

Effectiveness of Internet-based Psychosocial Interventions among Family Caregivers of People with Schizophrenia: A Systematic Review

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Abstract: Internet-based interventions have long been available in mental health care, offering alternative options for caring for patients and caregivers. This review aimed to evaluate the effectiveness of internet-based psychosocial interventions on psychological distress, caregiving burden, expressed emotion, knowledge about psychosis among family caregivers of people with schizophrenia, and hospitalization of the patients. A systematic search was conducted on June 20, 2022, in six databases (MEDLINE, EMBASE, CINAHL, Scopus, Cochrane Library, and ProQuest) from 2010 onwards in English and Thai. The review was conducted based on the JBI approach and reported following the PRISMA guidelines. The protocol was registered in PROSPERO as CRD42021255318.

Five out of 20 studies were included in the review. Meta-analysis was impossible due to the methodological heterogeneity across the included studies; therefore, narrative synthesis was utilized. Psychological distress was not improved as reported in one study; however, the caregiving burden was improved in another study. Two studies reported expressed emotion; however, they were impossible to combine due to methodological differences, and the results contradicted each other. Knowledge about psychosis was also found to contradict results in two individual studies. Hospitalization was not impacted by the intervention based on one study.

Four studies were randomized control trials, and another was a quasi-experimental research study. One out of four of the former did not mention blinding during randomization, which creates potential performance and detection bias. A robust randomized control trial should be carried out with a similar outcome measurement to decrease the heterogeneity and enhance the possibility for further meta-analysis and the ability to recommend for practice.

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Introduction

Schizophrenia is a cyclical disease that leads to chronic illness. In 2019, schizophrenia affected an estimated 24 million people worldwide, making up approximately 0.32% or 1 in 300 people. Among adults aged 20 and above, the prevalence of schizophrenia was 0.45% or 1 in 222 people.¹ Owing to stigmatization

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and inadequate care, schizophrenia remains a higher burden of disease.² According to the 2019 Global Burden of Diseases study, schizophrenia ranked among the

top three mental disorders with the largest proportions of disability-adjusted life-years (DALYs) in 2019. It accounted for 12.2% of the total DALYs attributed to mental disorders globally.³ Specifically, lower- and upper-middle-income countries have a much more significant burden of schizophrenia, which is approximately fourfold higher than in high-income countries.²

Although psychotropic medication and psychosocial intervention are standard care for people with schizophrenia, most lack access to treatment.⁴ A considerable proportion of individuals diagnosed with schizophrenia exhibit a suboptimal response to antipsychotic medications, with over one-third showing limited therapeutic benefits.⁴ Furthermore, some may experience adverse effects from these medications, which can further complicate their treatment and non-adherence to treatment.⁴ Non-adherence to treatment is a significant factor contributing to relapse in schizophrenia.⁵ Relapses, in turn, lead to hospitalization, increased healthcare costs, and reduced quality of life.⁵ However, there is an organizational approach that shows promise as a potential solution. Research indicates that deinstitutionalization could improve social functioning, psychiatric symptoms, and quality of life for people with schizophrenia, including long-stay patients.⁶ To address these challenges, the World Health Organization's (WHO) Comprehensive Mental Health Action Plan 2013–2020 advocates shifting the locus of care from long-stay hospitals to community-based mental health services.^{7,8}

Caregivers played a significant role in taking care of these afflicted people. A family caregiver of people with schizophrenia is a family member or close friend who assists in caring for their loved one.⁹ Care may include tasks such as ensuring the patient takes their medication as prescribed, providing emotional support, and assisting with daily activities such as personal hygiene, interpersonal interaction, getting sufficient food and sleep, and preventing potentially dangerous behavior.^{9,10}

Family caregivers of people with schizophrenia are vulnerable to mental health disorders. Studies have shown that family caregivers of people with

schizophrenia experienced stress, burden, isolation, and challenges related to managing medication, providing emotional support, and coordinating care with healthcare providers. Family caregivers may also experience stigma and discrimination related to their loved one's illness¹¹ and experience caregiving burdens.¹² Caregiver burden, in the context of schizophrenia, refers to the burden experienced by family members who are caring for chronic people with schizophrenia. A recent study highlights that caregiver burden is significantly associated with the prevalence of stress, anxiety, and depression among those who care for chronic people with schizophrenia.¹² In a 2022 cross-sectional study undertaken in Pakistan, researchers discovered that >60% of family caregivers of people with schizophrenia experienced heightened anxiety and depression.¹³ The research underscores the crucial need to prioritize the mental health of family caregivers of people with schizophrenia. It is essential to develop interventions that aim to promote their well-being and enhance their quality of life.

Studies have shown that psychoeducational programs and support groups for family caregivers of people with serious mental illness have successfully reduced caregiver burden, improved the caregiving experience, and alleviated psychological distress.¹⁴ In addition, recent research has indicated that family caregivers of people with schizophrenia with a high level of caregiving knowledge and skill expertise tend to experience fewer symptoms of stress, anxiety, depression, and more rewarding feelings in their caregiving role.¹⁵ Furthermore, clinical practice guidelines in various regions, including the United States,¹⁶ the United Kingdom,¹⁴ and Canada,¹⁷ have recommended psychoeducational programs and support groups for family caregivers of people with schizophrenia. Despite the widespread dissemination of reliable guidelines for caring for people with schizophrenia and their family caregivers, a systematic review revealed that these interventions are still poorly implemented in routine practice.¹⁸ The primary barriers to implementing family interventions are a lack of resources, including limited

time, staff shortages, and insufficient information systems for managing patients and their families.¹⁸ Hence, exploring internet-based interventions for family caregivers of people with schizophrenia may address these limitations.

The COVID-19 pandemic greatly impacted the lives of family caregivers of people with schizophrenia, including their psychological well-being, employment status, and income. Therefore, caregivers must have increased accessibility to mental health services.¹⁹ Internet-based psychosocial interventions have been identified as an effective means of addressing this need by providing remote access to mental health services, particularly during the COVID-19 pandemic. Moreover, evidence suggests that such interventions can help reduce caregiver burden, improving the overall well-being of caregivers and their loved ones.¹⁹

Over the past decade, technology known as eHealth has been used to enhance healthcare delivery as defined by the WHO.²⁰ eHealth includes various applications, such as telemedicine, for providing remote clinical services such as virtual consultations and remote patient monitoring.²⁰ Additionally, mHealth utilizes mobile devices, such as smartphones and tablets, to support healthcare delivery through health apps and text message reminders.²⁰ Notable progress has been made in developing internet-based interventions to promote mental health and prevent or treat mental health problems in developed countries.²¹ Numerous research studies have shown that internet-based psychosocial interventions can effectively reduce caregiver burden, decrease expressed emotion, and alleviate depression for family caregivers of people with schizophrenia.²²

Additionally, a study has demonstrated that carer education programs delivered via telepsychiatry significantly enhance caregivers' knowledge about psychosis.²³ This is of utmost importance as caregivers' knowledge about psychosis enables them to understand the condition better, effectively manage symptoms, and

provide optimal care to their loved ones.²³ An online psychoeducation study conducted for caregivers of people with schizophrenia reported higher satisfaction levels and convenient accessibility. However, the study showed a limited impact on caregivers' psychological distress, although there was a positive trend towards fewer hospitalizations among the online group.²⁴ Caregivers who have a better understanding of the disease and participate in the online intervention for an extended period can effectively monitor and identify symptoms and problems of their care of loved ones, leading to a reduction in hospitalization rates.²⁴ Nevertheless, the effectiveness of internet-based interventions needs to be assessed before they can be implemented as a standard of care.

A previous systematic review has focused on identifying the application of digital interventions for family caregivers of people with psychosis, with a particular emphasis on schizophrenia, as it represents the most common and severe form of psychosis.²⁵ However, the review primarily focused on evaluating the feasibility, usability, and acceptability of such interventions.²⁵ Likewise, another recent systematic review investigated the effectiveness of online interventions for patients with severe psychiatric disorders and their families. However, the studies included in the review had diverse study designs and quality, making it impossible to conduct a meta-analysis. Further RCTs are needed to determine the efficacy of these interventions.²⁶

A preliminary search of PROSPERO, MEDLINE (PubMed), JBI Evidence Synthesis, and Cochrane Database of Systematic Reviews was conducted, and we identified that there needed to be more ongoing systematic reviews on this topic.

Aim

To evaluate the effectiveness of internet-based psychosocial interventions versus active comparators (such as face-to-face interventions, bibliotherapy, or telephone interventions) and passive comparators

(such as usual psychiatric care) on psychological distress, caregiver burden, expressed emotion, and knowledge about psychosis in family caregivers of people with schizophrenia, and hospitalization rates of people with schizophrenia as a secondary outcome.

Methods

Design: This systematic review was conducted and reported using the JBI approach²⁷ and the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA),²⁸ respectively. This review also follows the protocol registered with PROSPERO (CRD420212 55318) and published in JBI Evidence Synthesis.²⁹

Data Sources and Search Strategy: A systematic search was conducted on June 20, 2022, through six electronic databases of MEDLINE (PubMed), EMBASE (OVID), CINAHL (EBSCO Host), Cochrane Central Register of Controlled Trials (CENTRAL), Scopus, and ProQuest from 2010 onwards, in English and Thai. A 3-step search strategy was implemented to ensure comprehensive coverage of relevant studies. First, an initial limited MEDLINE (PubMed) search was undertaken to identify studies on the topic. Second, a full search strategy was developed for MEDLINE (PubMed) and other relevant databases, incorporating the text words in the titles and abstracts of relevant studies. Finally, the index terms used to describe the studies. The search strategy example can be found in **Appendix Table 1**.

Inclusion Criteria: The present review focused on studies investigating family caregivers of individuals diagnosed with schizophrenia. The inclusion criteria required family caregivers aged 18 years or older who had been caring for people with schizophrenia for at least six months. This requirement was based on the understanding that an extended period is more likely to have observed and experienced during the phases of the illness of schizophrenia, especially in

the relapses phase. The studies must evaluate internet-based psychosocial interventions aimed at promoting mental health and preventing and/or treating mental health problems for family caregivers of people with schizophrenia. The interventions must have been based on or supported by the Internet and digital technologies (such as websites, smartphones, or apps) provided by mental health professionals. In addition, interventions delivered via either partially internet-based or fully automated internet-based were also included. The studies must be compared the intervention with active comparators (such as in-person interventions, bibliotherapy, or telephone interventions) or passive comparators (such as usual psychiatric care). The primary outcome was family caregivers' psychological distress; caregiving burden; expressed emotion; and knowledge about psychosis. The secondary outcome was hospitalization rates of people with schizophrenia. The outcomes represent values that can be either dichotomous or continuous data. It was a requirement that each outcome measurement underwent rigorous validation to ensure its accuracy and reliability. Additionally, the study types were experimental and quasi-experimental study designs, including randomized controlled trials (RCTs), non-RCTs, and before-and-after studies.

Exclusion Criteria: This review did not include studies investigating family caregivers with psychiatric comorbidities.

Study Selection: All identified studies were collated and uploaded to EndNote v.x20 (Clarivate Analytics, PA, USA), and duplicate studies were removed. Two independent reviewers screened the titles and abstracts to evaluate whether the studies met the inclusion criteria. Any potentially relevant studies were examined in full text, and their citation details were recorded in the JBI System for the Unified Management, Assessment and Review of Information (JBI SUMARI).³⁰ Two independent reviewers thoroughly evaluated the full texts of the selected citations against the inclusion criteria. There was no disagreement between the reviewers on the selection process.

Assessment of Methodological Quality: After the pilot testing, two independent reviewers assessed the methodological quality and determined the risk of bias of the full-text studies using standardized critical appraisal tools from JBI.²⁷ Out of 13 criteria checklists for RCTs and nine criteria checklists for quasi-experimental study can be scored as being met (yes), not met (no), unclear, or not applicable.²⁷ The decision to include/exclude could be based on achieving a predetermined cut-off score: a minimum of nine “yes” scores out of the 13 criteria for RCTs and a minimum of six “yes” scores out of the nine criteria for quasi-experimental studies. There was no disagreement between the reviewers on the quality of the studies. The critical appraisal results are reported in **Appendix Tables 2 and 3**.

Data Extraction: Two reviewers independently utilized the JBI data extraction tool³¹ to extract data from the included studies after pilot testing with one study. There was no disagreement between the reviewers on the data extraction. The data included specific details about the participants, study design, year, country, and setting of the studies included in the review (**Appendix, Table 4**).

Data Synthesis: A meta-analysis was not conducted due to methodological heterogeneity across the studies. Therefore, a narrative synthesis was used to summarize and interpret the systematic review’s findings. In this narrative synthesis, the data extracted from each included study were synthesized using text and words, focusing on the study design, participant characteristics, intervention, comparison, outcome measures, and key findings. We investigated similarities, differences, and patterns among the findings of the different studies.

Review Findings

Search Results

We found 3,098 records in database searching. After duplicate removal, we screened 2,573 titles and abstracts, and 2,549 were excluded. We reviewed 24 studies, and five sought to retrieve the full text. Unfortunately, we could not retrieve the full text of

four studies, although we contacted the corresponding authors. Finally, 20 full texts were assessed for eligibility using the PICO framework.

We excluded 16 studies from our review and listed reasons for exclusion in supplementary files. We excluded studies because five had ineligible interventions, five were study protocols or ongoing studies without a final report, four had ineligible participants, one had an ineligible study design, and one was a systematic review. As a result, four studies were included in the review.

Later, we searched for a study that cited any included studies and the references of the initially included studies. One full text that met the eligibility criteria was included in the review. Therefore, five studies^{24,32-35} were included for critical appraisal. The PRISMA 2020 flow diagram (**Figure 1**) illustrates the search results and study inclusion process.

Study Characteristics

The characteristics of the five included studies are outlined in **Appendix, Table 4**. The included studies were all published between 2010 and 2022. Four of the five studies were RCTs,³²⁻³⁵ while the remaining was a quasi-experimental study.²⁴ Geographically, two studies were conducted in Asia, one in Indonesia³³ and the other in Hong Kong,³⁴ one in England,³⁵ and the other in the USA.^{24,32} Regarding the delivery method, two studies were fully online, allowing participants to participate from their homes.^{34,35} The other three studies delivered online interventions to participants’ homes and face-to-face psychoeducation at an outpatient clinic.^{24,32,33} The interventions were categorized into three groups: active online psychoeducation,^{24,35} passive online psychoeducation,³⁴ and smartphone-based problem-solving self-learning program (PBSP).³³

Methodological Quality Assessment

Out of the 13 criteria assessed for RCTs, one RCT study³⁴ met a maximum of 12 “yes” scores, ensuring triple blinding of participants, intervention deliverers, and outcomes assessors to the assigned groups (Q4-6). Additionally, two other RCT studies^{33,35} had 10 and 11

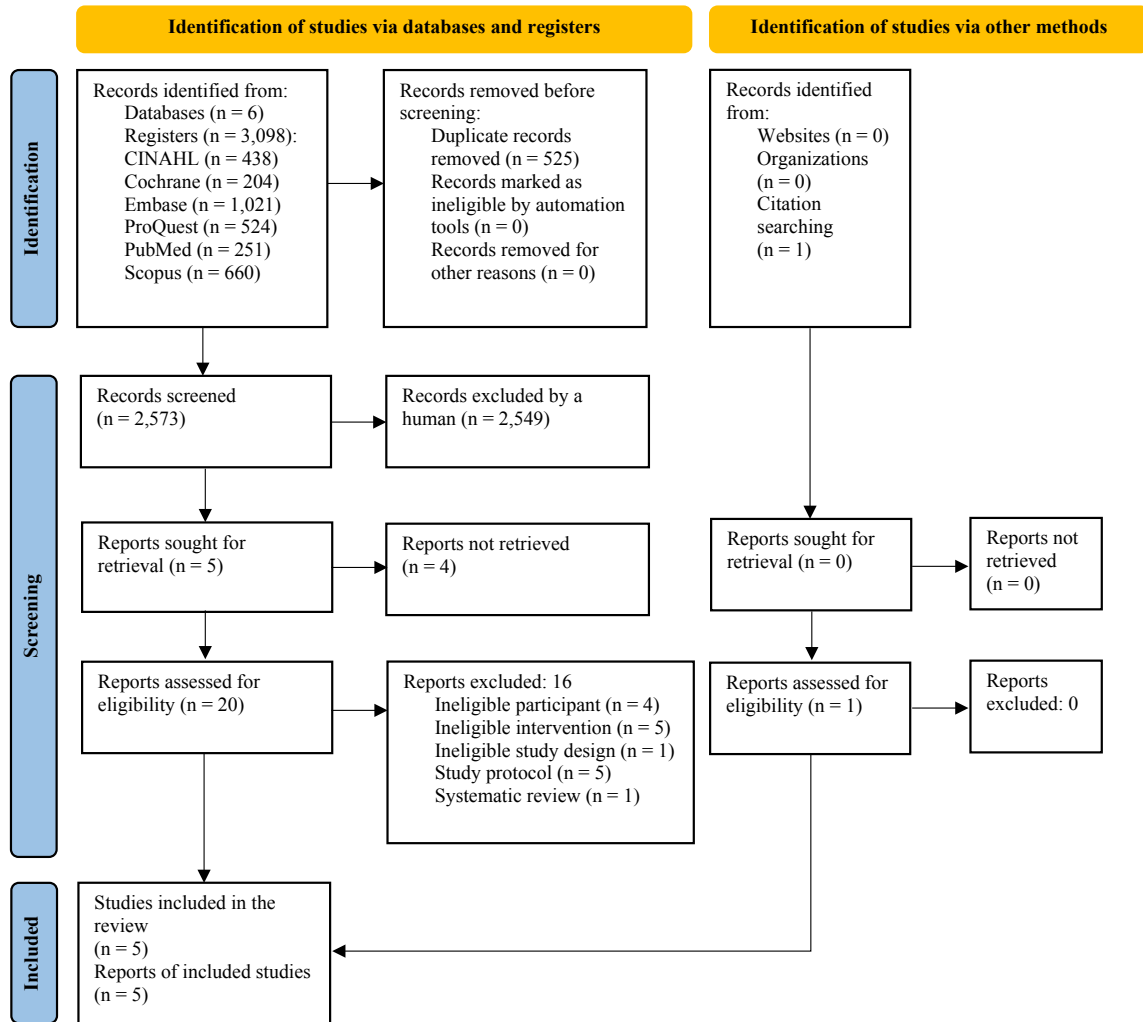


Figure 1. PRISMA flow diagram

“yes” scores, respectively, indicating blinding of outcomes assessors but lacking blinding of participants and intervention deliverers to the assigned groups (Q4–5). However, one RCT study³² met six “yes” scores out of the 13 criteria. This study lacked blinding of outcomes assessors to the assigned groups (Q6) and did not provide clear reporting on the blinding of participants and intervention deliverers to the assigned groups (Q4–6). Furthermore, a quasi-experimental study²⁴ was assessed based on nine criteria and met eight “yes” scores. Ultimately, we identified four studies^{24,33–35} demonstrating adequate overall methodological quality.

However, one RCT study³² did not meet the required methodological standards (9/13). Nevertheless, we included it because it met the inclusion criteria (PICO). The detailed results of the critical appraisal for each study are presented in Appendix, Tables 2 and 3.

Characteristics of the Internet-based Psychosocial Interventions

The internet-based psychosocial interventions were categorized into three groups: active online psychoeducation,^{24,32,35} passive online psychoeducation,³⁴ and a smartphone-based PBSP.³³ More than half of the studies delivered online interventions to participants’

homes combined with face-to-face psychoeducation at an outpatient clinic,^{24,32,33} while the remaining were fully online through the internet delivery to participants' homes.^{34,35}

Outcomes

As mentioned earlier, combining the result by meta-analysis was impossible due to methodological heterogeneity and the differences in outcome measurements. Therefore, a narrative synthesis approach was used to evaluate the effectiveness of internet-based psychosocial interventions for each outcome.

Psychological Distress

A quasi-experimental study²⁴ evaluated the effectiveness of an active online relative support program delivered through a website on psychological distress, using the subscale of anxiety and depression for family caregivers of people with schizophrenia, compared to usual mental health care. The study included 46 relatives who participated in the online groups, with each individual assigned a unique login name and password to access the website from their own homes for 12 months.

The website comprised four key components: a discussion board; resource links; written and brief streaming video educational; and real-time chat. Initially, chat sessions were scheduled weekly for the first six months and biweekly for the following six months. These sessions were facilitated by both a psychologist and research staff. In addition, participants were offered the opportunity to join two optional groups: one for discussing medication and treatment issues, facilitated by a physician, and another offering social support. Psychological distress was measured using the Brief Symptom Inventory (BSI) with subscales assessing anxiety and depression at baseline, six months, and 12 months. The study found no significant group effects on the BSI subscales related to psychological distress.

Caregiving Burden

An RCT³³ investigated the effectiveness of a smartphone-based PBSP on the caregiving burden in family caregivers of people with early psychosis and

their patients. The study compared the smartphone-based PBSP with a face-to-face family psychoeducation group and usual psychiatric care. Thirty-eight caregivers participated in the PBSP group, where they were instructed to read and practice a smartphone-based manual consisting of five modules focusing on caregivers' self-care, seeking services/supports, psychosis care, and managing the impacts of illness on patients and families for five months. After completing each module, caregivers were engaged in behavioral rehearsals or exercises related to caregiving. They also recorded their reading progress weekly and attended group sessions to discuss difficulties in problem-solving activities, facilitated by a family caregiver who had personal caregiving experience and training from a psychiatric nurse and the researchers. The primary outcome, caregiving burden, was assessed using the family burden interview schedule (FBIS) at recruitment, one week, and six months post-intervention. The study showed that the PBSP group had significantly greater improvements in caregiving burden compared to the face-to-face family psychoeducation group over the six-month follow-up (MD = 3.37, SE = 2.98, $p = 0.01$) and usual psychiatric care at one-week post-intervention (MD = 4.22, SE = 3.02, $p = 0.01$) and the six-month follow-up (MD = 9.12, SE = 3.91, $p = 0.01$).

Expressed Emotion

Two studies investigated expressed emotion regarding criticism and emotional overinvolvement in family caregivers of people with schizophrenia. One RCT³⁴ assessed the effectiveness of passive online psychoeducation videos on expressed emotion in family caregivers of people with schizophrenia compared to standard mental healthcare. The intervention group comprised 32 family caregivers who received a unique link to access educational video materials about schizophrenia every two weeks. They were reminded via phone, text, or email to watch the video periodically throughout the 12-week study period. The six educational videos covered various topics related to schizophrenia, including an introduction, stigma, current therapies,

expressed emotion, family and caregiver challenges, and patients' mood states. Expressed emotions, in terms of criticism and emotional overinvolvement, were assessed using the five-minute speech samples (FMSS) through a single session conducted via Skype or another virtual call service at 12 weeks post-intervention. The study revealed a significant decrease in expressed emotion, specifically regarding criticism (OR: 0.32, CI = 0.11-1.01) and emotional over-involvement (OR: 0.46, CI = 0.14-1.6) among family caregivers after psychoeducation.

Another RCT³⁵ aimed to examine the effectiveness of a multimedia and interactive online intervention called COPE-support on expressed emotion in family caregivers of people with schizophrenia, compared to a passive online information resource platform without interactive elements. The COPE-support group comprised 204 participants who accessed psychoeducation, multimedia materials, and interactive elements for networking support with peers and professionals. Participants in this group received an email to download a free app on their smartphones, tablets, and computers and access the materials at least 30 minutes per week over the initial 20 weeks. Additionally, participants could actively participate in the forums or passively read posts. An experienced mental health nurse, and an online facilitator monitored and facilitated the interactive functions. Expressed emotion regarding criticism and overinvolvement was measured using the Family Questionnaire (FQ) at baseline, ten weeks, 20 weeks, and 40 weeks of follow-up. However, the study did not find a statistical difference in expressed emotion between the COPE-support and control groups.

Knowledge about Psychosis

Two studies investigated knowledge about psychosis among family caregivers of people with schizophrenia. One RCT³⁵ assessed the effectiveness of an interactive online COPE-support on knowledge about psychosis in family caregivers of people with schizophrenia, compared to a passive online information resource platform without interactive elements. The measurement of knowledge about psychosis was done using the Mental Health

Knowledge Schedule (MAKS) at baseline, 10, 20 and 40 weeks during the follow-up period. The study did not find a statistical difference in knowledge about psychosis between the study groups.

Another RCT³² aimed to investigate the effectiveness of an active online psychoeducation website on knowledge about psychosis in family caregivers of people with schizophrenia and their patients, compared to usual psychiatric care. In the telehealth group, 13 family caregivers were assigned a unique login to access the Schizophrenia Online Access to Resources (SOAR) website for one year. Participants attended a psychoeducation survival skills workshop and installed computers in their homes before accessing the website. The SOAR website offered therapy forums where family caregivers and patients could ask questions and receive answers and ask questions from the project team within 24-48 hours. The forums were led and moderated by therapists, focusing on problem-solving, stress reduction, and fostering peer interaction to create a supportive environment for addressing issues. The Knowledge About Schizophrenia Instrument assessed knowledge about psychosis in family caregivers at baseline and six months post-baseline. The results indicated that the telehealth group showed a significant improvement in knowledge about the prognosis of psychosis compared to usual psychiatric care ($t = 2.32$, $df = 14$, $p = .036$, $d = 1.94$).

Hospitalization Rate of People with Schizophrenia

The quasi-experimental study²⁴ evaluated the effectiveness of an active online relative support program delivered through a website on the hospitalization rate of people with schizophrenia compared to usual mental health care. The study found that the online group showed a shorter length of stay during the year of the intervention. However, the difference did not reach statistical significance (24% vs. 50%, $\chi^2 = 2.93$, $p < 0.09$).

Discussion

Although we included the five studies in our review, the methodological heterogeneity, such as

the measurement tools and the difference in the component of the internet-based intervention, made it impossible to meet the criteria to conduct a meta-analysis. This reflects the field studies that need more direction and diversity of the research instruments. Moreover, based on our narrative synthesis approach, the outcome interest, such as expressed emotion and knowledge of psychosis, showed inconsistent results. There is still a need for primary research to investigate the effect of such intervention. The potential risk of bias related to the issue of true randomization and blinding is also found as the limitation of included study of this review. The standard RCT needs to be pivotal in this research field.

A quasi-experimental study²⁴ revealed that an active online relative support program delivered through a website had no impact on psychological distress regarding anxiety and depression in family caregivers of people with schizophrenia compared to usual care. However, an RCT study³³ found that the smartphone-based PBSP significantly improved the caregiving burden in family caregivers of people with early psychosis compared to face-to-face family psychoeducation and usual psychiatric care. This study is consistent with a previous systematic review²⁶ that explored the effectiveness of online interventions (web/app-based) for people with severe psychiatric disorders and their families, focusing on the same population and intervention. The review demonstrated that online interventions reduced burden and decreased perceived stress among families.

Another RCT³⁴ revealed a significant decrease in expressed emotion regarding criticism and emotional overinvolvement in family caregivers of people with schizophrenia after watching passive online psychoeducation videos. However, another RCT³⁵ found that a multimedia and interactive online intervention (COPE-support) did not impact expressed emotion and knowledge about psychosis in family caregivers of people with schizophrenia compared to a passive online platform without interactive elements. However, another RCT³² found that an active online psychoeducation

website significantly improved knowledge about prognosis in family caregivers of people with schizophrenia compared to usual psychiatric care.

Furthermore, a study²⁴ showed that an active online relative support program delivered through a website had a trend to a shorter length of stay for people with schizophrenia. This finding aligns with a previous systematic review²⁶ revealing that online interventions (web/app-based) had an impact on fewer hospitalizations in people with severe psychiatric disorders compared to the usual care. This review noted that more RCTs are needed to fully understand the effectiveness of online interventions for severe mental disorders.

Due to methodological heterogeneity and the mainly single studies included in the review, it was impossible to assess the certainty of evidence using the GRADE approach. Standardized critical appraisal tools from JBI²⁷ were used to evaluate the methodological quality. Most of the RCTs included in the review demonstrated adequate overall methodological quality. Only one RCT³⁴ reported triple blinding, which involved blinding participants, intervention deliverers, and outcome assessors. The two other RCTs^{33,35} indicated blinding of outcome assessors. However, the other RCT³² did not mention blinding during the randomization process.

Limitations

While the findings of this review provide valuable insights, it is important to approach them with caution due to certain limitations. The limited number of studies included, and the inclusion of mainly single studies in the review restrict the generalizability of the findings. Additionally, the inclusion criteria were limited to studies published in English and Thai, and the lack of gray literature has led to publication bias. The valuable studies published in other languages or not included in traditional databases may have been overlooked. Furthermore, the inability to conduct a meta-analysis is due to methodological heterogeneity

across the studies. As a result, it was not possible to quantitatively pool the results, and instead, a narrative summary of the individual study findings was provided. It is important to note that this approach has limitations and should be interpreted cautiously. These limitations emphasize the need for further research to address these gaps and generate more robust and definitive evidence regarding the effectiveness of internet-based psychosocial interventions in supporting family caregivers of people with schizophrenia. Despite these limitations, our review still offers valuable insights into the effectiveness of internet-based psychosocial interventions for family caregivers of persons with schizophrenia.

Implications for Nursing Practice

The findings of this review indicate that internet-based psychosocial interventions can potentially be valuable resources for family caregivers of people with schizophrenia. These interventions offer the advantage of easy accessibility, as they can be accessed online and conveniently completed in the privacy of the caregiver's home. Nurses should consider integrating these interventions into mental healthcare facilities, allowing for online delivery at the patient's home or outpatient clinic settings to support family caregivers of people with schizophrenia.

However, it is important to note that further studies should be conducted to validate their effectiveness before implementing these interventions into routine care. Additional research is necessary to confirm the potential positive outcomes observed and ensure their suitability for widespread implementation in clinical settings.

Implications for Further Research

Further research is necessary to enhance our understanding of the effectiveness of internet-based psychosocial interventions in supporting family caregivers of people with schizophrenia. Conducting robust RCTs would be valuable in evaluating the impact of these interventions. It is crucial to address the limitations identified in this review, such as the limited number of studies, the inclusion of mainly single studies, and

the presence of methodological and data characteristic differences among the included studies.

Future research should prioritize larger sample sizes and ensure homogeneity by maintaining consistency in population characteristics, intervention approaches, comparison groups, and outcome measures across the studies. Such research will provide more reliable and generalizable results. Conducting high-quality research with rigorous methodologies will minimize the risk of bias and enhance the validity and reliability of the findings. Researchers should adhere to established research protocols, implement appropriate study designs, and utilize reliable measurement tools. Furthermore, conducting a meta-analysis by pooling the results is needed to provide a comprehensive overview of the effectiveness of internet-based psychosocial interventions. This meta-analysis can further improve the generalizability of the findings and enable researchers to draw more robust conclusions and make informed decisions based on a larger body of evidence.

Conclusion

This systematic review included five experimental studies that met the inclusion criteria. Due to methodological heterogeneity, a meta-analysis could not pool the results. Therefore, a narrative synthesis was used to evaluate the effectiveness of internet-based psychosocial interventions for each specific outcome in family caregivers of people with schizophrenia. Based on one study, we found that psychological distress was not improved by active online psychoeducation. However, the caregiving burden was improved by smartphone-based PBSP based on one study. Two studies reported expressed emotion; however, the results could not be combined due to methodological differences and contradictory findings. One study showed decreased expressed emotion by passive online psychoeducation, while another was not improved by active online psychoeducation. Two studies reported knowledge about psychosis, but the results were

contradictory for active online psychoeducation. One study did not show improvement, while the other showed improvement in knowledge about psychosis. Hospitalization duration was shorter for people with schizophrenia with passive online psychoeducation based on one study. Further studies, particularly robust RCTs with larger sample sizes and ensuring homogeneity, are required to confirm the effectiveness of internet-based psychosocial interventions in family caregivers of people with schizophrenia. Conducting a meta-analysis would be valuable to combine the definitive effects of the interventions before their implication into practice.

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Appendix

Table 1. Search strategy

MEDLINE (PubMed), Search conducted in June 2022

Search	Query	Records retrieved
#1	(caregivers [mh] OR caregiver* [tw] OR carer* [tw] OR family [mh] OR famil* [tw] OR informal* [tw] OR relative* [tw] OR spouses [mh] OR spouse* [tw] OR siblings [mh] OR sibling* [tw] OR partner* [tw]) AND (schizophrenia [mh] OR schizo* [tw] OR psychos* [tw] OR psychotic* [tw] OR severe mental illness* [tw])	2,456
#2	psychosocial intervention [mh] OR psychosocial* [tw] OR psychological* [tw] OR internet-based intervention [mh] OR "internet-based" [tw] OR internet* [tw] OR "web-based" [tw] OR online* [tw] OR virtual reality [mh] OR "virtual reality" [tw] OR telemedicine [mh] OR teleme* [tw] OR telehealth* [tw] OR eHealth* [tw] OR mHealth* [tw] OR "mobile phone*" [tw] OR smartphone* [tw] OR "mobile app*" [tw] OR apps* [tw] OR "social media*" [tw] OR "social network*" [tw] OR "computer assisted therap*" [tw] OR "digital technolog*" [tw]	38,256
#3	psychological distress [mh] OR distress* [tw] OR stress* [tw] OR caregiver burden [mh] OR burden* [tw] OR depression [mh] OR depression* [tw] OR expressed emotion [mh] OR "expressed emotion*" [tw] OR knowledge* [tw] OR hospitalization* [tw] OR hospitalization [mh]	42,019
#4	#1 AND #2 AND #3	292

Limited to publication date from 2010 to 2022;
 English and Thai language;
 Clinical Trial, Clinical Trial, Phase I, Clinical Trial, Phase II, Clinical Trial, Phase III, Clinical Trial, Phase IV,
 Controlled Clinical Trial, Randomized Controlled Trial publication type

Table 2. Assessment of methodological quality for RCTs

Citation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
Rotondi et al. (2010) ³²	U	U	Y	U	U	N	N	U	Y	Y	N	Y	N
Chien et al. (2020) ³³	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Budiono et al. (2021) ³⁴	Y	Y	Y	Y	Y	Y	Y	Y	Y	U	Y	Y	Y
Sin et al. (2022) ³⁵	Y	Y	Y	N	N	Y	Y	Y	Y	Y	U	Y	Y
%	75	75	100	25	25	75	75	75	100	75	50	100	75

Percentages indicate the proportion of questions answered Yes (Y).

N, No; U, Unclear; Y, Yes.

Critical appraisal criteria for RCTs²⁶: Q1. Was true randomization used for the assignment of participants to treatment groups? Q2. Was allocation to groups concealed? Q3. Were treatment groups similar at the baseline? Q4. Were participants blind to treatment assignment? Q5. Were those delivering treatment blind to treatment assignment? Q6. Were outcomes assessors blind to treatment assignment? Q7. Were treatment groups treated identically other than the intervention of interest? Q8. Was follow-up complete, and if not, were differences between groups in terms of their follow-up adequately described and analyzed? Q9. Were participants analyzed in the groups to which they were randomized? Q10. Were outcomes measured in the same way for treatment groups? Q11. Were outcomes measured in a reliable way? Q12. Was appropriate statistical analysis used? Q13. Was the trial design appropriate for the topic, and any deviations from the standard RCT design accounted for in the conduct and analysis?

Table 3. Assessment of methodological quality for quasi-experimental studies

Citation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Glynn et al. (2010) ²⁴	Y	Y	Y	Y	Y	Y	N	Y	Y
%	100	100	100	100	100	100	0	100	100

Percentages indicate the proportion of questions answered Yes (Y).

N, No; Y, Yes.

Critical appraisal criteria for quasi-experimental studies²⁶: Q1. Is it clear in the study what is the ‘cause’ and what is the ‘effect’ (i.e., there is no confusion about which variable comes first)? Q2. Were the participants included in any comparisons similar? Q3. Were the participants included in any comparisons receiving similar treatment/care other than the exposure or intervention of interest? Q4. Was there a control group? Q5. Were there multiple measurements of the outcome, both pre and post the intervention/exposure? Q6. Was follow-up complete, and if not, were differences between groups in terms of their follow-up adequately described and analyzed? Q7. Were the outcomes of participants included in any comparisons measured in the same way? Q8. Were outcomes measured in a reliable way? Q9. Was appropriate statistical analysis used?

Table 4. Characteristics of participants and outcome measures

Authors, Year, Country	Setting	Sample	Outcome measures
Rotondi et al. (2010) ³²	Online and outpatient clinic	A total of 24 informal supporters, including family and friends of people with schizophrenia.	The Knowledge About Schizophrenia Instrument was used to assess the clinical knowledge about illness among informal supporters of people with schizophrenia at baseline and six months post-baseline.
Chien et al. (2020) ³³ Indonesia	Online and outpatient clinic	Totally 114 family caregivers were primarily spouses or parents of people with early psychosis. They served as the primary caregiver, devoting over four hours daily to caring for their loved ones at home.	The Family Burden Interview Schedule (FBIS) was employed to assess the caregiving burden experienced by family caregivers of people with early psychosis. Measurements were taken at recruitment, one week, and six months post-intervention.
Budiono et al. (2021) ³⁴ Hong Kong	Fully online delivery to participants' homes	A total of 64 family caregivers were included, with 34 being parents, 15 spouses, 12 siblings, and three children of people with schizophrenia. Among them, 43 lived in the same household as their loved ones. Caregiving hours varied from 20 to 100 hours per week, with a mean of 59.73 hours.	The five-minute speech sample (FMSS) was utilized to assess expressed emotion, specifically criticism and emotional overinvolvement, among family caregivers of people with schizophrenia. This measurement was carried out during a single session conducted via Skype or another virtual call service 12 weeks post-intervention.
Sin et al. (2022) ³⁵ England	Fully online delivery to participants' homes	A total of 407 relatives and close friends of people with psychosis participated in the study. Most participants (n = 258, 63%) were parents, and 197 (49%) had been providing care for less than five years.	The Family Questionnaire (FQ) was utilized to assess expressed emotion, specifically criticism and over-involvement, among relatives and close friends of people with psychosis. The Mental Health Knowledge Schedule (MAKS) was employed to evaluate the mental health knowledge of the participants. These assessments were conducted at baseline, ten weeks, 20 weeks, and 40 weeks during the follow-up period.
Glynn et al. (2010) ²⁴ United States	Online and outpatient clinic	A total of 46 relatives of people with schizophrenia participated in the study. Among them, approximately 80% (n = 37) served as the primary support to their loved ones.	The Brief Symptom Inventory (BSI) was employed to assess distress in the subscales of anxiety and depression, which reflected psychological distress among relatives of people with schizophrenia. Measurements were taken at baseline, six and 12 months.

Supplement File

Excluded studies and reasons for excluding studies

Authors and Year	Title	Reasons for excluding studies
Ferré-Grau C, Raigal-Aran L, Lorca-Cabrera J, Ferré-Bergadá M, Lleixà-Fortuño M, Lluch-Canut MT, et al. (2019)	A multi-centre, randomized, 3-month study to evaluate the efficacy of a smartphone app to increase caregiver's positive mental health	Ineligible participant; the inclusion criteria of participants were primary, secondary, formal, and informal family caregivers of people with chronic diseases.
Lobban F, Akers N, Appelbe D, Chapman L, Collinge L, Dodd S, et al. (2020)	Clinical effectiveness of a web-based peer-supported self-management intervention for relatives of people with psychosis or bipolar (REACT): online, observer-blind, randomised controlled superiority trial	Ineligible participant; the inclusion criteria of participants were relatives or close friends of someone with psychosis or bipolar disorder.
K. Kaplan, Solomon, Salzer, & Brusilovskiy (2014)	Assessing an Internet-Based Parenting intervention for mothers with a serious mental illness: a randomized controlled trial	Ineligible participant; this study examined the effectiveness of internet parenting education and support intervention among mothers with serious mental illness (SMI).
Lobban F, Robinson H, Appelbe D, Barraclough J, Bedson E, Collinge L, et al. (2017)	Protocol for an online randomised controlled trial to evaluate the clinical and cost-effectiveness of a peer-supported self-management intervention for relatives of people with psychosis or bipolar disorder: Relatives Education And Coping Toolkit (REACT)	Ineligible participant; the inclusion criteria of participants were relative/ close friend of someone with psychosis or bipolar disorder.
Hasan AA, Callaghan P, Lymn JS. (2015)	Evaluation of the impact of a psycho-educational intervention for people diagnosed with schizophrenia and their primary caregivers in Jordan: a randomized controlled trial	Ineligible intervention; the procedure comprised a booklet form of psychoeducation, with follow-up phone calls. To be noted, phone calls may be available in the condition of no internet access.
Ata EE, Doğan S. (2018)	The effect of a brief cognitive behavioural stress management programme on mental status, coping with stress attitude and caregiver burden while caring for schizophrenic patients	Ineligible intervention; this study evaluated the effect of the in-person "Brief Cognitive Behavioural Stress Management Programme" (BCBSMP) session.
Hasan AA, Callaghan P, Lymn JS. (2014)	Evaluation of the impact of a psycho-educational intervention on knowledge levels and psychological outcomes for people diagnosed with Schizophrenia and their caregivers in Jordan: a randomized controlled trial	Ineligible intervention; same reason as Hasan, Callaghan, & Lymn (2015)

Supplement File

Excluded studies and reasons for excluding studies

Authors and Year	Title	Reasons for excluding studies
Tabeleão V, Tomasi E, de Avila Quevedo L. (2018)	A randomized, controlled trial of the effectiveness of a psychoeducational intervention on family caregivers of patients with mental disorders	Ineligible intervention; the intervention included six home visits of psychoeducational interventions by 10 psychologists with a standardized intervention model for each mental disorder.
Deane FP, Marshall S, Crowe T, White A, Kavanagh D. (2015)	A randomized controlled trial of a correspondence-based intervention for carers of relatives with psychosis	Ineligible intervention; the participants were mailed a psychoeducational self-paced booklet and correspondence-based interactive newsletters.
Gleeson J, Lederman R, Herrman H, Koval P, Eleftheriadis D, Bendall S, et al. (2017)	Moderated online social therapy for carers of young people recovering from first-episode psychosis: study protocol for a randomised controlled trial	This study protocol was registered on the Australian New Zealand Clinical Trial Registry (ACTRN), identifier: ACTRN 12616000968471, on July 22, 2016. According to searching, we found that the study results were yet to be available, and there still needed to be published in peer-reviewed journals or gray literature at the time of the study.
Sin J, Henderson C, Cornelius V, Chen T, Elkes J, Woodham LA, et al. (2020)	COPE-support – a multi-component digital intervention for family carers for people affected by psychosis: study protocol for a randomized controlled trial	This study was a study protocol. Nevertheless, according to searching, we found that the study results were published in peer-reviewed journals, which as Sin et al. (2022), which met the inclusion criteria and thus included in this systematic review.
Sin J, Henderson C, Pinfold V, Norman I. (2013)	The E Sibling Project – exploratory randomised controlled trial of an online multi-component psychoeducational intervention for siblings	This study was a study protocol. According to searching, the study results have been published in peer-reviewed journals titled “Wellbeing, mental health knowledge and caregiving experiences of siblings of people with psychosis, compared to their peers and parents: an exploratory study” (Sin et al., 2016). However, this study did not meet the inclusion criteria regarding the study design was a cross-sectional correlational study.

Supplement File

Excluded studies and reasons for excluding studies

Authors and Year	Title	Reasons for excluding studies
Lemetyinen H, Onwumere J, Drake RJ, Abel K, Haigh C, Moulton G, et al. (2018)	Co-production and evaluation of an e-learning resource to improve African-Caribbean families' knowledge about schizophrenia and engagement with services: a pilot randomised controlled trial protocol	This study protocol was registered on the International Standard Randomised Controlled Trial Number (ISRCTN), identifier: ISRCTN11394005, on March 20, 2018. According to searching, we found that the study results were yet to be available and still needed to be published in peer-reviewed journals or gray literature at the time of the study.
Yu Y, Li T, Xi S, Li Y, Xiao X, Yang M, et al. (2020)	Assessing a WeChat-based integrative family intervention (WIFI) for schizophrenia: protocol for a stepped-wedge cluster randomized trial	This study protocol was registered on ClinicalTrials.gov, identifier: NCT04393896, on May 19, 2020. According to searching, we found that the study results were yet to be available, and there still needed to be published in peer-reviewed journals or gray literature at the time of the study.
Onwumere J, Amaral F, Valmaggia LR. (2018)	Digital technology for caregivers of people with psychosis: systematic review	This study was a systematic review.

ประสิทธิผลของการบำบัดทางจิตสังคมโดยใช้อินเทอร์เน็ตเป็นฐานต่อความทุกข์ทางใจ การดูแล การแสดงออกทางอารมณ์ และความรู้เกี่ยวกับโรคจิต ในผู้ดูแลในครอบครัวของผู้ที่เป็นโรคจิตเภท : การทบทวนอย่างเป็นระบบ

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บทคัดย่อ: การบำบัดทางจิตสังคมโดยใช้อินเทอร์เน็ตเป็นฐานเป็นทางเลือกหนึ่งสำหรับญาติผู้ดูแลผู้ที่เป็นโรคจิตเภท การทบทวนอย่างเป็นระบบครั้งนี้ มีวัตถุประสงค์เพื่อประเมินประสิทธิผลของการบำบัดทางจิตสังคมโดยใช้อินเทอร์เน็ตเป็นฐาน ผู้วิจัยสืบค้นและคัดเลือกวิจัยในฐานข้อมูลอิเล็กทรอนิกส์จำนวน 6 ฐาน (PubMed, CINAHL, EMBASE, Scopus, Cochrane Library, และ ProQuest) ตั้งแต่ ปี พ.ศ. 2553 ถึง พ.ศ. 2565 การทบทวนครั้งนี้ใช้ขั้นตอนของเจบีโอและรายงานผลตามแนวทางของ PRISMA

พบงานวิจัยที่เข้าเกณฑ์จำนวน 5 เรื่อง แต่เนื่องจากมีความแตกต่างกันด้านคลินิก จึงไม่สามารถวิเคราะห์อภิमानได้ ผู้วิจัยจึงใช้การสังเคราะห์เชิงเนื้อหา และพบว่า การบำบัดทางจิตสังคมโดยใช้อินเทอร์เน็ตเป็นฐานไม่มีผลในการลดความทุกข์ทางจิตใจ ในขณะที่สามารถลดภาระการดูแลได้ในการศึกษาวิจัยเชิงทดลอง ส่วนการแสดงออกทางอารมณ์ พบว่ามีผลการศึกษาที่ขัดแย้งกันในสองการศึกษา แต่ไม่สามารถนำมารวมกันได้เพราะใช้เครื่องมือวัดผลลัพธ์ที่ต่างกัน เช่นเดียวกับความรู้เกี่ยวกับโรคจิตในผู้ดูแลในครอบครัวผู้ที่เป็นโรคจิตเภทที่พบว่าได้ผลที่ขัดแย้งกัน และหนึ่งการศึกษาพบว่า การบำบัดทางจิตสังคมโดยใช้อินเทอร์เน็ตเป็นฐานไม่มีผลต่อจำนวนวันของการนอนในโรงพยาบาลของผู้ที่เป็นโรคจิตเภท

งานวิจัยที่คัดเข้า 5 เรื่องเป็นงานวิจัยเชิงทดลองสี่เรื่องและเชิงกึ่งทดลองหนึ่งเรื่อง โดยหนึ่งในงานวิจัยเชิงทดลองนั้นไม่มีการปกปิดในการสุ่มกลุ่มตัวอย่าง ก่อให้เกิดอคติด้านการดำเนินการวิจัยและการรวบรวมผลลัพธ์ได้ การวิจัยเชิงทดลองแบบควบคุมอย่างเข้มงวดจึงสมควรทำในอนาคตและควรใช้เครื่องมือวัดผลลัพธ์ที่เหมือนกันเพื่อจะได้มีงานวิจัยที่มีความเป็นเอกพันธ์ และสามารถนำมาสังเคราะห์อภิमानเพื่อดูประสิทธิผลของการบำบัดทางจิตสังคมโดยใช้อินเทอร์เน็ตเป็นฐานก่อนที่จะแนะนำให้ไปใช้ในคลินิกต่อไป

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คำสำคัญ: การดูแล การแสดงออกทางอารมณ์ ผู้ดูแลในครอบครัว การใช้อินเทอร์เน็ตเป็นฐาน ความทุกข์ทางใจ การบำบัดทางจิตสังคม ความรู้เกี่ยวกับโรคจิต จิตเภท การทบทวนอย่างเป็นระบบ

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