

**E-health Interventions on the Support Network of Transgender Individuals: A Scoping
Review**

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Abstract

Background: The support network of transgender individuals, such as mental health providers or caregivers, plays a key role in their mental health. E-health has been found to have multiple benefits over traditional treatment methods such as increased accessibility and patient involvement. However, no existing scoping reviews could be sourced that specifically focus on e-health interventions conducted on the support network of transgender individuals.

Objectives: This scoping review aims to identify the key characteristics of e-health interventions targeting the support network of transgender individuals, showcase the target groups of focus, and present potential gaps within the literature.

Design: Online databases were sourced for interventional studies published between 2015 and 2024. Studies had to be conducted as a randomized controlled trial, including an e-health component and written in English.

Results: The search resulted in 11 eligible studies conducted between 2019 and 2024, mostly from the USA ($n = 6$). Most interventions included a video-based ($n = 6$) or online-synchronous ($n = 5$) component. Studies mostly focused on (1) increasing transgender knowledge and competence ($n = 7$), (2) reducing transgender bias ($n = 5$) or (3) increasing supportive behaviors ($n = 6$). The methodological quality of the study and the risk of bias were assessed according to the Joanna Briggs Institute tool. The scores were categorized as either low ($n = 10$) or moderate ($n = 1$). The majority of interventions target healthcare staff ($n = 6$) and students ($n = 3$).

Conclusion: E-health interventions have shown significant results when targeting the support network of transgender people. However, due to limited transparency and the high risk of bias, better reporting of the study details is needed. Additionally, future studies should also target other members of the support groups such as siblings, friends, and partners to address the full support group. Furthermore, this scoping review has helped to establish a review of e-health interventions targeting specifically the support network of transgender people, thereby closing this literature gap.

E-health Interventions on the Support Network of Transgender Individuals: A Scoping Review

Gender dysphoria can be defined as the felt dissatisfaction when one's recognized gender at birth (natal gender) and the experienced or expressed gender differs (American Psychiatric Association, 2013). One of the requirements for the categorization of gender dysphoria according to the DSM-V is experiencing said discomfort for at least 6 months (American Psychiatric Association, 2013). *Transgender* refers to people who occasionally or permanently identify with a gender different from their natal gender (American Psychiatric Association, 2013). *Transsexual* on the other hand refers to an individual who seeks or has already transitioned either socially or biologically (American Psychiatric Association, 2013). Biological transitions can include cross-sex hormonal treatments or direct genital surgery (American Psychiatric Association, 2013). It is also relevant to note that not all transgender people experience gender dysphoria for reasons such as available medical means to undergo a transition, which in turn can alleviate dissatisfaction (American Psychiatric Association, 2013). Thus, transgender people can be transsexual without experiencing gender dysphoria.

According to Landen (2019), the diagnosis of gender dysphoria has increased more than 20 times in a period of 10 years in Sweden. In the U.S., the number of young patients diagnosed with gender dysphoria has almost tripled between 2017 and 2021 (Reuters, 2022). In 2021, according to Reuters (2022), roughly 0.3 % of the population in the U.S. aged 6-17 received a new diagnosis of gender dysphoria. That's about 42,000 individuals for that year, not counting the people in that age range who are already diagnosed with gender dysphoria. A survey in 2022 found that about 5% of young adults in the U.S. are reporting their recognized gender at birth to be different from their experienced gender (Pew Research Center, 2022). The same article highlights that this percentage is higher compared to older age groups, showing the growth of transgenderism among young people.

Transgender people can suffer from a variety of issues that range from personal, psychological, and social problems to experiencing direct violence (Catelan et al., 2017; Pinna et al., 2022). Pinna et al. (2022) found that transgender individuals have a higher prevalence of mental health issues compared to the general population. Comparing these two groups, they have a 1.5 times rate of being diagnosed with a mood disorder, a 3.9 times rate of being diagnosed with anxiety, and a 3.8 times rate of being diagnosed with a psychotic disorder (Hanna et al., 2019). Additionally, it was found that transgender people have a 13 times higher rate of self-injurious behaviors and suicide. These individuals also experience higher difficulties in financial matters such as accessing jobs and are often unemployed (Grant et al.,

2011). Transgender people also have a higher likelihood of substance use and are consequently more frequently diagnosed with substance use disorders (Frost et al., 2020; Gonzalez et al., 2017). The study of Nuttbrock et al. (2014) found that enacted stigma towards transgender people, with the presence of depressive symptoms, was a strong risk factor for substance use such as alcohol, cannabis, or cocaine. They concluded that improved substance abuse treatment is needed for this population. This highlights the vulnerability of transgender individuals to substance abuse, which can in turn increase the risk for mood disorders (Feingold et al., 2015; Nunes, 2023).

Apart from having a higher chance of being diagnosed with mental health disorders, these individuals are also often experiencing interpersonal violence, expressed in microaggressions (Nadal et al., 2014). The study by Casey et al. (2019) found that 28% of transgender people self-reported experiencing microaggressions related to their gender identity such as negative assumptions or offensive comments. Additionally, these individuals are also more likely to experience violence from their intimate partner or family member (Damanpak-Rizi et al., 2021; Peitzmeier et al., 2020; Stotzer, 2009). Transgender youth often spend a lot of time at home and extended periods in contact with their family members (Matsuno & Israel, 2021). Parental acceptance or rejection can have a high impact on the mental health of transgender youth (Olson et al., 2016; Ryan et al., 2010). Such acceptance can consist of affirming behaviors that confirm the transgender individual's identity (Matsuno & Israel, 2021). A report from 2012 has shown that parentally rejected transgender individuals had a 13 times higher chance of being suicidal than individuals accepted (Travers et al., 2012). Thus, educating parents on transgender topics can help improve the mental health of transgender people (Damanpak-Rizi et al., 2021; Matsuno & Israel, 2021).

Although educating parents on transgender-related topics can help improve the mental health of transgender people, further issues can be found within the healthcare system. There is growing evidence for institutionalized cissexism, which can increase discrimination, stigmatization, and violence against transgender people (Puckett et al., 2021; Zwickl et al., 2021). Cissexism refers to oppressive frameworks that enforce gender binarism and do not affirm transgender identities (Zwickl et al., 2021). Mental health providers often do not have the necessary knowledge, competence, or skills to treat transgender people accordingly (Martin et al., 2022). Training these healthcare providers to provide appropriate help is important and has been shown to improve the self-efficacy of healthcare staff (Hughto et al., 2017; Martin et al., 2022). Interventions training the support network of transgender individuals can focus on (1) increasing transgender knowledge and competence, (2) reducing transgender bias and

stigma or (3) increasing supportive and affirmative behaviors (Table 3). In this context, Lesbian, Gay, Bisexual, Transgender, and Queer (LGBTQ or LGBT) competence is used as an umbrella term for subcategories such as self-efficacy and skills (Boekeloo et al., 2023). Stigma, bias, or phobia, are related terms and can be defined as harassment, violence, or emotional disgust against transgender individuals (Boccanfuso et al., 2020; Hill & Willoughby, 2005). Lastly, LGBT support or affirmation refers to behaviors confirming one's identity or protecting transgender individuals from harassment (Boekeloo et al., 2023; Bradley et al., 2019; Lelutiu-Weinberger et al., 2023).

As mentioned above, training staff within the healthcare system can help to increase their overall transgender competencies and skills, but it is also important to look at other institutional settings such as schools and universities. Transgender individuals can often be exposed to verbal harassment within educational settings, however, teachers are often not prepared to react correctly in these situations (Bradley et al., 2019). Teachers often lack an understanding of transgender-related issues, which makes them ineffective at assisting transgender students (Milburn & Palladino, 2012). Educating teachers or peers on transgender-related issues could increase LGBT teacher support. Teachers could then act as a mediator between the harasser and the transgender person (Bradley et al., 2019). In conclusion, transgender people are often confronted with social discrimination and violence. This can happen both outside and within institutional settings. Educating and training the support networks of transgender people could indirectly improve the mental health of transgender people by creating a more supportive environment. Multiple subgroups can be considered to be a part of the support group such as family members, intimate partners, education facilities, friends, and staff within the healthcare system (Appendix 1; Table 1). Thus, interventions targeting the support network of transgender people can be crucial to improving their mental well-being.

Considering the importance of the support network of these individuals, intervention training and educating these support networks should be a high priority. Many studies targeting the support network of transgender individuals have been conducted in person (Hughto et al., 2017; Malpas et al., 2022). E-health is an umbrella term for digitally assisted healthcare (Aida et al., 2020; Renner et al., 2022). Renner et al. (2022) have divided e-health into 7 subcategories: (1) programs, such as modules, videos, or games; (2) telehealth, meaning video consultations delivered through both clinical and non-clinical services; (3) telemedicine, which refers to video consultations delivered through medical specialists; (4) mHealth, which refers to the use of mobile apps in medical care; (5) blended care, which refers to the combination of

in-person and video consultations; (6) social media health, referring to the use of social media to deliver health-promoting behaviors; and (7) further approaches, such as chats, forums or appointment reminders. To simplify the categorization of e-health interventions, this scoping review will divide e-health into four sub-categories: (1) live online interventions; (2) movie or video-based interventions; (3) online simulations; (4) and other (Aida et al., 2020; Renner et al., 2022). Although e-health is important in healthcare, it is not mentioned in a recent systematic review of family-based interventions for transgender people (Malpas et al., 2022; Renner et al., 2022). E-health can help to bridge physical distances and enable healthcare providers to deliver online care (Renner et al., 2022). Research has shown many additional benefits, such as increased accessibility, increased information sharing, increased patient involvement, and cost-effectiveness for patients (Calegari & Fettermann, 2022; Kolovos et al., 2018). Thus, e-health interventions targeting the support network of transgender people could increase the accessibility and effectiveness of much-needed support for transgender people.

Objectives

There was no existing literature review focusing on e-health interventions targeting the support network of transgender people. This created a significant research gap. Thus, this study aimed to conduct a scoping review of available interventions focusing on the support network of transgender people through incorporating e-health, specifically randomized controlled trials (RCTs). Randomized controlled trials are considered the gold standard in research and try to control for bias (Jadad & Enkin, 2007). This scoping review tried to map out the existing literature to identify the characteristics of these e-health interventions, showcase the target groups, and present the potential need for further research within this area. The area of transgenderism and gender dysphoria is consistently evolving, but no existing scoping review was found on the topic of this scoping review. Further objectives include assessing the quality of eligible studies according to the Joanna Briggs Institute (JBI, 2020).

Research Questions

1. What are the characteristics of e-health interventions on the support network of transgender people?
2. What were the target groups of these e-health interventions?
3. What are the existing gaps within these literatures?

Methods

The study was conducted as a scoping review because scoping reviews provide an overview of the relevant literature, showcase the gaps, highlight the key aspects, and provide the depth of the field (Levac et al., 2010). The PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews) checklist served as a guideline to ensure a coherent structure and transparency (Tricco et al., 2018).

Eligibility Criteria

The eligibility criteria were based on previous research. Randomized controlled trials are often used to control for bias and establish causality (Jadad & Enkin, 2007). Thus, for this scoping review, only RCTs have been selected to be part of the scope. Additionally, only studies from 2015 and onward were included because a previous review about e-health interventions for transgender people has not found relevant studies that are older (Renner et al., 2022). According to Renner et al., (2022), e-health in transgender care is fairly new, limiting the results. The review by Anastasaki et al. (2024) about healthcare barriers for transgender people has excluded studies older than 2015. They argued that only the most recent studies from the last 10 years should be included. Additionally, only peer-reviewed articles from indexed journals were included (Catelan et al., 2017). Thus, the inclusion criteria were as follows: (a) the study was conducted between 2015 and 2024; (b) it was written in English; (c) it includes e-health; (d) it is administered to the support network of transgender individuals such as caregivers or healthcare providers; (e) it has a randomized controlled trial as the study design; (f) it is a scientific paper that has been published in an indexed journal and is peer-reviewed; (g) it involves an intervention, such as cognitive-behavioral therapy or a training; (h) it aims to improve transgender-related care. The exclusion criteria are: (a) articles not accessible in full text; and (b) purely theoretical articles, reviews, protocols, or surveys.

Information Sources

The search was conducted on August 29, 2024, and included articles in English published between 2015 to 2024. The scanned databases include PubMed, Scopus, Web of Science, and PsycINFO because it was decided that they were relevant and because they were accessible through the university database (Catelan et al., 2017; University of Twente, n.d.). Additional databases that were relevant but excluded due to restricted access were CINAHL and LGBTQ+ Source (Catelan et al., 2017; *LGBTQ+ Source* | EBSCO, n.d.).

Search

The search string was constructed with the help of the PICO approach (Schardt et al., 2007). The main keywords were derived from the research questions and consist of five main terms, namely: (1) Transgender, (2) support network, (3) e-health, (4) intervention, and (5) randomized controlled trials. The search string consists of the main keywords and their related terms to ensure all relevant articles are found. The related terms for each keyword were retrieved from reviews focusing on related topics. Table 1 provides an overview of the keywords and their related terms. On the other hand, Appendix 1 provides the references of the reviews that were used to retrieve all related keywords. For the support network of transgender individuals, only the following groups and related keywords were selected: family, friend, partner, healthcare provider, teacher, and student. Boolean operators were used to combine the keywords into a search string (AND, OR, NOT). Additionally, because e-health is new to transgender healthcare, the selected keywords were broadly related, resulting in false positives, which was deemed acceptable to ensure all relevant articles were captured (Renner et al., 2022). The search was conducted on four databases. To ensure replicability and transparency of the results, the search strategy for Scopus is mentioned in detail: The search on Scopus was conducted through the advanced search option and included a combination of the keywords and boolean operators provided in Table 1. Initially, 338 documents were found on Scopus. After applying the language, articles, and date filters, 252 studies remained.

Table 1

Keywords and their Relevant Search Strings Following the PICO Approach

Keywords	Search string
Transgender individuals	Transgender* OR trans OR TGNB OR transsex* OR “Female To Male*” OR “Male To Female*” OR FTM OR MTF OR “trans man” OR “trans woman” OR “Gender Non-conforming” OR “Gender Non-Conforming” OR “gender nonconforming” OR GNC OR TGNC OR Non-binary OR “Non Binary” OR “Demi Gender” OR “Demi Girl” OR “Demi Boy” OR Demi-Gender OR Demi-boy OR Demi-girl OR BiGender OR “Bi Gender” OR Genderless OR “Non Gender*” OR Non-gender* OR Genderqueer OR “Gender Queer” OR “Gender Fluid” OR Genderfluid OR “Multi Gender” OR

	Multigender OR Multi-gender OR Intersex OR Neutrois OR “Gender Variant” OR “Third Gender” OR “Two Spirit*” OR “2 Spirit*” OR LGBT* OR Transsexual* OR agender OR gender identit* OR “Sexual and Gender minorit*” OR “Gender divers*” OR transman OR transmen OR transwom* OR Transmasculine OR Transfeminine OR "Cross sexual" OR “Gender creative” OR “gender incongruence” OR “gender identity*” OR GID OR “gender misalignment” OR “sex dysphoria” OR “body dysphoria” OR “gender dysphor*” OR “gender affirm*” OR “assigned male*” OR “male assigned” OR “assigned female*” OR “female assigned” OR “confirmation surgery” OR “female born” OR “male born” OR “male-born” OR “female-born”
Support network	caregiver* OR sibling* OR famil* OR guardian* OR “support network” OR parent* OR relative* OR brother* OR sister* OR father* OR mother* OR paternal OR dad* OR mom* OR home* OR friend* OR social* OR acquaintanc* OR peer* OR colleague* OR partner* OR companion* OR spouse* OR wife* OR husband* OR couple* OR “loved one” OR cohabit* OR provider* OR practitioner* OR counsel* OR therapist* OR pediatric* OR paediatric* OR administ* OR clinic* OR supporter* OR worker* OR professional* OR physician* OR doctor* OR nurse* OR specialist* OR assistant* OR staff OR surgeon* OR psychiat* OR specialist* OR “medical graduates” OR “healthcare personnel” OR hospital* OR GP OR GPs OR practice* OR “health care” OR psychologist* OR pathologist* OR oncologist* OR allergist* OR cardiologist* OR dermatologist* OR endocrinologist* OR Gastroenterologists OR geriatrician* OR hospitalist* OR Ophthalmologist* OR Otolaryngologist* OR Neonatologist* OR Physiatri* OR Pulmonologist* OR Radiologist* OR personnel OR Rheumatologists OR Neurosurgeon* OR urologist* OR gynecologist* OR mentor* OR neurologist* OR Ally OR allies OR “inner circle” OR house* OR mate* OR classmate* OR roommate* OR schoolmate* OR “aid network” OR “support group*” OR organization* OR communit* OR center* OR coworker* OR associate* OR teacher* OR educator* OR student*
E-Health	ehealth OR “e-health” OR "electronic health" OR "digital health" OR "digital technolog*" OR "digital intervention*" OR "electronic care" OR telemedicine OR "tele medicine" OR telehealth OR “tele health” OR telecare OR “tele care” OR “tele-care” OR telemonitoring OR “tele monitoring” OR teleconsultation OR “tele-consultation” OR videoconsult* OR "video consult" OR “e-consult*” OR "text messag*" OR texting OR "mobile health" OR "mobile care" OR mhealth OR "m health" OR “m-health” OR

	android OR app OR apps OR audio* OR “cell phone” OR cellphone OR computer* OR mobile OR “multi-media” OR multimedia OR “personal digital assistant” OR PDA OR SMS OR "social medi*" OR software OR telecomm* OR “e-Portal” OR “ePortal” OR “eTherap*” OR e-therap* OR forum* OR “information technolog*” OR "instant messag*" OR internet* OR ipad OR i-pad or iphone OR i-phone OR ipod OR i-pod OR android OR web* OR "smart phone" OR smartphone OR “mobile phone” OR e-mail* OR email* OR online OR virtual OR remote
Intervention	Intervention OR therap* OR training OR enhance* OR learn* OR improv* OR program OR educat* OR counselling OR reduc* OR treat* OR teaching OR care OR support OR psychoeduc*
RCTs	Rct* OR trial OR randomized OR randomly OR randomised OR “double blind” OR “single blind” OR “double-blind” OR “single-blind” OR “within-subject” OR “between subject” OR “control group”
Excluded terms	“Social media use” OR “social media experience*” OR HIV OR “scoping review” OR “systematic review” OR vaccinat* OR “human papillomavirus” OR “observational study” OR “men who have sex with men” OR “case report” OR “case study”

Selection of Sources of Evidence

First, the mentioned databases were scanned independently. Afterward, a manual search was conducted through Google and the references of the eligible articles, which resulted in no further relevant literature. Later, the combined results of all databases were screened using Covidence (Version 2024). Initially, titles were screened independently. When there was ambiguity in deciding the eligibility, the abstract was analyzed. If articles were deemed eligible, after reading the abstract, they underwent full-text review. The review was conducted by a single reviewer and was assisted by the supervisor when there was uncertainty. The screening process can be seen in the PRISMA flow diagram in Figure 1, with the details reported in the results section.

Data Charting Process

The data extraction process was conducted solely by the primary reviewer, who read the full text of each article. For the data extraction, no software tools were used. The relevant

data was manually inserted into a spreadsheet, ensuring a structured and consistent approach. Based on the research questions, the relevant data was extracted according to the data items (Table 3). Because there was only one reviewer, no pilot testing or inter-reviewer validations could be conducted.

Data Items

The data items were selected to provide a rigorous overview of the key characteristics of e-health interventions targeting the support network of transgender people (RQs 1 and 2). Additionally, these items help to identify the involved target groups and uncover the existing gaps within the literature, by highlighting the missing target groups or other relevant characteristics (RQs 2 and 3). The supervisor assessed the individual data items to further secure their completeness and relevance. The data items were defined as follows to ensure transparency: (1) the first name of the author, followed by “et. al” if other authors were present; (2) the year of publication or the recommended year for citation by the publisher; (3) the country of origin or the categorization as “international” when the sample was retrieved from multiple countries; (4) a detailed description of the e-health component; (5) the aim of the study, such as “reducing bias against LGBT people”; (6) the target group, such as healthcare providers or teachers; (7) the measured outcomes, such as “knowledge” or “self-efficacy”; (8) the theoretical framework guiding the study; (9) the study design describing if the control group was either active or passive (such as a waitlist-control group) and which group had an e-health component; (10) the sample size for both the experimental and control groups; and lastly (11) the findings and effect of the intervention.

Critical Appraisal of Individual Sources of Evidence

To assess the quality of each randomized controlled trial, the Joanna Briggs Institute (JBI) critical appraisal tool was used (JBI, 2020). It assessed the methodological quality and risk of bias within a study (JBI, 2020). The appraisal tool consisted of 13 unique questions, which were applied to all 11 eligible articles. The questions regarding the quality of the study could be answered by either “yes”, “no”, “unclear” or “n/a”. The quality assessment score could be calculated by dividing the total number of available questions by the number of questions answered with “yes”. The quality score was then grouped into 3 categories, namely low (<49%), moderate (50-69%) and high (>70%) (Yu et al., 2023). The JBI assesses the risk of bias with the help of questions such as “Were treatment groups similar at baseline?” or “Were treatment groups treated identically other than the intervention of interest?”. Thus, the

final quality score includes the risk of bias as part of a broader quality score and can help inform synthesis and interpret the results of the study (JBI, 2020).

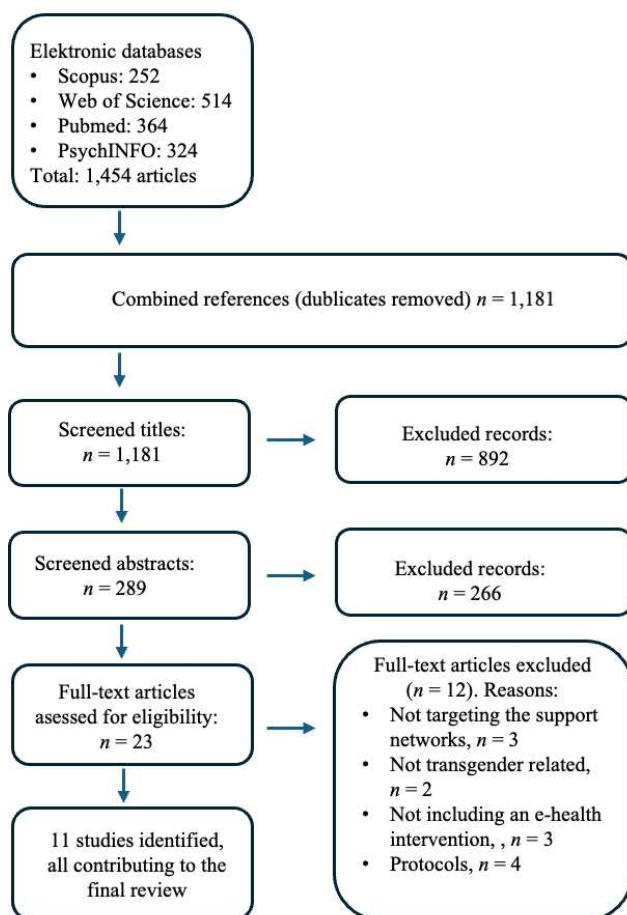
Results

Selection of Sources of Evidence

After conducting a search throughout all four databases, a total of 1,454 studies were extracted to Covidence (Version 2024). The complete screening process can be seen in Figure 1. After the automatic duplicate removal, a total of 273 articles were excluded. The remaining 1,181 articles were screened independently by one researcher. First, the titles of articles were screened, resulting in 882 articles being excluded. Then, the remaining 289 abstracts were analyzed, which resulted in 23 articles being eligible for full-text screening. Lastly, 11 out of the 23 articles were included in the final analysis and contributed to the scoping review. Twelve out of the 23 articles were excluded because they either did not focus on transgender-related themes, did not include an e-health intervention, focused on transgender individuals themselves, or were study protocols. Hand-searching of relevant review articles or reference lists did not result in further eligible studies.

Figure 1

Flowchart Detailing Screening Process According to Predefined Inclusion and Exclusion Criteria



Critical Appraisal within Sources of Evidence

After conducting the critical appraisal according to the JBI (2020), 10 out of 11 articles were scored as low quality whereas one article was scored as moderate quality (Table 2; Yu et al., 2023). No articles were scored as high quality, suggesting that the articles could pose a high risk of bias (JBI, 2020; Yu et al., 2023). Most studies do not give sufficient information regarding the blinding procedures for participants, outcome assessors, and randomization procedures (Table 2). Additionally, multiple studies lack information regarding attrition rates. Follow-up refers to the time period from randomization until the end of the trial (JBI, 2020). When there was a loss to follow-up, differences between groups regarding dropout rates and their impact on the study results were often not analyzed. However, all studies were found to be similar to a standard RCT design (Table 2; JBI, 2020). Overall, most studies lack transparency regarding the concealment, the randomization procedure, and sufficient analysis regarding the dropout rates.

Table 2*Critical Appraisal of Eligible Studies According to the JBI (2020)*

Author	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Score
Boccanfuso et al.	●	●	●	●	●	●	●	●	●	●	●	●	●	46.15%
Boekeloo et al.	●	●	●	●	●	●	●	●	●	●	●	●	●	23.08%
Bradley et al.	●	●	●	●	●	●	●	●	●	●	●	●	●	38.46%
García-Acosta et al.	●	●	●	●	●	●	●	●	●	●	●	●	●	46.15%
Kara and Serpen	●	●	●	●	●	●	●	●	●	●	●	●	●	23.08%
Lelutiu-Weinberger et al.	●	●	●	●	●	●	●	●	●	●	●	●	●	46.15%
Martin et al.	●	●	●	●	●	●	●	●	●	●	●	●	●	38.46%
Massey et al.	●	●	●	●	●	●	●	●	●	●	●	●	●	23.08%
Matsuno and Israel	●	●	●	●	●	●	●	●	●	●	●	●	●	7.69%
Mayer et al.	●	●	●	●	●	●	●	●	●	●	●	●	●	30.77%
Pachankis et al.	●	●	●	●	●	●	●	●	●	●	●	●	●	61.54%

Note Green = yes; red = no; gray = unclear; Q1 = true randomization?; Q2 = concealed group allocation? ; Q3 = treatment group similar at baseline?; Q4 = participant blindness?; Q5 = were those delivering treatment blind?; Q6 = outcome assessors blindness?; Q7 = identical treatment other than intervention?; Q8 = follow-up complete?; Q9 = intention-to-treat (ITT) analysis?; Q10 = outcome measured in the same

way?; Q11= Outcomes measured reliably?; Q12 = appropriate statistical analysis?; Q13 = standard RCT design?; Score = total number of available questions divided by the number of questions answered with “yes” (in percentage)

Characteristics and Results of Individual Sources of Evidence

For each included source of evidence, the characteristics and results can be seen in Table 3. For the review questions, the most relevant characteristics of the randomized controlled trials are the year, description, aim, target group, outcome measures, and effect.

Table 3

Summary of the Characteristics of E-health Randomized Controlled Trials on the Support Network of Transgender Individuals

Author and Year	Country	Description	Aim	Target group	Outcome Measures	Theoretical Approach	Design	Sample (n)	Effect
Boccanfuso et al. (2020)	Australia	Synchronous interactive online intervention with a live transgender person	Reducing stigma about transgender people	Undergraduates and community members ¹	Transgender stigma	Allport's intergroup contact theory (Allport, 1954)	Active 1* vs active 2*	Active 1, n = 47; Active 2, n = 67	Significant: Reduced transgender stigma of cisgender men
Boekelo et al. (2023)	USA	Real-time virtual face-to-face training	Improve LGBT competency and attitude	Therapists and mental health organizations (MHOs)	LGBT climate, Knowledge, attitude, self-efficacy, learning commitment, affirmative	The Information-Motivation-Behavioral Skills (IMB) model (Fisher et al., 2003), Social Cognitive Theory (SCT) model	Active 1* vs active 2*	Baseline assessment: Active 1, MHOs, n = 5; therapists, n = 29; active 2, MHOs, n = 5; therapists, n = 32 Follow up:	Significant: Higher increased affirmative attitude and practices and self-efficacy

					behavior, and skills	(Schunk & DiBenedetto, 2022), Socio-Ecological Model (Kilanowski, 2017; SEM)		Active 1, MHOs, $n = 5$; therapists, $n = 23$; active 2, MHOs, $n = 5$; therapists, $n = 25$	
Bradley et al. (2019)	USA	Online role-playing simulation	Teach classroom LGBT harassment training for teachers; improve competency and supportive behaviors	Teachers	Preparedness, Likelihood, Self-efficacy	Critical human rights theory (Rensmann, 2017)	Active* vs passive	Initially: Active, $n = 1452$; Passive, $n = 1452$; Primary data analysis: Active, $n = 674$; Passive, $n = 716$ Follow-up: Active, $n = 106$; Passive, $n = 118$	Significant: Improvements in preparedness, likelihood, and self-efficacy
García-Acosta et al. (2019)	Spain	Film-forum and discussion-forum	Increase transgender knowledge	Nursing Students	Knowledge	Constructivist framework (Hyde & Fife, 2005), Problem-Based Learning (Yew & Goh, 2016)	Active 1* vs active 2* vs passive	Active 1, $n = 31$; Active 2, $n = 28$; Passive, $n = 57$ No dropouts reported	Significant: Increase in knowledge

Kara and Serpen (2022)	Türkiye	5-week movies based intervention and online group work	Reducing general LGBT phobia	Social workers	Homophobia	Ecological perspective (McLaren & Hawe, 2004)	Active* vs passive	Active, $n = 12$; Passive, $n = 12$ No dropouts reported	Significant: Reduction of homophobia levels
Lelutiu-Weinberger et al. (2023)	Romania	Livestream online broadcast	Improve LGBT competence, affirmative beliefs, and reduce bias. Assess feasibility and acceptability of study design	Mental health providers	LGBT-related bias, skills, beliefs, behaviors and intentions, acceptability and feasibility of study design	Minority Stress Theory (Meyer, 2003), LGBTQ-affirmative therapy (Ritter & Terndrup, 2002)	Active 1 vs active 2*	Initial randomization: Active 1, $n = 60$; active 2, $n = 60$ Completed intervention: Active 1, $n = 58$; active 2, $n = 55$ First Follow-up: Active 1, $n = 48$; active 2, $n = 49$	Significant: Reduced bias; Improved LGBT skills, beliefs, and behaviors. Qualitative feedback: high acceptability
Martin et al. (2022)	USA	Video clip teaching material	Educate healthcare staff on transgender people	Healthcare professionals and trainees	Knowledge, attitude, beliefs	Minority stress theory (Meyer, 2003)	Active* vs active* vs passive	Initial randomization: Active 1, $n = 126$; active 2, $n = 108$; active 3, $n = 109$; passive 1, $n = 124$ Post-Intervention:	Significant: Increased transgender acceptance, knowledge, and attitude

								Active 1, $n = 46$; active 2, $n = 46$; active 3, $n = 44$; passive 1, $n = 64$ Follow-up: Active 1, $n = 19$; active 2, $n = 28$; active 3, $n = 29$; passive 1, $n = 24$	
Massey et al. (2021)	USA	Watching a TV show called transparent	Reducing stigma towards transgender people	Undergraduates	Parasocial interaction and empathy, anxiety, social distance, attitude	Parasocial contact hypothesis (Schiappa et al., 2005), intergroup contact theory (Allport, 1954)	Active 1* vs active 2*	Active 1, $n = 78$; active 2, $n = 83$ No dropouts reported	Significant: The quality of parasocial interaction determines prejudice, reduced transphobia
Matsuno and Israel (2021)	USA	Interactive online intervention	Feasibility and acceptability trial: increase parental transgender affirming	Parents	Acceptability of intervention program, distress and isolation, knowledge,	Behavior Change Theory (Bandura, 1977), Psychodynamic theories (Natoli et al., 2022),	Active* vs passive	27 total Active, $n = 2/3$ of 27; passive, $n = 1/3$ of 27	Qualitative feedback: Increased knowledge and empathy, decreased

			behaviors and knowledge		empathy, supportive behavior	Allport's intergroup contact theory (Allport, 1954), Theory of planned behavior (Ajzen, 1991), 6SquID (Wight et al., 2015), K-A-P theory (Qiquan & Hua, 2021)			negative emotions, and high acceptability of the study design
Mayer et al. (2024)	USA	1-h online prerecorded webinar, slide shows and videos	Increase gender identity documentation in healthcare systems	Health center (HC) staff	Sexual and gender identity documentation levels, number of preventive screenings ³	Kern's curriculum development (Kern, 1998)	Active 1* vs active 2 ²	Initial randomization: Active 1, <i>n</i> = 6 HCs; active 2, <i>n</i> = 6 HCs	Non-significant changes
Pachanki et al. (2022)	International	11-week real-time online LGBTQ training	Increase affirmative LGBTQ behavior and competency	Mental health providers	Affirmative competency, humility, knowledge	Minority Stress Theory (Meyer, 2003), LGBTQ-Affirmative Cognitive	Active 1* vs active 2*	Active 1, <i>n</i> = 61; active 2, <i>n</i> = 60	Significant: Improved self-reported competency,

(LGBT and MST)	Behavioral Therapy (CBT; Ritter & Terndrup, 2002)	knowledge, skills, and use
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Note *The main part of the intervention includes an e-health component; ¹“Community members” were not further defined in the study. ² in-person interventions include some e-health components such as a 10-minute video and slide shows (only partly e-health). ³ HIV screenings and other STIs

Table 4*Studies Divided Across Different E-health Components*

Components	Sample size (<i>n</i>)	Studies
Live online session (e-health)	5	*Boccanfuso et al. (2020), *Boekeloo et al. (2023), *Kara and Serpen (2022), *Lelutiu-Weinberger et al. (2023), *Pachankis et al. (2022)
Movies or videos (e-health)	6	*García-Acosta et al. (2019), *Kara and Serpen (2022), *Martin et al. (2022), *Massey et al. (2021), Matsuno and Israel (2021), Mayer et al. (2024)
Online simulation (e-health)	1	*Bradley et al. (2019)

* Significant effect found

Table 5*Aims of the Eligible Interventions*

Aim	Sample size (<i>n</i>)	References
Increase knowledge or competence	7	*Boekeloo et al. (2023), *Bradley et al. (2019), *García-Acosta et al. (2019), *Lelutiu-Weinberger et al. (2023), *Martin et al. (2022), Matsuno and Israel (2021), *Pachankis et al. (2022)
Reduce stigma, bias, prejudice, or phobia	5	*Boccanfuso et al. (2020), *Kara and Serpen (2022), *Lelutiu-Weinberger et al. (2023), *Martin et al. (2022), *Massey et al. (2021)
Increase support or affirmation	6	*Boekeloo et al. (2023), *Bradley et al. (2019), *Lelutiu-Weinberger et al. (2023), Matsuno and Israel (2021), *Pachankis et al. (2022)

Improve healthcare documentation of gender-identities	1	Mayer et al. (2024)
Testing feasibility and acceptability of the study design	2	Lelutiu-Weinberger et al. (2023), Matsuno and Israel (2021)

* Significant effect found for that aim

Synthesis of Results

In total, 11 eligible articles examined the effect of an intervention on the support network of transgender individuals. Studies ranged from 2019 until 2024, while most studies were from the year 2022 ($n = 3$) and 2023 ($n = 3$). The country of origin was mainly the USA ($n = 6$), while other studies were conducted in Australia ($n = 1$), Spain ($n = 1$), Türkiye ($n = 1$), Romania ($n = 1$) or internationally ($n = 1$). Multiple studies included a live online session ($n = 5$), whereas most studies included a video or movie component ($n = 6$) (Table 4). Only one study implemented an interactive online simulation as part of their intervention (Bradley et al., 2019).

According to Table 5, the study aims can be categorized into five categories: (1) increasing LGBT-related competence and knowledge ($n = 7$); (2) reducing LGBT-related stigma or bias ($n = 5$); (3) increasing LGBT-related support ($n = 6$); (4) improving gender identity related documentation within healthcare systems ($n = 1$); or (5) assessing acceptability and feasibility of the study design ($n = 2$). No studies have measured the indirect effect of the intervention on transgender individuals themselves. The vast majority of interventions target healthcare providers or healthcare staff ($n = 6$). The other target groups are students ($n = 3$), teachers ($n = 1$), community members ($n = 1$) and parents ($n = 1$). Most studies have focused on an active-versus-active study design ($n = 6$), whereas the other designs included an active-versus-passive design ($n = 3$) or a mixed study design (including both an active and passive comparison group; $n = 2$). The study of Bradley et al. (2019) had the biggest initial sample size, with 2904 participants being randomized into different groups. Kara and Serpen (2022) had the smallest sample ($n = 24$). For the study of Mayer et al. (2024), a total of 12 healthcare centers participated, but the number of individuals is unknown. In total, 4115 participants were initially randomized from 10 different interventions, excluding the intervention of Mayer et al. (2024).

Lastly, for the effects of the interventions: almost all interventions have found a significant effect ($n = 9$), such as increased competence and knowledge ($n = 6$), reduced stigma and bias ($n = 5$), or increased support ($n = 4$) (Table 5). The intervention of Mayer et al. (2024) has found non-significant effects. The study of Matsuno and Israel (2021), has not conducted any statistical analysis for their feasibility trial due to the small sample size. However, they have reported positive qualitative feedback from participants regarding increased knowledge and high acceptability for the study design (Matsuno & Israel, 2021). Furthermore, the effects of the interventions can be categorized based on the type of e-health (Table 4): all interventions including a live online session ($n = 5$), or an online simulation ($n = 1$) have found a significant effect, whereas only 4 out of 6 interventions have found a significant effect for including a video-based e-health component.

Discussion

This scoping review identified 11 eligible e-health-focused RCTs targeting the support network of transgender individuals when searching for studies published between 2015 and 2024. Most studies were from 2022 to 2023, indicating that research within this area is fairly new and still expanding, which might explain the scarce number of eligible studies. The research questions were: (1) “What are the characteristics of e-health interventions on the support network of transgender people?”; (2) “What were the target groups of the e-health interventions?”; (3) “What are the existing gaps within these literatures?”.

Characteristics of Research Questions (RQ1)

The scoping review focused on identifying the key characteristics of e-health interventions targeting the support network of transgender people. Eligible studies varied in design, format, published year, and theoretical framework. Most interventions focused on increasing LGBT-related knowledge and competence, while others focused on reducing transgender-related bias, increasing supportive behaviors, or improving healthcare-related gender documentation. Often, the studies included multiple of the mentioned aims and thus provided a more complete approach in educating the support network.

Although most interventions focused on educating the support network of transgender individuals, they differed significantly in their approach. Multiple studies (5 out of 11) used live, online sessions, which enabled participants to interact with instructors and other participants in real time. This live format was very effective in improving supportive behaviors and reducing bias (Table 4; Table 5). Video-based interventions were also common,

but their effectiveness differed. While some video-based studies reported significant improvements in knowledge, others showed limited effects. This indicates that additional factors may influence the effectiveness of each approach. Furthermore, simulation-based interventions were especially effective in improving empathy and preparedness in supporting transgender individuals in classroom settings.

The quality of the included studies was mostly low, indicating potential implicit bias, and reducing the overall quality of the identified interventions. Additionally, the majority of the studies were conducted in the USA, which limits the generalizability of the results to other countries and cultures. Furthermore, some studies had small sample sizes, which limits the generalizability of the results (Boekeloo et al., 2023; Kara & Serpen, 2022).

The theoretical guidance for most studies was based on behavior change and prejudice theories. The Minority Stress Theory and Allport's Intergroup Contact Theory were frequently mentioned in multiple interventions. The Minority Stress Theory focuses on the reduction of stigma and the latter promotes understanding through contact with transgender individuals. These theories guided the interventions, suggesting that basing e-health interventions on established frameworks could improve their effectiveness.

In conclusion, the characteristics of e-health interventions focusing on the support network of transgender people are still a field in development, focusing mostly on interactive or video-based formats and behavioral theories. However, the effectiveness of the different intervention types differs, which indicates the need for further research to determine the most effective formats for each target group.

Target Groups (RQ2)

The second research question examined the target groups of the interventions focused on the support network of transgender individuals. The findings show that e-health interventions were conducted on a variety of target groups such as teachers, students, healthcare providers, and parents. However, most interventions were directed toward healthcare providers, followed by students. To a lesser extent, some interventions targeted teachers and parents. As healthcare providers are essential for improving the mental health of transgender people, the interventions largely focused on increasing the knowledge and competence of healthcare providers or reducing their bias (Martin et al., 2022).

However, by focusing mainly on healthcare providers and students, the broader support network of transgender individuals is overlooked. Other target groups such as parents, teachers, siblings, friends, and intimate partners are underrepresented despite their

significance. For instance, parents and close family members play an important role in the mental health of transgender youth, as parental acceptance is linked to reduced stress (Olson et al., 2016; Ryan et al., 2010). Teachers, on the other hand, have the unique opportunity to support transgender individuals in school settings, helping to create a safe and inclusive learning environment. The limited research on these groups highlights the need for broadening the focus to include these target groups in e-health interventions to create a fully supportive network for transgender people.

In summary, while healthcare providers can be an important target group, future research should include diverse support figures within the support network of transgender people. By targeting different members of the support network, the interventions could create a more diverse support environment and improve the overall mental well-being of transgender individuals.

Literature Gaps (RQ3)

The third research question identified significant gaps within the identified e-health interventions. Three main gaps could be identified: (1) limited targeting of the full support network, (2) incomplete focus on all transgender-related skills and competencies, and (3) insufficient quality and transparency in study designs.

Limited Targeting of the Full Support Network

The findings indicate that current e-health interventions predominantly focus on healthcare providers and students. Other essential members of the transgender support group such as teachers and parents received limited attention. The study of Bradley et al. (2019), was the only study that could be sourced to target teachers, whereas the study of Matsuno and Israel (2021) was the only study focusing on the caregivers of transgender people. This restricted scope overlooks other important figures within the support network such as friends and partners. The findings suggest that future studies should focus on a more diverse set of target groups to create a fully supportive environment with family members, friends, partners, and educators.

Incomplete Focus on All Transgender-Related Skills and Competencies

Most of the studies were found to focus on improving only two of the four essential competencies and skills for supporting transgender individuals: increasing knowledge and reducing stigma. Improving other skills such as supportive behaviors and gender-related

documentation in healthcare settings were less frequently targeted. These four dimensions — knowledge enhancement, stigma reduction, an increase in supportive behaviors, and improved healthcare documentation — showcase a diverse skill set necessary for providing complete inclusive support to transgender individuals (Table 5). Only the study of Lelutiu-Weinberger et al. (2023) attempted to focus on three out of four dimensions (Table 5). Future studies should aim to improve the skills and competencies of the support network of transgender individuals on all dimensions, thereby creating a support network trained to meet the varied needs of transgender people.

Insufficient Quality and Transparency in Study Designs

Lastly, most identified studies had insufficient quality and transparency according to the low JBI scores. Multiple reasons accounted for low quality scores, such as small sample sizes and insufficient reporting of the concealment and randomization procedures. This reduced the reliability of the findings within the studies and might have resulted in a high risk of bias (JBI, 2020). The study of Matsuno and Israel (2021) had the lowest JBI score, indicating the highest risk of bias due to limited transparency.

In the future, studies should focus on providing sufficient transparency regarding their concealment and randomization procedures. Additionally, larger sample sizes could increase the statistical power (Lakens, 2022). Furthermore, some studies included an active-versus-passive design, such as a waitlist-control group, further reducing the quality of the findings by possibly introducing a placebo effect (Boot et al., 2013). Future interventions would benefit from an active control group by reducing possible expectancy bias (Boot et al., 2013). These adjustments could increase the overall quality of the interventions and provide more reliable conclusions in interventions targeting the support network of transgender people.

Previous Gaps and Contributions of This Scoping Review

This scoping review has helped to close multiple existing gaps by focusing specifically on e-health interventions targeted at the support network of transgender people. Although the systematic review of Malpas et al. (2022) focused on interventions targeting parts of the support network of transgender people, it did not focus on e-health interventions. Furthermore, the review of Renner et al. (2022) focused on e-health interventions for transgender people, but not on their support network, creating a literature gap to be explored. This scoping review helped to address these gaps by examining e-health interventions designed for the support network of transgender individuals, offering a detailed view of how

e-health can improve the support provided by healthcare providers, teachers, and other parts of the support network.

More specifically, this scoping review has provided a list of how certain transgender-related skills and competencies — such as knowledge, bias reduction, supportive behaviors, and healthcare documentation — can be effectively improved. Although the direct effect of the improved LGBT competencies and skills of the support network on transgender individuals was not measured by the interventions, this scoping review shows that educating the support network through e-health interventions could indirectly improve the mental health of transgender people by creating a more understanding, supportive and inclusive environment.

Limitations

There are several limitations considering this scoping review. The search was limited to the databases Pubmed, Scopus, Web of Science, and PsychINFO. Other important databases such as CINAHL or LGBTQ+ Source were excluded due to restricted access. This might have limited the number of identified studies. Additionally, only peer-reviewed articles from indexed sources were included, potentially excluding important non-peer-reviewed studies. Although the results of this scoping review indicate that eligible studies were not older than 2019, limiting the search results to studies published between 2015 and 2024 might have excluded eligible studies older than 2015.

Conclusions

Research on e-health interventions targeting the support networks of transgender individuals shows promising results but is incomplete. The findings show that eligible e-health interventions mostly focus on (1) increasing knowledge or competence, (2) reducing bias and stigma, and (3) increasing supportive LGBT behaviors. The results indicate that the e-health interventions can be successful in indirectly benefiting transgender people by fostering a more supportive and inclusive environment (Boekeloo et al., 2023; Lelutiu-Weinberger et al., 2023; Pachankis et al., 2022).

However, research on e-health interventions targeting the support network of transgender people is incomplete in scope, only targeting parts of the full support network. Future research should broaden the focus and include other crucial target groups within the support network of transgender individuals such as further family members, friends, teachers, and partners. Additionally, future research should improve methodological reporting by

adding further details about their blinding and randomization procedures. Additionally, studies should report on potential reasons for dropout rates, and analyze the impact of the dropout rates on the study results. Furthermore, improved study designs with active control groups would strengthen the reliability of the results.

This scoping review has helped to establish a review of e-health interventions targeting specifically the support network of transgender people. By doing so, it has addressed the literature gap, showcasing how e-health interventions can enhance knowledge, reduce bias, and promote supportive behaviors among healthcare providers, teachers, and other key members of the support network. Although the direct effects of the interventions on transgender individuals were not measured, these interventions show that e-health interventions can indirectly improve their mental health by creating an inclusive and supportive environment.

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Appendices

Appendix 1

Main Keywords and the References of the Studies Providing the Related Terms

Keywords	References for related terms
Transgender	Wong et al. (2022), Goulding et al. (2024), Ludvigsson et al. (2023)
Support network	<p>Related keywords to <i>family</i>:</p> <p>Kustanti et al. (2024), Wills-Ibarra et al. (2024), Birkeland et al. (2018),</p> <p>Related keywords to <i>friend</i>:</p> <p>Hale et al. (2024), Cunningham et al. (2012)</p> <p>Related keywords to <i>partner</i>:</p> <p>Fletcher et al. (2024), Birkeland et al. (2018)</p> <p>Related keywords to <i>healthcare provider</i>:</p> <p>Ghahramani et al. (2021)</p> <p>Related keywords to <i>teacher</i>:</p> <p>Dille and Røkenes (2021)</p> <p>Related keywords to <i>student</i>:</p> <p>Barker et al. (2022), Gillani et al. (2023)</p>
E-health	Erku et al. (2023), Johnsen et al. (2021)
Intervention	Zerden et al. (2023), Samadbeik et al. (2023), McDougall et al. (2023)
RCTs	Selman et al. (2024), Medcalf et al. (2024), Han et al. (2024)