# Digital Mental Health Interventions: A Comprehensive Systematic Review

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# Abstract

With the emergence of smartphone applications, chatbots, and AI-powered technologies in recent years, digital mental health interventions have grown in popularity. The purpose of this systematic review was to assess the efficacy and morality of these technologies in delivering care and support for mental health. A thorough review of the relevant research revealed that digital treatments in mental health have the potential for increasing the availability and cost of mental health care. However, difficulties with data privacy, ethical issues, and the requirement for more study were also noted. This study gives recommendations for future research and practice as well as insightful information about the state of digital mental health interventions now.

***Keywords:*** *Digital health, AI-powered technologies, mental health treatment, costs, ethical issues, and digital interventions*

## 1.0 Introduction

Millions of individuals worldwide are impacted by mental health disorders, which have become an urgent global concern. The World Health Organization (WHO) has acknowledged that depression in particular has become the main contributor to disability, highlighting the urgent need for readily available and efficient mental health interventions. Although effective, conventional methods of mental health care can encounter considerable obstacles in terms of availability, cost, and the lack of mental health experts (1). The field of digital mental health interventions has experienced explosive expansion in response to these difficulties.

The phrase "digital mental health interventions" refers to a broad range of technology-based approaches to deal with mental health issues. These interventions can range from chatbots and AI-

driven tools to web platforms and mobile applications (apps), all of which are intended to offer support and therapy to those who are dealing with mental health concerns. These innovations promise to increase access to mental health services, lessen the stigma around asking for help, and provide affordable solutions. (2)

This systematic review explores the challenges and ethical issues that digital mental health interventions raise while examining their effectiveness. We hope to advance knowledge of the possibilities and constraints of these technologies in tackling the worldwide mental health epidemic by examining this complex terrain.

## 1.1 Objectives

Three goals were set for this systematic review:

1. Assess the Performance of Chatbots, Mobile Apps, and AI-Powered Tools in the Delivery of Mental Health Support and Treatment:

- We want to find out how much chatbots, smartphone apps, and other AI-powered solutions aid in the support and care of people with mental health difficulties.

- We want to evaluate the effects of these digital interventions on lowering the symptoms of different mental health problems, such as anxiety, depression, and stress, by reviewing pertinent papers.

- This goal will provide light on these therapies' potential efficacy as well as their function in enhancing mental health outcomes.

2. Investigate the Ethical Consequences of These Digital Mental Health Interventions:

- We will examine the ethical implications of digital mental health interventions in addition to assessing their efficacy.

- This investigation will cover topics such data privacy, consent, security, building therapeutic partnerships, and risk of harm.

- We hope to clarify the obligations and difficulties experienced by those who provide digital mental health services by addressing these ethical issues.

3. Identifying Gaps in the Literature and Outlining Prospective Research and Practice Areas

- Given how quickly the field of digital mental health therapies is developing, there probably are gaps and areas that need more research.

- In order to improve the use of these technologies in mental health care, we plan to identify these gaps and recommend relevant directions for further study, policy development, and clinical practice.

- This goal intends to offer a development and improvement roadmap for digital mental health interventions in the upcoming years.

## 2.0 Methods

### 2.1 Search Strategy

A thorough search of academic databases was done in order to ensure a rigorous and thorough review of digital mental health interventions. These three databases PubMed, PsycINFO, and Google Scholar were used in the search. These databases were chosen for their comprehensive coverage of publications from peer-reviewed journals in the fields of psychology, technology, and mental health. In order to provide a current snapshot of the state of digital mental health therapies, the search covered the years 2010 through 2022. The chosen historical period is in line with modern ethical concerns and the rapid expansion of digital mental health solutions, (Table 1).

To achieve inclusion, the search strategy included a variety of pertinent terms and phrases. The following expressions served as the main search terms:

- "Digital mental health interventions"
- "Mobile apps"
- "Chatbots"
- "AI-driven tools"
- "Effectiveness"
- "Ethics"

These keywords were combined in different ways to find a wide range of papers pertinent to the goals of this systematic review. It is crucial to remember that, despite the search strategy's best efforts to be exhaustive, there may still be publications that were unintentionally overlooked, and the review may not have included all relevant studies.

### 2.2 Inclusion Criteria

The following inclusion criteria were set in order to streamline the selection process and guarantee the relevance of the included studies:

1. **Studies Published in English:** Studies that were published in English received priority for inclusion because it is the predominant language used in scientific discourse. This choice was taken to speed up the evaluation procedure and guarantee the maximum level of accessibility and comprehension for the study team.

2. **Studies Assessing the Ethical and Effectiveness of Chatbots, Mobile Apps, and AI-Powered Tools in Mental Health Support:** We only considered research that expressly evaluated the efficacy and moral implications of digital mental health therapies. This criterion was necessary to keep the systematic review's core goals in the forefront of consideration.

3. **Primary Research Articles, Systematic Reviews, and Meta-Analyses:** Articles that fall within the categories of primary research, systematic reviews, and meta-analyses were taken into consideration for inclusion. These study kinds were chosen to guarantee the inclusion of the most reliable and illuminating sources.

4. **Studies Involving Human Participants:** Only research using human participants were included in order to retain therapeutic relevance and applicability. These studies were anticipated to specifically investigate the results and experiences of individuals' experiences with digital therapies for mental health.

## 2.3 Data Extraction and Synthesis

To carefully collect pertinent data from the chosen studies, a data extraction procedure was used. The following significant findings from each study were taken:

**Study Design:** Details of the study's methodology, including whether it was an experimental trial, an observational study, a qualitative investigation, a systematic review, or a meta-analysis.

**Sample Size:** To comprehend the size and scope of the research, the number of participants in each study was noted.

**Intervention Type:** Information about the digital mental health intervention that was the subject of the inquiry, including its type (app, chatbot, or AI-powered tool).

**Outcomes:** Information on the study's main conclusions, such as any effects on mental health disorders, symptom relief, or general wellbeing.

The gathered information was then combined to offer a thorough assessment of the situation of digital mental health therapies today. This synthesis sought to analyze the combined findings of the studies that were included in order to make meaningful judgments about the efficacy and moral implications of these therapies.

**Table 1: Studies selected for the systematic review of digital mental health interventions**

| Author(s) | Year | Title | Outcomes |
|---|---|---|---|
| Lattie EG, Adkins EC, et al. | 2019 | Digital Mental Health Interventions for Depression, Anxiety, and Enhancement of Psychological Well-Being Among College Students: Systematic Review | Systematic review of digital mental health interventions for college students. |
| Borghouts J, Eikey E, et al. | 2021 | Barriers to and Facilitators of User Engagement With Digital Mental Health Interventions: Systematic Review | Systematic review of barriers and facilitators to user engagement with digital mental health interventions. |
| Garrido S, Millington C, et al. | 2019 | What Works and What Doesn't Work? A Systematic Review of Digital Mental Health Interventions for Depression and Anxiety in Young People | Systematic review of the effectiveness of digital mental health interventions for young people with depression and anxiety. |
| Strauss P, Morgan H, et al. | 2019 | Trans and gender diverse young people's attitudes towards | Qualitative investigation of the attitudes of trans and gender |

| | | | game-based digital mental health interventions: A qualitative investigation | diverse young people toward game-based digital mental health interventions. |
|---|---|---|---|---|
| Graham AK, Lattie EG, et al. | 2020 | | Implementation strategies for digital mental health interventions in health care settings | Strategies for implementing digital mental health interventions in healthcare settings. |
| Boucher EM, Harake NR, et al. | 2021 | | Artificially intelligent chatbots in digital mental health interventions: a review | Review of the use of AI chatbots in digital mental health interventions. |
| Kretzschmar K, Tyroll H, et al. | 2019 | | Can Your Phone Be Your Therapist? Young People's Ethical Perspectives on the Use of Fully Automated Conversational Agents (Chatbots) in Mental Health Support | Ethical perspectives of young people on using chatbots in mental health support. |
| Bendig E, Erb B, et al. | 2019 | | The Next Generation: Chatbots in Clinical Psychology and Psychotherapy to Foster Mental Health – A Scoping Review | Scoping review of chatbots in clinical psychology and psychotherapy for mental health. |
| Dash S, Shakyawar SK, et al. | 2019 | | Big data in healthcare: management, analysis and future prospects | Discusses the role of big data in healthcare management and analysis. |
| Zhou X, Snoswell CL, et al. | 2020 | | The role of telehealth in reducing the mental health burden from COVID-19 | Explores the role of telehealth in addressing mental health challenges during the COVID-19 pandemic. |
| Bettis AH, Burke TA, et al. | 2021 | | Digital Technologies for Emotion-Regulation Assessment and Intervention: A Conceptual Review | Conceptual review of digital technologies for emotion-regulation assessment and intervention. |
| Berry N, Lobban F, Bucci S. | 2019 | | A qualitative exploration of service user views about using digital health interventions for self-management in severe mental health problems | Qualitative exploration of service user views on using digital health interventions for self-management in severe mental health problems. |
| Perski O, Blandford A, et al. | 2016 | | Conceptualizing engagement with digital behavior change interventions: a systematic review using principles from | Conceptualization of engagement with digital behavior change interventions. |

| | | critical interpretive synthesis | |
|---|---|---|---|
| D'Alfonso S, Lederman R, et al. | 2020 | The Digital Therapeutic Alliance and Human-Computer Interaction | Discusses the digital therapeutic alliance and human-computer interaction. |
| Torous J, Wisniewski H, et al. | 2019 | Creating a Digital Health Smartphone App and Digital Phenotyping Platform for Mental Health and Diverse Healthcare Needs: an Interdisciplinary and Collaborative Approach | Describes the creation of a digital health smartphone app and digital phenotyping platform for mental health. |
| Alvarez-Jimenez M, Rice S, et al. | 2020 | A Novel Multimodal Digital Service (Moderated Online Social Therapy+) for Help-Seeking Young People Experiencing Mental Ill-Health: Pilot Evaluation Within a National Youth E-Mental Health Service | Pilot evaluation of a multimodal digital service for young people with mental health issues. |
| Hornstein S, Forman-Hoffman V, et al. | 2021 | Predicting therapy outcome in a digital mental health intervention for depression and anxiety: A machine learning approach | Discusses predicting therapy outcomes in a digital mental health intervention using machine learning. |
| Lattie EG, Adkins EC, et al. | 2019 | Digital Mental Health Interventions for Depression, Anxiety, and Enhancement of Psychological Well-Being Among College Students: Systematic Review | Systematic review of digital mental health interventions for college students. |
| Scholten H, Granic I. | 2019 | Use of the Principles of Design Thinking to Address Limitations of Digital Mental Health Interventions for Youth: Viewpoint | Discusses the use of design thinking principles to address limitations of digital mental health interventions for youth. |
| Chandrashekar P. | 2018 | Do mental health mobile apps work: evidence and recommendations for designing high-efficacy mental health mobile apps | Examines the effectiveness of mental health mobile apps and provides recommendations for designing high-efficacy apps. |

| | | | |
|---|---|---|---|
| Baillie AJ, Rapee RM. | 2004 | Predicting who benefits from psychoeducation and self-help for panic attacks | Predicts who benefits from psychoeducation and self-help for panic attacks. |
| Rathnayaka P, Mills N, et al. | 2022 | A Mental Health Chatbot with Cognitive Skills for Personalized Behavioral Activation and Remote Health Monitoring | Describes a mental health chatbot with cognitive skills for personalized behavioral activation and remote health monitoring. |
| Andersson G, Titov N. | 2014 | Advantages and limitations of Internet-based interventions for common mental disorders | Discusses the advantages and limitations of internet-based interventions for common mental disorders. |
| Chow J, Xu L. | 2021 | Chatbot for Healthcare and Oncology Applications Using Artificial Intelligence and Machine Learning (Preprint) | Discusses the use of chatbots in healthcare and oncology applications using AI and machine learning. |

## 3.0 Effectiveness of Digital Mental Health Interventions

Mobile applications, chatbots, and AI-driven solutions for mental health interventions have drawn a lot of attention because of their potential to improve mental health outcomes. The effectiveness of various interventions will be discussed in this section, along with the state of the research and how they affect people who are struggling with mental health issues.

### 3.1 Mobile Apps

### 3.1.1 Efficacy in Symptom Reduction

The effectiveness of mental health apps in easing the signs of anxiety, despair, and stress is backed by a sizable body of research. Numerous therapeutic tools, such as mood tracking, cognitive-behavioral exercises, meditation, and relaxation methods are frequently included by these apps. These tools are available at any time, giving users the freedom to self-direct interventions that fit their needs and schedules. These apps' accessibility on smartphones and other mobile devices has widened access to mental health care, especially for those who might have difficulty accessing conventional in-person therapy.(3)(21)

### 3.1.2 Psychoeducation and Self-Help

A wide range of self-help tools and psychoeducational content are available in mobile apps. Users can practice mindfulness techniques, cognitive-behavioral therapy (CBT) exercises at their own speed, and access psychoeducational resources to help them better understand and take care of their mental health. These resources give users the information and abilities needed to manage their symptoms and develop resilience. Many people find that this educational component improves their general mental health literacy and is an essential addition to regular therapy. (4)(22)

### 3.1.3 Remote Monitoring

The capability of remote monitoring is a key benefit of mobile apps. People can monitor changes in their emotions, behaviors, and treatment outcomes throughout time. Since it allows for the early detection of relapses and the modification of treatment regimens, this data can be extremely beneficial for both users and mental health specialists. A person's capacity to remotely monitor their mental health is especially important if they have time or geographic restrictions that could prevent them from attending regular therapy sessions. (5)(23)

### 3.1.4 Need for Standardization

Even though the promise of mental health applications is encouraging, not all of them are supported by research. There are many apps on the market, but they might range widely in terms of effectiveness and quality. The need for standardized testing and quality assurance in the creation and dissemination of mental health apps is highlighted by this variability. To guarantee that consumers may confidently rely on these tools to improve their mental health, rigorous review and certification processes are required. (5)

## 3.2 Chatbots

### 3.2.1 Immediate Emotional Support

The ability of chatbots to offer users immediate emotional assistance has been greatly shown. Natural language processing and AI-driven algorithms have allowed for improvements in chatbot conversational capabilities. Users who need assistance navigating times of distress, loneliness, or anxiety can access this real-time, on-demand support. For people who may not have access to quick human care, chatbots' availability at any hour of the day or night can be very helpful. (7)

### 3.2.2 Personalized Interactions

Another significant benefit of chatbots is that they are personalized. These AI-powered solutions may adjust to the requirements and preferences of specific users, offering specialized suggestions and responses. This degree of personalisation can foster a feeling of understanding and connection, which can improve the user experience and possibly have a positive impact on mental health outcomes. (9)(23)

### 3.2.3 Limited Long-Term Evidence and Quality Concerns

While chatbots have the ability to provide quick emotional assistance, there isn't enough long-term data to substantiate their efficacy. To ascertain the long-term effects of chatbot therapies on mental health outcomes, more study must be done. Concerns emerge as well about the caliber of responses produced by chatbots. The problem of ensuring that these automated interactions are reliable, moral, and beneficial to users' well-being demands constant validation and improvement. (8)

## 3.3 AI-Driven Tools

Tools powered by artificial intelligence are a cutting-edge method of offering mental health support. These tools hold enormous potential for early identification of mental health concerns, enabling prompt and efficient care. They frequently use predictive analytics and data-driven insights. We will look into the capabilities and factors related to AI-driven mental health interventions in this part.

### 3.3.1 Early Identification of Mental Health Issues

AI-driven solutions have the ability to spot mental health disorders before they become serious. They employ algorithms and predictive analytics to examine big datasets that could contain different user data types, such text, speech, or physiological measurements. These tools help alert people, carers, or healthcare practitioners to potential mental health difficulties before they worsen by spotting trends, deviations, and risk factors. Early detection is essential because it allows for prompt action, which can greatly enhance results and avert disasters. (10)

### 3.3.2 Crisis Prediction and Prevention

The ability of AI-driven solutions to anticipate and avert mental health crises in high-risk persons is one of its most encouraging features. These instruments can continuously observe people, seeking for indications of distress or behavioral changes that might point to a developing crisis. For instance, an AI-driven system may alert a user or suggest professional support if it notices a rapid shift in sleep habits or a rise in keywords associated with stress in their text messages. AI-driven solutions have the ability to save lives and reduce suffering by foreseeing and responding to impending catastrophes early on. (11)

### Ethical Considerations

Digital mental health interventions must take ethical considerations into account in order to provide responsible and respectful care to those who need it. In this section, we examine a number of ethical issues related to these interventions, such as data privacy, therapeutic relationships, and the significance of equity and accessibility.

### 4.1 Data Privacy

### 4.1.1 Collection of Sensitive User Data

Mobile applications, chatbots, and AI-driven tools used in digital mental health interventions gather a variety of sensitive user data. Personal information, health-related information, and even emotional states could be included in this data. Although this data is essential for adjusting interventions and keeping track of success, it also raises valid privacy and security issues. (12)

### 4.1.2 Regulatory Frameworks and Compliance

Different legislative frameworks have been devised to protect user data in response to these privacy issues. The Health Insurance Portability and Accountability Act (HIPAA) in the United States and the General Data Protection Regulation (GDPR) in the European Union are two notable examples. These laws include detailed instructions for the gathering, storing, and handling of personal health information. However, there may be differences in how different digital mental health service providers adhere to these rules.(13)

### 4.1.3 Transparency and Informed Consent

Transparency and informed consent are necessary in order to protect users' data privacy. The collection, processing, and use of users' data must be properly disclosed to them. Individuals must give their consent after being informed of the benefits and potential risks of utilizing certain technology. Additionally, it enables individuals to decide on their participation with knowledge. Building trust and maintaining the moral application of these interventions depend on open disclosure about data privacy policies. (14)

### 4.2 Therapeutic Relationships

### 4.2.1 Creating Therapeutic Relationships

Tools powered by AI and chatbots can build therapeutic connections with people. Although not the same as human connections, these partnerships can provide emotional support, direction, and a sense of community. Users who grow to trust these tools may confide in them and seek advice as well as discuss problems about their mental health. (16)(25)

### 4.2.2 Boundaries and Potential for Harm

It's essential to establish and uphold limits in these therapeutic partnerships. While chatbots and AI-driven solutions can offer helpful assistance, they cannot replace human clinicians. It is important to be aware of and take steps to prevent any potential harm, especially if these tools offer bad or inaccurate advice.

### 4.2.3 The Role of Human Clinicians

The function of human therapists in digital mental health interventions should be specified by ethical rules. It is crucial to decide when and how a human physician should assist in order to guarantee user security and welfare. When a user should be sent to a human expert and what such professionals must do to supervise AI-driven treatments should be included in the recommendations. (15)(24)

### 4.3 Equity and Accessibility

### 4.3.1 Exacerbating Health Disparities

If digital mental health therapies are not available to everyone, especially marginalized people, they could make health inequities worse. People who are already at risk for mental health problems may become even more marginalized as a result of the digital gap, which includes restrictions on access to technology, internet connectivity, and digital competence. (17)

### 4.3.2 Efforts for Inclusivity and Affordability

In the area of digital mental health therapies, efforts are required to guarantee affordability and inclusion. This entails meeting the requirements of various populations and making these interventions accessible to people with little resources. It also requires offering assistance to people who might encounter linguistic, cultural, or other challenges to receiving mental health care online. (18)

### Discussion

The subject of digital mental health interventions is explored in depth, along with its promise, difficulties, and potential future paths. In light of this, we assess how mobile apps, chatbots, and AI-powered technologies can increase accessibility and affordability while simultaneously taking into account any necessary ethical considerations.

### Accessibility and Affordability Enhancement

A ground-breaking opportunity to improve the availability and affordability of mental health care is provided by digital mental health therapies. These initiatives remove physical and logistical obstacles, enabling people to get assistance, information, and interventions wherever they are. Particularly mobile apps give consumers access to mental health services, enabling them to take

charge of their well-being. These treatments can fill the gap and provide essential assistance for those who live in distant places or have limited access to mental health specialists. (19)

By offering in-the-moment emotional support, chatbots and AI-driven solutions broaden the definition of accessibility. Users can get assistance at any time, whether they need it for a crisis or just to talk to someone. This immediate accessibility can be extremely helpful in stressful situations. (20)

One important benefit of these digital systems is the opportunity for early intervention. AI-driven technologies can continuously monitor users, picking up on early indications of mental health problems and providing prompt support. These interventions are a crucial addition to conventional care since they can lessen the severity of mental health issues and avert emergencies. (20)

### Ethical Concerns

Although digital solutions for mental health show considerable promise, they are not without ethical issues. These worries cover a number of crucial topics:

**Data Privacy:** Serious questions concerning data privacy and security are raised by the initiatives' acquisition of sensitive user data. Data breaches or unauthorized access can have serious repercussions because personal information about users, their health information, and their emotional states are frequently processed. It is crucial to follow strict data protection laws and uphold open data practices in order to ensure user trust and secure their privacy.

**Therapeutic Relationships:** There are significant ethical concerns raised by the potential for chatbots and AI-driven systems to establish therapeutic connections. The function of human clinicians in these partnerships must be stated, as well as boundaries and the possibility for harm. Although these technologies can provide assistance, they cannot replace human therapists, and the guidelines should state when such intervention is required.

**Equity and Accessibility:** It's critical to avoid escalating already-existing health disparities while we work towards greater accessibility. Vulnerable people may become even more marginalized as a result of the digital divide, which includes obstacles like technology access and digital literacy. All users need to be supported in a way that is inclusive, affordable, and culturally appropriate.

### Future Directions and Research Needs

The literature now available on digital interventions for mental health emphasizes how they might enhance mental health services. However, more research and development are needed in a number of areas.

**Long-Term Studies:** Although early research points to the advantages of these therapies, there are surprisingly few long-term studies available. Long-term study is necessary to evaluate the influence on users' mental health and the maintained effectiveness. The advantages and constraints of these tools can be better understood by tracking results and experiences over long time periods.

**Development of Ethical Guidelines:** The creation of ethical guidelines is necessary in order to manage the intricate ethical issues raised by these interventions. Data privacy, therapeutic interactions, equity, and accessibility should all be covered by these rules, which will serve as a framework for ethical practices in the area of digital mental health.

**Integration with Traditional Care:** A dynamic integration of digital interventions with conventional in-person therapy is expected to be part of the future of mental health care. There is

still much to learn about how these two techniques might work together to deliver comprehensive care.

## 5.0 Conclusion

Mobile applications, chatbots, and AI-driven tools used in digital mental health interventions have the potential to improve the effectiveness and accessibility of mental health therapy. With the help of these cutting-edge technology, individuals may take control of their mental health in a society that is always connected. The ethical aspects of these interventions are, nonetheless, of utmost significance, as this comprehensive study has shown. As digital technologies gather and handle sensitive data, protecting user safety and privacy is crucial. The review also emphasizes the need for more investigation, particularly long-term studies, as well as the creation of thorough ethical guidelines in order to fully realize the promise of these technologies in promoting mental health support.

The proper development and integration of digital mental health interventions into a broad continuum of mental health care is essential to their future. Our awareness of the ethical issues that surround technology must also advance along with it. The field of digital mental health interventions may continue to grow and provide crucial support to those struggling with mental health issues by addressing these ethical issues, performing thorough research, and creating clear rules.

## 6.0 Recommendations

A dynamic and developing field, digital mental health interventions have the potential to greatly improve mental health care. This comprehensive review has shown that in order to maximise their advantages and guarantee responsible implementation, various areas need attention. The following are some important suggestions to direct the creation and application of digital mental health interventions:

**1. Conduct Long-Term Studies:** Long-term research are essential to get a deeper understanding of the ongoing efficacy of digital mental health therapies. Long-term outcomes and user experiences should be tracked in this research, providing information on the long-term effects of these interventions on people's mental health. In order to make sure that the advantages of these therapies are not transitory, longitudinal research can assist in identifying any potential differences in effectiveness over time.

**2. Develop Standardized Guidelines for Data Privacy and Security:** Because the information gathered and used in digital mental health interventions is sensitive, standardized guidelines for data privacy and security must be created and put into use. These rules ought to guarantee the security of user information, the reduction of data breaches, and the users' full control over their own personal information. To uphold the highest levels of data privacy, it is important to adhere to laws like the General Data privacy Regulation (GDPR) and the Health Insurance Portability and Accountability Act (HIPAA).

**3. Explore Integration with Traditional Mental Health Care:** Digital treatments for mental health should not be seen as stand-alone fixes but rather as valuable parts of a whole system of mental health care. Investigating how to combine these digital interventions with conventional mental health care can offer patients a more complete and individualized support network. In order to provide a fluid exchange of data and assistance between the two modalities, this integration may

require specifying the responsibilities of human clinicians in charge of managing digital interventions.

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