analyses, which highlighted a high burden of psychological and psychiatric conditions among sexual and gender minorities around the world^{1,3-5}. A meta-analysis found a significant correlation ($r=.25$, $p=.001$) between minority stress and adverse mental health among gay, lesbian, and bisexual youths⁶. Psychological conditions like self-devaluation, internalized homophobia or biphobia, suppression, and fear may affect the mental health and wellbeing among sexual and gender minorities^{1,2}. Another meta-analysis reported gender minorities are 1.5 times more likely to experience anxiety and substance use disorders compared to heterosexual individuals⁷. Several systematic reviews and meta-analyses reported high prevalence of depression and self-harm among sexual and gender minorities^{1,7}. The lifetime prevalence of suicide attempts was three to five times higher among minorities compared to heterosexuals⁸, which highlights the severity of the underlying psychological and psychiatric conditions continue to affect their lives and wellbeing. Furthermore, despite having a higher epidemiological burden of mental health conditions, sexual and gender minorities are also less likely to have access to mental health services due to a wide range of socioecological factors, which are also associated with the high vulnerability to impaired mental health^{1,2}. Therefore, a vicious cycle of poor mental health and wellbeing exists for the sexual and gender minorities, who live with varying states of mental health disparities, both from preventive and therapeutic perspectives^{1,2,6,7}.

In the 21st century, worldwide web has offered an avenue for enhanced communication and exchange of services across industries. The emergence of e-health is centered on the concept of using internet for diverse purposes in healthcare organizations⁹. Moreover, mobile devices like cellphones, tablet computers, and wearable devices have enriched the field of mHealth. Digital health technologies, which collectively encompasses both eHealth and mHealth, are being used in mental health research and practice¹⁰. Web-based or app-delivered therapies are being provided to people living with common mental disorders in diverse contexts. Moreover, digital tools are

designed and implemented to address substance abuse and promote psychosocial health among populations who are vulnerable to poor mental health conditions. Several meta-analyses have shown the effectiveness of such digital mental health interventions, which significantly improved access to the mental health services, reduced the burden of mental illness and promoted better mental health among the study participants^{11–13}. However, little is known about how digital technologies are being used to improve mental health and wellbeing among sexual and gender minorities. A substantial gap in the evidence base exists, which could promote future research and practice by informing how digital tools can be incorporated to increase access to mental health resources and services to alleviate the preexisting mental health disparities. Also, such evidence may help the mental healthcare providers to improve the psychological status and promote psychosocial wellbeing among vulnerable individuals using advanced technologies. This systematic review aims to contribute to this knowledge gap by synthesizing the current evidence on applications of digital interventions to improve mental health and wellbeing among sexual and gender minorities.

Materials and methods

Data sources

We used the PRISMA (preferred reporting items for systematic reviews and meta-analyses) guidelines¹⁴ and searched MEDLINE, PubMed, CINAHL, Health Source Nursing/Academic Edition, Health Policy Reference Center, PsycARTICLES, PsycINFO, and Gender Studies Database using specific keywords. These keywords were selected to specify the sexual and gender minorities (for example, lesbian, gay, or transgender) and interventions that used digital platforms (for example internet-based or mobile phone delivered). Moreover, the comparison group could be heterosexuals, another non-heterosexual group with control condition, or baseline; for this inclusive comparative perspective, no keyword for comparison group was applied. Lastly, we used keywords to specify outcomes related to mental health, which include search terms for mental disorders and psychological conditions which are associated with mental health and wellbeing. A full list of the keywords and the search strategy is provided in the Table 1. No time and language restrictions were applied during searching the databases. The search was first conducted in January 23, 2019 and repeated for the last time on October 15, 2019. In addition to database searching, we searched additional sources including the citing articles of selected studies and contacted with

several scholars working on mental health and minority health domains. All the collected citations were uploaded and reviewed using Rayyan software, which is a cloud-based platform for systematically screening the selected literature. Two authors independently reviewed the citations and a third author was involved at the end of the primary screening to review and resolve conflicts based on a consensus.

Study selection

We included an article if it: a) was an empirical study published as a peer-reviewed journal article, b) had the full-text available in English, c) reported an intervention aiming to improve any of the mental or psychological conditions, d) the intervention was delivered using any of the digital medium (internet or mobile devices), e) reported at least one group of sexual or gender minorities as the focus population of the intervention, and f) reported at least on mental or psychological health outcome following the intervention.

We excluded an article if it: a) was not an empirical research study published as a peer-reviewed article (for example, letters, opinions, commentaries, reviews, and dissertations were excluded), b) did not have the full-text available in English, c) did not focus on any of the mental health domains, d) used a medium of the intervention which was not digital (for example, face-to-face therapy or self-help printed booklets were excluded), e) did not have sexual or gender minority participants in the intervention group, and f) did not report any mental or psychological health outcome among the study participants who received the intervention.

Table 1: Search strategy of this systematic review

Search query	Keywords (searched as titles, abstracts, subject heading, and general keywords in each database)
1	"men who have sex with men" OR msm OR "lesbian" OR "gay" OR "bisexual" OR "transgender" OR "queer" OR "lgbt" OR "lgbtq" OR "lgbtq+" OR "sexual minorities" OR "sexual minority" OR "gender minorities" OR "gender minority"
2	"mental" OR "psychiatric" OR "mental health" OR "mental health services" OR "mental disorders" OR "mental illness" OR "common mental disorders" OR "psychological" OR "psychosocial" OR "psychosomatic" OR "emotional" OR "psychiatric disorders" OR "psychiatric illness" OR "behavioural" OR "behavioral" OR "Alzheimer's" OR "obsessive compulsive" OR "dementia" OR "depression" OR "depressive" OR "suicidal" OR "suicide" OR "self-harm" OR "schizophrenia" OR "bipolar disorder" OR "mood disorder" OR "alcohol" OR "anxiety" OR "substance abuse" OR "substance use" OR "panic" OR "addiction" OR "posttraumatic" OR "post-traumatic" OR "PTSD" OR "dissociative" OR "personality disorder"
3	"computerized" OR "digital" OR "mhealth" OR "ehealth" OR "m-health" OR "e-health" OR "mobile health" OR "electronic health" OR "telemedicine" OR "telemedicine" OR "tele-health" OR telehealth OR "mobile phone" OR "cell phone" OR "text message" OR "mobile telephone" OR "text messaging" OR "internet delivered" OR "technology delivered" OR "internet based" OR "technology based" OR "web-based" OR "web-delivered" OR "telephone"
4	"intervention" OR "treatment" OR "therapy" OR "program*" OR "strategy" OR "implementing" OR "implement" OR "implementation" OR "application"
Final search query	1 AND 2 AND 3 AND 4

Data extraction, synthesis, and quality evaluation

A codebook was designed to extract data from the finally recruited intervention studies. Two authors independently extracted the data on study characteristics, sample size and recruitment strategy, design and components of the intervention, and reported outcomes following the interventions. After extracting the data, a third author reviewed and resolved discrepancies in reporting the items following discussions and consensus. Further, the extracted data were narratively synthesized, and no meta-analysis was planned considering the broader scope of diverse mental health outcomes among different sexual and gender minority groups. The methodological quality of the included studies was evaluated using the Downs and Black checklist, which allowed to evaluate and compare both randomized and non-randomized intervention studies.

Figure 1: Flow Diagram of the Systematic Review Process

Results

We found 1668 citations from literature search and 268 citations from additional sources, totaling 1936 citations. After removing 672 duplicates, we evaluated the titles and abstracts of 1264 unique citations according to the inclusion and exclusion criteria of this review. Among those citations, 1222 did not meet the criteria and remaining 42 citations were considered for full-text evaluation. Finally, we excluded 31 articles which did not fulfill all the criteria and included 11 articles in this systematic review. The complete literature review process is depicted in Figure 1.

Characteristics of the included studies

Among the 11 studies included in the review, only eight¹⁵⁻²² mentioned the time in which it was conducted. The first study reporting digital intervention for sexual minorities, Lin and Israel et al, 2012 was conducted in 2011. Most of the studies were conducted around 2014 (n=4)¹⁷⁻²⁰. The most recent study by Vogel et al. 2019, was conducted in 2018.

Studies were conducted in different countries however most studies (n=9)^{15-18,20-24} were conducted in the United States and one each in New Zealand²⁵ and Romania¹⁹.

More than half of the studies (n=6)^{17,20-24} were randomized control trials and the remaining (n=5)^{15,16,18,19,25} were non-randomized trials with pre-post evaluation. Majority (n=4)^{5,19,21,22} of the studies conducted the follow up after 3 months) and only one²⁰ study followed up after 12 months.

Methodological quality of the studies

Methodological quality was assessed for all included studies. Score in 5 subscales were added to calculate the total score out of 32. The range of score was between 17 to 27 with the mean score being 23.36. Studies were divided into three subgroups, low (<18), moderate (19-22) and high (23>) quality. Among the included studies, majority (n=8)^{15,17,20-24} had high quality and the remaining (n=3)^{16,18,25} had moderate quality.

Sample characteristics and recruitment strategy

Among the included studies sample size ranged from 15 to 367. Most of the participants (n=9) were self-identified males who were attracted to the same sex. Two studies included bisexual youths and one included transgender women. The age range was between 16.6 - 42.7 years. A vast

majority of the studies (n= 8) recruited participants from various platforms such as Facebook, mTurk, online dating app, and others. Two studies recruited participants from multiple sources and one from nation-wide resources for the sexual minorities. In most of the studies (n=5), participants were suffering from smoking and substance abuse. Four studies recruited participants with internal heterosexism or internal homonegativity, two each with anxiety, depression and other depressive symptoms.

Summary of the interventions

Majority of the interventions (n=8)^{15,17,18,20–24} were delivered via internet among which Vogel et al., 2019 was exclusively delivered through Facebook, two^{16,19} interventions were delivered using mobile app and one⁵ using the computer.

A significant number of interventions (n=4)^{15,20,23,24} focused on increasing acceptance and affirmation by clearing the misconceptions and reducing negativity towards their sexuality. For example, Lin and Israel et al., 2012 provided web-based modules to de-mystify the stereotypes, remove the misconceptions about sexuality and increase affirmation to the sexual orientation of an individual.

Three interventions^{16–18} aimed to increase social support and health education. For example, Rebeck et al., 2012 provided mobile based text messages to participants with supportive and educational contents.

Additionally, three interventions^{5,19,24} utilized cognitive behavioral therapy to manage stress, depression, anxiety and other mental health conditions. For example, Lucassen et al. 2015 provided computerized cognitive behavioral therapy (CBT) called “Rainbow SPARX” which included seven modules with graphical contents and interactive exercises to manage depression.

Outcomes of the interventions

All the studies reported outcomes specific to the mental health domain they targeted. These outcomes include reduction in the bi/homonegativity and increased affirmation, decrease in smoking and substance abuse, improved coping skills, reduced level of depression, anxiety, and stress. Most of the studies (n=4)^{16,17,21,22} reported reduction in smoking and substance abuse. For example, Rebeck et al., 2012 reported decrease in frequency of methamphetamine use and increase

in self-reported abstinence, along with decrease in unprotected sexual behavior on methamphetamine. Vogel et al., 2019 reported increased abstinence from smoking among the participants in the intervention group. Only Heffner et al., did not observe any significant difference in smoking cessation among the intervention and control group.

Reduction in depression, anxiety and stress was also reported by three studies^{17–19} For example, Hightow-Weidman et al. 2015 reported reduced depressive symptomology and social isolation among the participants in the intervention group.

Moreover, Few studies (n=2)^{15,23} also reported, reduction in bi/homonegativity and increased affirmation. For example, Lin and Israel et al., 2012 reported significantly decreased level of homonegativity and increased affirmation according to the Revised Internalized Homonegativity Inventory (IHNI-R) global score, Personal Bi/Homonegativity subscale, and Affirmation subscale. But Fleming et al., 2016 reported no significant changes in the internalized homonegativity after the intervention.

Furthermore, Schwinn et al., 2015 reported higher coping skill and problem-solving skill in the participants in intervention group.

Table 2: Overview of digital interventions for improving mental health among sexual and gender minorities

Source	Study location and period (if reported)	Sample size	Sample characteristics and recruitment strategy	Mental health domain	Study design and follow-up
Lin and Israel (2012)	United States, 2011	367	Self-identified same-sex attracted adult males; mean age 34.9 (SD 14.4) years; recruited from nationwide LGB-related sources	Internalized heterosexism	Non-randomized study; pre-post evaluation between two groups
Rebeck et al. (2012)	United States, 2008-09	52	Gay and bisexual men; mean age 36.5 (SD 8.9) years; recruited from multiple community, institutional, and online sources	Substance abuse	Non-randomized study; pre-post evaluation after 2 months
Lucassen et al. (2015)	New Zealand	21	52.4% self-identified as men; mean age was 16.5 (SD 1.6) years; recruited through multiple sources including schools, organizations, and advertisement	Depression	Non-randomized single group study; pre-post evaluation with follow-up at 3 months
Schwinn et al. (2015)	United States, 2014	236	Sexual minority youth; 32.1% men, 49.6% women, 18.3% queer/other; mean age 16.08 (SD 0.58) years; recruited through Facebook and other online platforms	Substance abuse	Randomized controlled trial; follow up after 3 months
Hightow-Weidman et al. (2015)	United States, 2013	15	Transgender women; black, mean age 26.1 (SD 3.3) years, 60% HIV-infected; recruited from healthcare, community, Facebook and online sources	Internalized homophobia, social isolation, depressive symptoms	Non-randomized single group study; pre-post evaluation at 4 weeks

Fleming et al. (2016)	United States	184	Men who have sex with man; mean age 37.9 (SD 16.78) years; recruited online	Internalized homonegativity	Randomized controlled trial; pre-post evaluation
Iu-Weinberger et al. (2018)	Romania, 2015-16	43	Gay and bisexual men; mean age 23.2 (SD 3.6) years; recruited from Facebook, social networking sites, and other online/offline sources	Anxiety, depression	Non-randomized single group study; follow-up at 3-month post- baseline
Heffner et al. (2019)	United States; 2014- 2015	2637	Lesbian or gay (n=122, bisexual (n=131), non-sexual minority (n=2384); mean age 46.2 (SD 13.4) years; recruited from Facebook, online and offline sources	Nicotine use disorder or smoking	Randomized controlled trial; follow up at 3, 6, 12 months
Israel et al. (2019)	United States	641	Bisexual; mean age 33.28 (SD 10.27) years; recruited from Amazon mTurk online platform	Internalized bi-negativity	Randomized controlled trial; with post-test evaluation
Vogel et al. (2019)	United States, 2018	165	Sexual and gender minority with varying rates; age ranged between 18-25 years; recruited from Facebook	Nicotine use disorder or smoking	Randomized controlled trial; follow up at 3 and 6 months
Wray et al. (2019)	United States, 2017	40	Men who have sex with men; mean age 27.7 (control) and 28.8 (intervention) years; recruited from dating apps	High-risk alcohol consumption	Randomized controlled trial; follow up till 3 months

Table 3: Medium and content of the interventions and their outcomes

Sources	Medium and content of the intervention	Outcomes
Lin and Israel (2012)	Internet-delivered; intervention group received three web-based modules on de-mystifying stereotypes, sources of misconceptions about sexuality, and increasing affirmation to the sexual orientation of the participants; control group received regular stress management care	Significant standardized between-condition mean difference was observed in Revised Internalized Homonegativity Inventory (IHNI-R) global score ($d=0.17$), Personal Bi/Homonegativity subscale ($d=0.19$), and Affirmation subscale ($d=0.17$); difference for morality of Bi/Homosexuality subscale was not significant.
Rebeck et al. (2012)	Mobile device-based text messages; social support and health education messages were provided to the participants for two weeks	Significant reduction in the length of last use in methamphetamine, use in two months, unprotected sex on methamphetamine and overall use of methamphetamine.
Lucassen et al. (2015)	Computerized; cognitive behavioural therapy (CBT) named Rainbow SPARX comprising seven modules with graphical contents and interactive exercises	Significant reduction in depression was observed ($d=1.01$, $p<0.0001$) after the intervention, which was maintained at 3-month follow-up
Schwinn et al. (2015)	Internet-delivered; three-session social competency skill-building strategy focusing on stress management, five-steps guide for decision-making, and drug use refusal skills	Intervention group less stress ($d=.34$), reduced peer drug use ($d=.31$), lower rates of past 30-day other drug use ($d=.34$), and higher coping ($d=.32$), problem solving ($d=.32$), and drug-use refusal skills ($d=.32$)
Hightow-Weidman et al. (2015)	Internet-delivered; HealthMpowerment.org (HMP) is an online intervention for addressing risky sexual behaviors,	Participants had reduced depressive symptomology, significant difference in social isolation, and non-significant changes in internalized homophobia

	promoting health, wellness, positive norms, reflective appraisals, and supportive relationships	
Fleming et al. (2016)	Internet-delivered; evaluative conditioning (EC) for modifying self-esteem and internal homonegativity with either control or experimental activities among two groups	No significant between-group differences on self-esteem ($ps > .49$) or internalized homonegativity ($ps > .28$) were observed following the intervention
Iu-Weinberger et al. (2018)	Mobile device-based text messages; counselling sessions grounded in motivational interviewing and cognitive behavioural skills training	Participants had significant reductions in anxiety (mean 1.4 vs mean 1.0; $P=.02$) and depression (mean 1.5 vs mean 1.0; $P=.003$) following the intervention
Heffner et al. (2019)	Internet-delivered; two web-based cessation interventions grounded in acceptance and commitment therapy and standard care treatment model, with four intervention text messages per day for 28 days	No significant difference in smoking cessation outcomes among SM versus non-SM smokers (24% vs. 25%, adjusted OR = 0.91, 95% CI = 0.65 to 1.28) were observed, which was consistent across SM subgroups (24% for bisexual vs. 23% for lesbian or gay, adjusted OR = 1.01, 95% CI = 0.51 to 2.00); despite differences at demographics and smoking exposure
Israel et al. (2019)	Internet-delivered; intervention adopting the Releasing Internalized Stigma for Empowerment (RISE) model comprising quiz that challenged negative bisexual stereotypes, an activity where participants identified external sources of their binegative beliefs, biaffirming digital contents	Participants in the intervention group had significant reduction in internal binegativity ($d=.24$), anticipated binegativity ($d=.25$), and identity affirmation ($d=.32$)
Vogel et al. (2019)	Facebook-based; tailored or non-tailored groups received counselling and Facebook posts in the respective group	Participants in the tailored intervention group were more likely to report smoking abstinence at 3 (23.8% vs. 12.3%; OR=2.50; $p=.03$) and 6 months (34.5% vs. 12.3%;

		OR=4.06; $p<.001$) and reduction in smoking at 3 months (52.4% vs. 39.5%; OR=2.11; $p=.03$) compared to the non-tailored group; however, smoking abstinence did not differ in biochemical verification
Wray et al. (2019)	Internet-delivered; intervention group received usual care plus Game Plan (GP), a tablet-based BMI for alcohol use and HIV risk; control group received usual care counselling	Participants in the intervention group reported 24% fewer heavy drinking days and 17% fewer alcohol problems compared to the control group

Discussion

To our knowledge, this is the first systematic review of digital interventions for improving mental health and well-being of sexual and gender minorities. In this review, we found empirical studies using digital interventions to improve mental health domains such as smoking and substance abuse, bi/homonegativity, depression, anxiety, stress, etc. More than half of the studies (n=6) were randomized control trials, and the remaining were non-randomized trials with pre and post evaluations. As the study design, content of the intervention, targeted mental health domain, and the outcomes were diverse, drawing inference on comparative findings of the studies was not possible. All of the included studies aimed to improve the mental health of the sexual minorities by increasing acceptance and affirmation by reducing the misconceptions negativity towards their sexuality, increase social support and health education, and cognitive behavioral therapy. Digital platforms such as different websites, social media, online forums, mobile apps, and others played a key role in all the interventions. Majority of the studies reported positive outcomes such as a reduction in smoking and substance abuse, reduced bi/homonegativity, increased coping skills and decrease in depression, anxiety, and other mental health conditions. Only two studies did not report any significant changes. But none of the studies have reported any adverse outcomes. Despite the low number of primary studies, the current evidence suggests that digital interventions are beneficial for the wellbeing of this population with various mental health disorders. At the same time, it also highlights the existing gaps in current research and provides future directions not only for research but also for policy implementations and practices regarding this issue.

Firstly, most of the studies had small sample sizes. Randomized control trials with a large sample size and rigorous design should be implemented to increase generalizability and establish the efficacy of these interventions.

Secondly, the majority of the studies were of short duration with follow up after three months. Only one study conducted the follow up after 12months. In the past, many studies have shown promising results immediately after the interventions but failed to sustain the changes in the long run²⁶. Moreover, it is very common for mental illness to relapse after the initial treatment²⁷. This necessitates the provision of the long term follows up for this population.

Thirdly, although majority of the research has targeted one or two mental health domains, a substantial amount of research shows that multiple public health problems such as poor mental health, substance abuse, victimization, discrimination are highly prevalent among this group of people^{4,6,7}. Considering the complex nature of this problem it can be easily concluded pharmacotherapy or counselling will not be sufficient to respond to this complex problem²⁸. Multicomponent intervention including policy level changes should be implemented.

Fourth, although studying the online behavior of different population is gaining momentum, it is still in its infancy. More efforts should be given to study the online behavior of the sexual minorities to draw insights and identify their health needs and develop interventions addressing them.

Fifth, all the studies were conducted in developed countries. There was no study from Low- and middle-income countries (LMICs), although the prevalence of mental health illness among sexual minorities is also alarmingly high due to the cultural and social stigma. Researchers and practioners should adopt evidence-based programs and culturally tailor them according the need

of these communities in countries where incorporation of digital intervention for such problems is still in its early stage.

Sixth, after conducting psycho-analysis of the individuals and the community, current evidence-based programs should be tailored and incorporated in the treatment guideline for mental illness for these population.

Seventh, collaboration with the LGBT community, their online forums and social media-based groups is necessary to culturally tailor these intervention and provision of in-person and digital mental health care services.

Lastly, Mental health and digital health policies should be implemented for the sexual minorities in order to address the current disparities, provide affordable and accessible care to this vulnerable population and to protect their confidentiality by ensure data security.

Limitations of this review

There are several limitations of this review. One such limitation is a potential publication bias as studies with little or low effects may not have been published. We did not include dissertations or research reports, which may be another reason of excluding such studies, if there are any.

Moreover, we included studies particularly focusing on sexual and gender minorities. Therefore, studies that had participants with mixed genders and sexual identities were excluded from our review. These limitations may have contributed to a low number of recruited studies.

Furthermore, our selection of search terms and databases attempted to include major sources of scientific literature; however, additional databases may have indexed studies which were beyond the scope of our review. Last but not least, we did not include digital apps available in the online stores, rather, our review is limited within published scientific literature. This increases the

scientific credibility of our review but may have excluded digital interventions which are not reported in peer-reviewed publications. These limitations should be considered to comprehend our findings and conduct future research in this domain.

Conclusion

This systematic review identified evidence-based interventions improving different aspects of mental health and wellbeing among sexual and gender minorities. Most of the interventions have shown varying levels of effectiveness in addressing a wide range of mental health problems whereas none of studies reported any negative outcomes following the interventions. A low number of total studies highlight a critical gap in developing and implementing digital interventions for mental health of sexual and gender minorities, which is more prominent in the LMICs necessitating extensive research addressing such gaps. Moreover, studies with low sample and a lack of randomized studies many not allow to generalize the findings of the existing studies. More research and evidence synthesis are required to understand the utility and effectiveness of such digital interventions. Nonetheless, the existing interventions provide valuable insights for adopting evidence-based digital tools in clinical and community-based care so that the benefits of digital revolution can address mental health needs of the sexual and gender minorities living in psychosocial marginalization around the world.

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