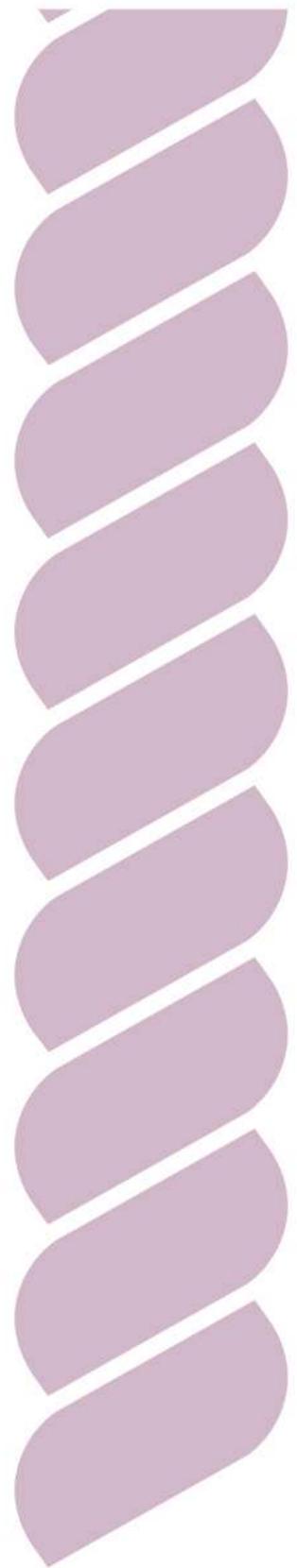


Effectiveness of e-mental health approaches

Rapid review



**Te Pou o te
Whakaaro Nui**

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Contents

Acknowledgements	3
List of tables	5
Executive summary	4
Effective e-mental health approaches	6
Best practice in evaluating and monitoring e-therapy tools	7
Effectiveness of e-mental health for specific population groups	7
Key evidence gaps	8
Conclusion.....	8
Background	9
Purpose & objectives.....	9
Method	10
Literature search.....	10
Measures	10
Analysis.....	10
Results	12
Effective e-mental health approaches	12
Computerised and internet-based interventions.....	12
Mobile phone.....	16
Game-based approaches.....	17
Summary	17
Best practice in evaluating and monitoring e-therapy tools	18
Study design	18
Participants.....	19
Intervention.....	19
Outcomes	19
Analysis.....	20
Effectiveness of e-mental health for specific populations	21
Children	21
Youth.....	21
Indigenous populations	22
Prisoners	24
Key evidence gaps	25
Gaps in knowledge.....	25
Gaps in research methodology.....	26
Discussion	27
Effective mental health approaches	27
Best practice in evaluating and monitoring e-therapy tools	28
Effectiveness of e-mental health for specific population groups	28
Key evidence gaps	28
Conclusion.....	29
Appendix: Systematic reviews and meta-analyses for the effectiveness of e-mental health approaches	30
References	51

List of tables

Table 1. *Effect Sizes of E-Mental Health Approaches (Including Guided and Unguided) on Depression and Anxiety Outcomes Compared to Control Conditions (Including Active/Non-Active Waitlist Controls, and Alternative Treatments)* 18

Table 2. *Effect Sizes of Internet-Based Interventions (Including Guided and Unguided) on Substance Use Outcomes Compared to Control Conditions (Including Active/Non-Active Waitlist Controls, and Alternative Treatments)*..... 18

Table 3. *Key Evidence Gaps in Research Methodology and Knowledge for E-Mental Health Approaches* 25

Table 4. *Systematic Reviews and Meta-analyses for the Effectiveness of E-Mental Health Approaches* 30

Executive summary

The purpose of this rapid review is to provide current evidence on e-mental health approaches in responding to mild to moderate mental health issues (particularly depression and anxiety).

Specific objectives are outlined below.

1. What e-mental health approaches have proven effective in responding to mild to moderate mental health issues and substance use problems (including approaches to reduce symptoms and impacts of existing mental health problems, and approaches to promote and enhance resilience)?
2. What is the current best practice internationally in evaluating and monitoring the use of e-therapy tools (including platforms and portals)?
3. What is the evidence of effectiveness of e-mental health for specific population groups (e.g., children, youth and emerging adults, indigenous populations (in particular Māori and Pacific youth if available) and prisoners)?
4. What are the gaps in evidence where testing through a pilot may contribute to building an evidence base?

This rapid review was based on systematic reviews and meta-analyses identified via the Ministry of Health's database searches, and an existing rapid review published by the Mental Health Commission of Canada (Wozney et al., 2017). Brief literature scans were also undertaken to identify recent studies for population specific groups.

Effective e-mental health approaches

A total of 43 systematic reviews and meta-analyses were included on the effectiveness of e-mental health approaches. Overall, it was difficult to isolate individual effects as the reviews often incorporated a mix of intervention features and control conditions in their analyses.

Compared to control conditions, moderate to large effects were identified for:

- computerised cognitive behaviour therapy (CBT) interventions on youth anxiety and depression outcomes
- computerised CBT interventions on adult anxiety outcomes
- mobile messages on youth alcohol consumption
- game-based interventions on adult and youth depression
- virtual reality exposure therapy on adult social anxiety disorder.

Small to moderate effects were identified for:

- computerised CBT interventions on adult depression outcomes
- mobile or smartphone applications on adult and youth depression and anxiety outcomes
- computerised acceptance and commitment therapy and mindfulness on adult depression outcomes.

Reviews indicate effect sizes are influenced by clinician or other guidance, length of intervention, comparison to waitlist or treatment as usual. Findings suggest guided interventions have a larger effect on outcomes than unguided interventions (see for example Baumeister et al., 2014). For example, drop-

out rates for largely unguided computerised interventions for children and youth may be as high as 40 per cent. However, this effect may not apply to smartphone interventions, as apps that did not involve human contact appeared to have a greater impact on depression than those which did.

Findings indicate computerised and internet-based interventions have little or no effect on measures of substance use, thoughts about suicide or resiliency.

Best practice in evaluating and monitoring e-therapy tools

This rapid review found e-mental health approaches were evaluated and monitored through RCTs, like traditional interventions.

Best practice recommendations for the evaluation and monitoring e-therapy tools include:

- between groups designs (ideally, intervention group vs. the most cost-effective alternative treatment)
- assessments at baseline, post-intervention, and long-term follow up (e.g., after six months)
- clearly identified target group and participant screening process
- clearly describing the intervention and its underlying theoretical basis
- use of standardised and commonly used measures for clinical outcomes, psychosocial outcomes, usability, and cost-effectiveness
- separate analyses on outcomes for different age groups
- calculation and reporting of effect sizes to support interpretation of findings and comparability across studies.

Effectiveness of e-mental health for specific population groups

An additional brief literature review focused on four specific population groups: children, youth, indigenous populations, and prisoners. Key findings are outlined below.

- The effect of e-mental health approaches amongst children is inconclusive, as few RCTs have specifically focused on children.
- In comparison to other population groups, a wide variety of e-mental health approaches have been trialled on youth populations, and so, there is a relatively stronger evidence base compared to children.
- Recent research for Māori youth focused on the use of SPARX (a computerised CBT intervention).
- There are no RCTs focused on outcomes for Pacific peoples.
- Qualitative data has been collected from indigenous populations in New Zealand, Australia and Canada.
- For prisoners with substance use disorder, one RCT indicated non-guided Therapeutic Education System (TES) intervention was as equally effective as group sessions with an addiction practitioner at increasing the use of coping skills to support abstinence.

Key evidence gaps

The following key evidence gaps in e-mental health approaches were identified:

- effect amongst children and older adults
- effect amongst Māori and Pacific peoples, and people living in remote/rural areas
- effect on substance use disorders, resiliency or wellbeing, and long-term outcomes
- potential risks and adverse events.

The following key evidence gaps in research methodology were identified:

- RCTs with large sample sizes (>100 participants)
- double blind study designs
- reporting of cost measures within clinical settings
- use of alternative cost-effective treatments as a control condition
- identification of factors that influence engagement and adherence
- comparison between settings/distribution methods for delivery of e-mental health approaches
- comparison between guided and unguided approaches
- separate analyses for different types of interventions and control conditions in reviews.

Conclusion

This rapid review provides a summary of the e-mental health research undertaken in the past five years. While the evidence base is showing some positive results, especially for computerised CBT interventions amongst youth and adults, there is still a clear need for more high quality RCTs. More research is needed to determine the effectiveness of e-mental health approaches for psychosocial outcomes, cost-effectiveness, children, indigenous populations, and prisoners. There is a need for local research to prioritise the mental health needs of youth and Māori people who may have less access to mental health services.

Background

In New Zealand the demand for mental health and addiction services has increased in recent years, from 2.3 per cent to 3.6 per cent of the population (New Zealand Government, 2017b).¹ This increase in demand is in line with international trends and benchmarks. To meet increasing demand, New Zealand's response to mental health issues and substance use problems has moved from an institutional to recovery model over the past decade. This means the vast majority of people with common mental health issues receive treatment in the community.

To help expand access to treatment in the community, e-mental health approaches enable remote access via computerised programmes and/or communication (Rodda, Abbott, Dowling, & Lubman, 2017). The Office of the Prime Minister's Chief Science Advisor (Potter, Poulton, Gluckman, McNaughton, & Lambie, 2017) have emphasised the development of computer-delivered treatments as a priority for service delivery. This is based on the advantages of e-mental health approaches, including:

- being as effective as traditional face-to-face therapy
- ability to deliver with high fidelity
- massively accessible
- highly cost-efficient.

Purpose & objectives

This rapid review aims to provide current evidence of e-mental health approaches in responding to mild to moderate mental health issues.

Specific objectives are outlined below.

1. What e-mental health approaches have proven effective in responding to mild to moderate mental health issues and substance use problems (including approaches to reduce symptoms and impacts of existing mental health problems, and approaches to promote and enhance resilience)?
2. What is the current best practice internationally in evaluating and monitoring the use of e-therapy tools (including platforms and portals)?
3. What is the evidence of effectiveness of e-mental health for specific population groups (e.g., children, youth and emerging adults, indigenous populations (in particular Māori and Pacific youth if available) and prisoners)?
4. What are the gaps in evidence where testing through a pilot may contribute to building an evidence base?

¹ From 96,000 people to almost 168,000 people.

Method

Literature search

A literature search across health research databases was undertaken by the Ministry of Health in 2017. This search identified reviews, international literature, and New Zealand based evidence relevant to e-mental health approaches published since 2012. Given that research in this field is growing rapidly, the rapid review was based on systematic reviews and meta-analyses identified by the Ministry of Health's literature search, and a rapid review published by the Mental Health Commission of Canada (Wozney et al., 2017).²

Brief literature scans were also undertaken for substance use outcomes, population specific groups, and included studies published between 2012 and 2017.

Measures

E-mental health approaches

E-mental health approaches have been classified as:

- computerised and internet-based interventions
- mobile phone interventions, including apps and text messaging
- games, including virtual reality.

E-mental health approaches guided by clinicians, therapists or other support people were documented.

Symptoms

Key symptoms included depression, anxiety, substance use, and other mental health problems.

Resiliency

Resiliency included measures of:

- wellbeing
- quality of life and general life satisfaction
- recovery
- other psychosocial factors (e.g., quality of relationships, engagement in work).

Adherence

Adherence included treatment/program completion rates and drop-out rates.

Analysis

This review primarily focused on the results of systematic reviews and meta-analyses of randomised controlled trials (RCTs).

The analysis examined the population group, number of studies, intervention and control groups, as well as the findings.

² See https://www.mentalhealthcommission.ca/sites/default/files/2017-08/eMH%20Literature%20Review_FINAL%20EN.pdf

Where possible, results were examined to see if they varied for different population groups, including:

- children <13 years
- youth 13-25 years
- adults, including older adults
- forensic populations
- indigenous populations.

The interpretation of effect sizes followed Cohen's (1988) guidelines. Standardised mean differences (SMDs, including Cohen's *d* and Hedges' *g*) were interpreted as:

- small effect = 0.20
- medium effect = 0.50
- large effect = 0.80.

However, it is noted that research design, clinical value, and previous findings are also important in the interpretation of effect sizes from clinical studies and reviews (Durlak, 2009).

Results

Results are presented in four sections in relation to the main objectives of this rapid review, including:

1. effective e-mental health approaches for mild to moderate mental health issues and substance use problems
2. best practice in evaluating and monitoring the use of e-therapy tools
3. evidence of the effectiveness of e-mental health for specific population groups
4. key evidence gaps where testing through a pilot may contribute to building an evidence base.

Effective e-mental health approaches

Results in this section are reported for effective e-mental health approaches in responding to mild to moderate mental health issues and substance use problems. Results from systematic reviews and meta-analyses have been reported for:

- computerised and internet-based interventions
- mobile phone interventions, including apps and text messaging
- games, including virtual reality.

Results are presented for depression, anxiety, substance use and other mental health and addiction problems, as well as resiliency (including wellbeing and quality of life), adherence and cost-effectiveness where available.

Attached in the Appendix are details of individual systematic reviews or meta-analyses included in this rapid review.

Computerised and internet-based interventions

A total of 34 reviews were identified that focused on computerised and internet-based interventions, making it the most common platform for e-mental health approaches in the recent literature. Of these reviews, 26 focused on CBT largely for depression and/or anxiety outcomes, one on acceptance and commitment therapy, and one on mindfulness-based interventions. Eight reviews included computerised and internet-based interventions for substance use outcomes. Several reviews also reported on the cost-effectiveness of computerised and internet-based interventions.

Findings are presented in this section in relation to:

- CBT for children and youth, and adults
- acceptance and commitment therapy
- mindfulness-based interventions
- substance use.

Cognitive behaviour therapy (CBT)

Of the 26 reviews focused on computerised and internet-based CBT interventions largely for depression and anxiety outcomes, eight focused on children and youth, 13 on adults, and five included a mix of age groups (e.g., youth and adults).

Children and youth

Eight studies examined computerised interventions amongst children and youth, all of which included youth and five included children. All or most of the individual studies included in the reviews were based on CBT. Most studies examined outcomes for both anxiety and depression and included guidance from a therapist, clinician or other support.

Depression and anxiety

Most of the reviews included both depression and anxiety measures in their analyses. Findings from Pennant et al. (2015) and Ebert et al. (2015) found a moderate to large effect of computerised interventions on anxiety and depression for youth. A recent meta-review by Hollis et al. (2017) suggested the effect for anxiety may be greater than depression compared to waitlist and placebo controls. When compared to face-to-face CBT, Vigerland et al. (2016) found no significant difference on depression and anxiety outcomes, suggesting computerised CBT interventions are equally effective.

For children, there is a paucity of research available, and so, the effect of computerised interventions on depression and anxiety outcomes is largely inconclusive (Ebert et al., 2015; Hollis et al., 2017; Pennant et al., 2015; Rooksby, Elouafkaoui, Humphris, Clarkson, & Freeman, 2015; Stasiak et al., 2016; Vigerland et al., 2016). Thus far, subgroup analyses indicate computerised interventions are less effective for children compared to adolescents (Ebert et al., 2015; Hollis et al., 2017; Pennant et al., 2015). However, this may reflect the relative lack of data, the different outcome measure scales used for children, or lower baseline scores amongst children (Hollis et al., 2017; Pennant et al., 2015).

Adherence

Reviews indicate there is variability in completion and drop-out rates for computerised interventions aimed at children and youth (see for example Stasiak et al., 2016). O’Dea, Caelear, and Perry (2015) reviewed three CBT based internet programs³ and found adherence to completion was low amongst youth aged 12 to 19 years with about one-third to 40 per cent completing all of the modules. In another review of largely unguided cognitive based interventions for youth aged 12 to 25 years, drop-out rates also varied significantly ranging from 3 to 41 per cent (Rice et al., 2014). Overall, findings suggest that drop-out rates for largely unguided computerised interventions for children and youth may be as high as 40 per cent.

Adults

Thirteen reviews focused on internet-based interventions among adults. Of these, 10 included measures of depression, and six for anxiety. Several studies also reported on outcomes for people thinking about suicide, resilience and adherence.

Depression

Ten reviews examined the effectiveness of computerised CBT interventions on depression amongst adults (half of which also examined anxiety). Findings indicate computerised CBT has a small to moderate effect (0.25–0.56) on depression. Effects are greater when compared to waitlist controls (0.63–0.83), than treatment as usual controls (0.23–0.39). However, the review by Deady et al. (2017) indicated the long-term effects (at least 6 months) on depression were small based on the follow-up results of four studies. The review by Andersson, Topooco, Havik, and Nordgreen (2016) examined studies that directly compared internet-based interventions with face-to-face CBT. Based on five studies, Andersson et al.

³ Only one of the studies reviewed by O’Dea et al., (2015) included clinician support.

(2016) concluded internet-based CBT interventions appeared to be as equally effective as face-to-face CBT for depressive symptoms amongst adults.

The reviews indicate outcomes for depression are influenced by contact with a clinician or other support person, and the duration of intervention. Supported or guided interventions for depression resulted in better outcomes (0.65–0.78 vs 0.36–0.50) and adherence to interventions. This is in line with the review of 14 studies by Baumeister, Reichler, Munzinger, and Lin (2014), which concluded guided internet-based interventions are more effective compared to unguided interventions. Moreover, the review by Richards and Richardson (2012) indicated that interventions less than eight weeks in duration were more effective than those which were longer (0.75 vs. 0.29).

Anxiety

Six reviews examined the efficacy of computerised CBT interventions on anxiety amongst adults. Overall, findings suggest computerised interventions have a moderate to large effect on anxiety when compared to waitlist controls (0.31–0.84), and a small effect compared to active controls or other interventions. Based on the results of one study, Deady et al. (2017) concluded that after at least 6 months there was a small long-term effect on anxiety (0.21).

Suicidal thoughts

One review by Leavey and Hawkins (2017) examined the effects of internet-based CBT interventions on thoughts about suicide. Based on the results of five individual studies, the review concluded internet-based CBT interventions have not yet been shown effective in reducing the risk of suicidal thinking or behaviour. It is important to note that the majority of RCT studies and reviews examined in this review excluded people with baseline measures where a risk of suicide was indicated.

Resiliency

There was a paucity of research examining resiliency, including quality of life or wellbeing, as a result of computerised CBT interventions for adults. Only one review examined resiliency outcomes, and found no significant difference in measures of wellbeing and quality of life post-treatment compared to control conditions, based on 12 studies focused on computerised CBT (So et al., 2013).

Adherence

The review by van Ballegooijen et al. (2014) found completion rates for CBT delivered face-to-face and internet guided CBT interventions were similar (84 vs. 81 per cent respectively). However, other reviews indicate computerised interventions exhibit a wide range of adherence and dropout rates; for example Twomey and O'Reilly (2017) reported adherence rates ranging from 10 to 100 per cent. Moreover, Richards and Richardson (2012) found guided computerised CBT interventions had greater retention compared to those without therapist support.

Cost effectiveness

Several reviews examined the cost-effectiveness of internet-based interventions. Ophuis et al. (2017) concluded that internet-delivered CBT appears to be cost effective in treating anxiety in comparison to group CBT programs and inactive treatment controls. However, the heterogeneity of interventions, study design, and outcome measures limited the comparability of studies (Ophuis et al., 2017, p. 1). Another economic evaluation of internet-based interventions mostly including CBT for mental health was undertaken by Donker et al. (2015). They concluded that the “results of guided internet interventions

being cost-effective are promising” (p. 3357) but more economic evaluations are needed comparing internet-based interventions to the most cost-effective treatments currently available.

Acceptance and commitment therapy

Brown, Glendenning, Hoon, and John (2016) specifically examined internet-delivered acceptance and commitment therapy amongst adults.

Depression and anxiety

Based on the results of 10 studies (including seven guided by a trained psychologist or student), Brown et al. (2016) found acceptance and commitment therapy had a small effect on anxiety and depression in comparison to mostly waitlist or active controls, and a moderate to large effect when compared to baseline scores. A moderate effect was also found in quality of life following intervention.

Adherence

On average, Brown and colleagues (2016) found 83 per cent of those who received treatment also completed the post-assessment. While a variety of methods were used to report completion, the authors concluded these were high overall suggesting acceptance and commitment therapy is highly acceptable to people.

Mindfulness-based interventions

Mindfulness-based interventions were reviewed by Spijkerman, Pots, and Bohlmeijer (2016).

Depression, anxiety, wellbeing and mindfulness

Based on 15 studies (of which nine were guided), results indicate online mindfulness-based interventions for adults have a small effect on depression, anxiety, wellbeing, and mindfulness. A moderate effect was also found for stress (Spijkerman et al., 2016). Effect sizes were higher for guided interventions.

Adherence

A variety of adherence measures were used in the studies reviewed. Based on the results of five studies, adherence rates for the completion of all sessions varied between 40 to 92 per cent (Spijkerman et al., 2016).

Substance Use

Eight reviews examining the effect of e-mental health approaches targeting substance use were identified. All these reviews included youth, and six included adults as well. Four reviews each focused on cannabis and alcohol use, three smoking, and two general substance use. While one review specifically focused on computerised CBT interventions (Twomey et al., 2013), the others included a wider variety of interventions, including social influence theory, online or telephone chat, or mobile messaging.

Findings from three reviews indicate internet-based interventions have little or no effect on cannabis use amongst adults and youth (-0.01–0.38) (Gulliver et al., 2015; Hoch, Preuss, Ferri, & Simon, 2016; Tait, Spijkerman, & Riper, 2013). For alcohol use, there may potentially be a small effect of internet-based interventions. For example, Carey, Scott-Sheldon, Elliott, Garey, and Carey (2012) examined computer delivered interventions for youth and adults, and found a small effect (0.13–0.29) on alcohol consumption compared to non-active waitlist controls.

None of the substance use reviews focused on resiliency outcomes, adherence, or cost-effectiveness.

Mobile phone

Six reviews examining mobile phone interventions were identified; five focused on mobile applications, and one on text messaging.

Mobile or smartphone applications (apps)

Five reviews focused on the effectiveness of mobile phone apps amongst adults and youth; of which four included some studies based on CBT. Reviews included clinical and primary care populations, and people from the general population. Four reviews examined outcomes for depression, three for anxiety, and one for substance use. One also included weight management, physical activity, smoking cessation and medication adherence. Donker et al. (2013) identified only five evidence-based apps from the more than 3,000 mental health apps freely available to download. Concerns about apps integrating evidence-based approaches and conforming to established guidelines were also highlighted in a review by Chan, Torous, Hinton, and Yellowlees (2015).

For depression, results indicate mobile phone apps have a positive effect, particularly amongst adults with mild-to-moderate depression. There appears to be little or no effect on major depressive disorder or bipolar disorder amongst the few studies that have examined this. Firth, Torous, Nicholas, Carney, Prapat, et al. (2017) found a moderate effect ($g = 0.52$) on self-reported mild-to-moderate depression across five studies. Subgroup analysis across all depression symptom measures indicated the effect was greater when compared to inactive than active control conditions. Smartphone interventions which did *not* involve human contact appeared to have a greater impact on depression than those which did.

For anxiety outcomes, results from three reviews indicate mobile phone apps have a positive effect. Firth, Torous, Nicholas, Carney, Rosenbaum et al. (2017) found a moderate effect on anxiety outcomes in comparison to waitlist/inactive controls, and a small effect in comparison to active controls.

For other outcome measures, Donker et al. (2013) found mobile phone apps in conjunction with face-to-face dialectical behaviour therapy (DBT) had a small positive effect on the urge to use substances amongst people with borderline personality disorder. They also found the usability, helpfulness and satisfaction ratings of mobile phone apps were moderate to high.

Text messaging

In addition to reviews of mobile phone apps, one review by Mason, Ola, Zaharakis, and Zhang (2015) examined the effect of largely automated text messaging interventions (either stand alone or in combination with another program) for adolescent and young adult substance use, including smoking and alcohol consumption. While two studies of shorter duration (1–4 days) found no significant effect on alcohol consumption, a 12-week text messaging intervention was shown to have a moderate impact on alcohol consumption (Mason et al., 2015). Overall, the review found evidence of a dose-response effect with studies including a larger number of text messages having a greater effect on smoking and alcohol consumption (Mason et al., 2015).

Game-based approaches

Four reviews focused on gaming approaches to mental health. One review included a variety of games for depression (Li, Theng, & Foo, 2014), another focused on exercise-based games (Li, Theng, & Foo, 2016), and one on educational games targeting substance use (Rodriguez, Teesson, & Newton, 2014). Another review included virtual reality exposure therapy for anxiety (Kampmann, Emmelkamp, & Morina, 2016). Outcomes for depression and substance use (including tobacco, alcohol, cannabis and other drugs) were examined.

Game-based interventions

Li et al. (2014) examined a variety of game-based interventions amongst adults and youth (including games based on psycho-education and training, virtual reality exposure, exercising and entertainment). The results from 10 RCTs indicate game-based approaches have a moderate effect on depression amongst adults and youth. The effect of game-based approaches was higher amongst waitlist controls compared to those receiving treatment as usual or active treatment (Li et al., 2014). Moreover, game-based approaches guided by a therapist were shown to be slightly more effective than those without (-0.54 vs -0.44).

Li and colleagues (2016) found games involving virtual reality appeared to be most effective. In contrast, exergames had a small effect on depression compared to baseline, treatment as usual, or occupational therapy. Exergames had a larger impact on older adults, compared to other adults. Moreover, one review examining the effect of games underpinned by educational or social influence approaches found limited effect on substance use amongst adolescents (Rodriguez et al., 2014).

Virtual reality exposure therapy

One study of technology assisted interventions amongst adults found virtual reality exposure had a large effect ($g = 0.82$) on symptoms of social anxiety amongst adults when compared to passive controls, but did not have an effect compared to active controls (Kampmann et al., 2016).

Summary

Summarised in Table 1 are the findings of this rapid review on the effectiveness of e-mental health approaches for mild to moderate depression and anxiety, and Table 2 shows the effectiveness of internet-based interventions on substance use.

Table 1. *Effect Sizes of E-Mental Health Approaches (Including Guided and Unguided) on Depression and Anxiety Outcomes Compared to Control Conditions (Including Active/Non-Active Waitlist Controls, and Alternative Treatments)*

E-mental health approach	Children (<13 years)		Youth (13-25 years)		Adults (>25 years)	
	Depression	Anxiety	Depression	Anxiety	Depression	Anxiety
Computerised and internet-based approaches						
CBT	small [^]	small [^]	moderate - large	moderate - large	small - moderate	moderate - large
ACT	-	-	-	-	small	small
Mindfulness	-	-	-	-	small	small
Other platforms						
Mobile apps	-	-	small - moderate	small - moderate	small - moderate	small - moderate
Text messaging	-	-	-	-	-	-
Games	-	-	moderate	-	moderate - large	-
Virtual reality	-	-	-	-	-	moderate - large

Note: - = not identified in review; * = requires more research; [^] = compared to other age groups. CBT = cognitive behavioural therapy, ACT = acceptance and commitment therapy. Effect sizes were interpreted as: small effect = 0.20; medium effect = 0.50; large effect = 0.80.

Table 2. *Effect Sizes of Internet-Based Interventions (Including Guided and Unguided) on Substance Use Outcomes Compared to Control Conditions (Including Active/Non-Active Waitlist Controls, and Alternative Treatments)*

E-mental health approach	Youth (13-25 years)	Adults (>25 years)
Alcohol consumption	Small	Small
Cannabis use	Small - no effect	Small - no effect

Note: Effect sizes were interpreted as: small effect = 0.20; medium effect = 0.50; large effect = 0.80.

Best practice in evaluating and monitoring e-therapy tools

The evaluation of e-mental health approaches has followed the same evaluative process as traditional interventions (Shore et al., 2014; cited in Feather et al., 2016).

Study design

Best practice in evaluating and monitoring e-mental health approaches has involved RCTs using between groups designs where one group receives the intervention, and the other is a control condition. Ideally this should be an alternative treatment that is currently the most cost-effective available. Where a between groups design is not feasible, studies can use a within groups design to compare people's baseline scores with their outcomes at the end of treatment. Each design requires assessments at baseline, post-treatment, and ideally a long-term follow-up, such as 6-months following intervention.

Participants

The target group for the intervention should be clearly identified, such as age group or non-clinical population. For example, some studies specifically excluded people with serious mental health issues or people at risk of suicide. This was identified via screening prior to intervention.

Intervention

The intervention itself and its underlying theoretical basis needs to be clearly identified, along with the number of sessions, timing and frequency of intervention. Also, whether any support was provided by a clinician, therapist or another person (including administration computer support) and how support was provided, for example by email, text message or phone.

Outcomes

Evaluations of e-mental health approaches have primarily focused on usability and treatment effectiveness (Chan et al., 2015; Feather et al., 2016). Chan et al. (2015) outlined a framework for assessing the usability of mobile phone apps, which includes the dimensions of usefulness, usability, integration and infrastructure. They provide a useful outline of how each of these dimensions may be assessed.

Treatment effectiveness has been assessed with standardised measures. While the psychometric properties and relevance in a New Zealand context has not been reviewed here, the use of standardised and commonly used measures will enable results to be compared with other studies. The following are commonly used measures:

- for depression, the Beck Depression Inventory (BDI), Centre for Epidemiological Studies Depression Scale (CES-D), and Depression Anxiety and Stress Scale – 21 item version (DASS-21)
- for anxiety, the Anxiety Sensitivity Inventory (ASI), Beck Anxiety Inventory (BAI), DASS-21, and hospital anxiety and Depression Scale
- for psychological distress, Kessler 10 (K10), Patient Health Questionnaire (PHQ) 4 item and 9 item version.

Feather et al. (2016) also stresses the importance of measuring psychosocial outcomes. Common measures of quality of life and wellbeing used in the current review included the Quality of Life Inventory (QOLI), World Health Wellbeing Index (WHO-5), Mental Health Continuum short form (MHC-SF), and Short form 12.

A large proportion of studies examining computerised and internet-based interventions included adherence as part of their evaluation. While definitions varied, completion and drop-out rates were two of the most common measures used.

Measures of cost-effectiveness are also useful but to date have only been included in a limited number of studies.

Analysis

The evaluation should clearly describe characteristics of the intervention and control groups.

Where possible, outcomes should be examined separately for different age groups (e.g., children, youth, adults, and older adults) as the efficacy of interventions has been shown to vary for different population groups.

The inclusion of effect sizes in evaluating and monitoring e-mental health approaches supports interpretation of results and greater comparability of findings across studies.

Effectiveness of e-mental health for specific populations

This section describes recent research examining the effectiveness of e-mental health approaches for specific population groups, including children, youth and emerging adults, indigenous populations (in particular Māori and Pacific youth where available) and prisoners.

Children

As shown in the previous section, five reviews were identified examining the effect of computerised or internet-based CBT interventions amongst children aged under 13 years old. Overall, the effectiveness of e-mental health approaches for children is inconclusive due to the paucity of research available, but in general results indicate promising effects on children's depression and anxiety outcomes (Ebert et al., 2015; Hollis et al., 2017; Pennant et al., 2015; Rooksby et al., 2015; Stasiak et al., 2016; Vigerland et al., 2016). Evidence is limited by low availability and quality of studies focused on children (Pennant et al., 2015). To strengthen the evidence, there is a need for replication studies and long-term follow-up data (Stasiak et al., 2016).

Findings from reviews suggest that age group appears to moderate the acceptability of e-mental health approaches and treatment outcomes (Ebert et al., 2015). The meta-review by Hollis et al. (2017) found internet CBT-based interventions were less effective for children compared to adolescents and adults, though this may be due to lower baseline scores amongst children. Both Ebert et al. (2015) and Pennant et al. (2015) indicated the effectiveness of computerised CBT interventions on anxiety outcomes were smaller amongst children compared to youths. Moreover, Hollis et al. (2017) emphasised that previous research shows no evidence to suggest children and youth prefer computerised CBT over face-to-face or phone-based CBT. Self-reported data indicates that while children may find it helpful to search the internet for information about mental health problems, many prefer treatment that involves talking to someone in a clinical setting, rather than using a computer program (Stallard, Velleman, & Richardson, 2010).

Youth

In total, 25 reviews focused on e-mental health interventions amongst youth aged 13 to 25 years. Across these reviews, a wide variety of e-mental health approaches via games, mobile phones, and internet have been trialled on youth populations. For depression and anxiety outcomes, computerised or internet-based CBT approaches, such as SPARX, have a moderate to large effect on depression and anxiety scores compared to non-therapeutic and waitlist control conditions (Ebert et al., 2015; Pennant et al., 2015; Vigerland et al., 2016). For substance use outcomes, computer or internet-based approaches have little or no effect amongst adolescents (Champion, Newton, Barrett, & Teesson, 2013; Hoch et al., 2016; Tait et al., 2013; Wood et al., 2014). Thus, compared to children, there is relatively more evidence to support the effectiveness of e-mental health approaches for youth populations.

Local research

In New Zealand, SPARX is currently the main evidence-based, computerised CBT intervention available for young people. Developed by The University of Auckland, SPARX takes the form of an interactive 3D fantasy game with the purpose of treating depression in young people (Merry et al., 2012). The game consists of seven modules targeting the development of different skills, a supplementary workbook, and prompts to seek clinical help if there have been no improvements. The effectiveness of SPARX was

examined in a multicentre randomised controlled non-inferiority trial involving 187 adolescents (aged 12 to 19 years) across 24 primary healthcare services (Merry et al., 2012). The participants were adolescents seeking help for mild to moderate depressive symptoms from their primary healthcare clinician; 94 received the SPARX intervention and 93 treatment as usual (there was heterogeneity in the variety of treatment types) (Merry et al., 2012). The sample excluded high scores on items for morbid ideation and suicidal ideation.

The trial indicated SPARX had a small to moderate effect ($d = 0.30$) on depression symptoms amongst young people, and the reduction in depression scores was slightly better than the treatment as usual group (Merry et al., 2012). In addition, the SPARX group had significantly improved scores on the hopelessness scale, mood and feelings scale, and the Spence generalised anxiety scale, compared to treatment as usual. The dropout rates were equally low for both treatment conditions; only 60 per cent of SPARX participants completed all seven modules. Follow-up questionnaires indicated over 90 per cent of SPARX participants reported this type of support would appeal to other teenagers, and 81 per cent would recommend it to their friends (Merry et al., 2012).

Following the main SPARX RCT study (Merry et al., 2012), additional research indicates the program is also effective amongst young people who are: Māori (Shepherd, 2011), excluded from mainstream education (Fleming, Dixon, Frampton, & Merry, 2012), or same/both sex attracted (Lucassen, Merry, Hatcher, & Frampton, 2015). Moreover, the acceptability of SPARX amongst rural Australian youth has been examined (Cheek et al., 2014). SPARX was perceived as a promising and appealing option for youth in rural communities, but they also emphasised that privacy within a small community was particularly important (Cheek et al., 2014). Furthermore, an open trial of BRAVE-online, a computerised CBT program developed in Australia, had a positive effect on anxiety and quality of life outcomes amongst 42 young people in Canterbury who experienced the earthquakes in 2011 (Stasiak & Moor, 2016).

Indigenous populations

Overall, there are few RCTs that have examined the effects of e-mental health interventions for indigenous populations. In contrast, there is relatively more qualitative data available, which can help to inform the future development of e-mental health approaches specifically for indigenous populations.

Randomised controlled trials

The brief literature search identified two RCTs focused on indigenous populations. One study examined a computerised CBT intervention for Māori youth, and another examined a suicide prevention mobile app designed for Aboriginal and Torres Strait Islander peoples in Australia. To date, there have been no trials specifically focussed on the effectiveness of e-mental health interventions amongst Pacific populations.

For computerised or internet-based interventions, SPARX has been designed to appeal to Māori youth through the incorporation of Māori graphics, and its effectiveness amongst Māori youth has been examined in a pilot study and a sub-group analysis based on RCT data. A pilot study comprising of seven Māori youth aged 12 to 19 years indicated SPARX had significantly reduced depression and anxiety symptoms, and increased quality of life compared to pre-intervention (Shepherd, 2011). However, there were no significant changes on the secondary measures of depression (RADS-2, HPLS, and MFQ-LV). In this pilot study, all but one of the young people (6 out of 7) completed all seven modules of SPARX. In addition, a sub-group analysis of Māori youth that included 45 participants from the main SPARX RCT study (Merry et al., 2012), indicated SPARX had significantly reduced depression and anxiety amongst

Māori youth to within normal range, and was equally effective compared to treatment as usual (Shepherd, 2011). While the small amount of available data provides promising results, there is a need for larger scale RCTs focused on Māori and Pacific peoples to determine the effectiveness of e-mental health approaches for these population groups.

For mobile phone apps, Australia has a suicide prevention app designed for Aboriginal and Torres Strait Islander peoples, known as 'ibobbly'. This app is based on acceptance and commitment therapy, and its effectiveness has been examined in an RCT. Tighe et al. (2017) examined the effectiveness of 'ibobbly' amongst 61 Australian aboriginal youth aged 18 to 35 years living in remote communities. Results indicated 'ibobbly' significantly reduced distress and depression symptoms compared to the waitlist condition, however there was no effect on suicidality and impulsivity symptoms (Tighe et al., 2017). While this app was not guided by clinicians, it displayed emergency contact information.

Qualitative studies

Qualitative data from indigenous population groups in New Zealand, Australia and Canada helps to better understand attitudes towards e-mental health approaches, and can inform the future development of interventions.

In New Zealand, to support the development and delivery of SPARX for Māori youth, Shepherd et al. (2015) conducted focus groups with 19 Māori youth and seven parents/caregivers who were shown a prototype of SPARX. The study identified the following themes:

- SPARX was perceived as potentially effective and appealing for young people with depression
- cultural relevance is important to engage Māori youth, such as Māori designs, formal introduction of the computerised characters, and inclusion of characters' values, whakapapa and hapu
- whānau are important for the wellbeing of Māori youth, such as the inclusion of whānau during the intervention, and additional resources to support whānau
- improvements to make the intervention more appealing included the use of language to reflect the understanding of mental health amongst Māori youth, reducing the amount of text/reading, and adding more features that appeal to male adolescents such as directing males to participate in kapa haka, fishing, and mau rākau (Māori martial arts).

Similarly, a pilot study in Canada examined the effectiveness of SPARX amongst 75 Nunavut youth and showed promising results in reducing depressive symptoms and increasing resiliency (Bohr & Merry, 2016). From this pilot study, a small sub-sample of 12 Nunavut youth also participated in follow-up phone-based focus group interviews (Khourochvili, Bohr, Litwin, Lucassen, & Merry, 2016), and the following themes were identified:

- SPARX promotes emotional regulation
- SPARX supports acquiring skills that can be used in daily life
- SPARX is fun and useful, and youth would recommend it to their peers
- SPARX should be adapted to be Inuit-specific, such as the inclusion of native clothing and animals
- SPARX could be improved and technically enhanced, such as increasing game complexity.

The supervising youth workers, however, identified systematic challenges when administering the program, including the maintenance of youth engagement, time pressures, and storage of resources.

In Australia, focus groups with Aboriginal and Torres Strait Islander community members identified the following factors as being important for acceptability of e-mental health approaches (Povey et al., 2016):

- personal factors, such as motivation, technological competence, and literacy
- environmental, such as stigma, awareness, community, and information sharing
- app characteristics, such as access, appealing graphics, content, clear navigation, and inclusion of indigenous languages.

Prisoners

The brief literature search identified one open-label RCT study by Chaple et al. (2014) that examined the use of Therapeutic Education System (TES), a computerised psychosocial approach based on CBT and community reinforcement approach (CRA) aimed at prisoners with substance use disorders. A total of 494 prisoners in the US were randomised in this study that had been diagnosed with a substance use disorder but not currently receiving treatment. Results indicated non-guided TES was as equally effective as group sessions with an addiction counsellor; and both conditions significantly increased the use of coping skills to support abstinence amongst prisoners (Chaple et al., 2014). In addition, more than half of the participants (56 per cent) completed all 32 modules of the TES intervention, and compared to the standard care condition, TES was rated as more interesting and satisfying (Chaple et al., 2014). The authors concluded that TES can be feasibly implemented in prison settings; however it is more likely to be implemented as an extension to face-to-face therapy, rather than a standalone treatment (Chaple et al., 2014).

Key evidence gaps

This section describes apparent gaps in the evidence base for e-mental health approaches where testing through a pilot study may contribute to building an evidence base.

Since 2010, New Zealand and Australia has contributed approximately 22 per cent of the total e-mental health research, however it is a relatively new concept that continues to grow rapidly within the literature and mental health sector (Wozney et al., 2017). Table 3 shows the key evidence gaps identified by the Mental Health Commission of Canada (Wozney et al., 2017) and other recent reviews.

Table 3. *Key Evidence Gaps in Research Methodology and Knowledge for E-Mental Health Approaches*

Gaps in knowledge	Gaps in research methodology
Effect amongst children	RCTs with large sample sizes (>100 participants)
Effect amongst older adults	Double blind study designs
Effect on substance use disorders	Reporting of cost measures within clinical settings
Effect on resiliency or wellbeing	Use of alternative cost-effective treatment as control
Effect amongst Māori and Pacific peoples	Identifying factors that influence engagement and adherence
Effect amongst people living in remote/rural areas	Comparison between settings/distribution methods for delivery of e-mental health approaches
Long-term effects on outcome measures	Comparison between guided and unguided approaches
Potential risks and adverse events	Separate analyses for different types of interventions and control conditions in reviews

Gaps in knowledge

For outcome measures, the analysis of recent reviews indicated there is a paucity of research examining resiliency and psychosocial outcomes like wellbeing and quality of life. However, three reviews included this measure (examining internet-based CBT, acceptance and commitment therapy, and mindfulness). Similarly, substance use measures were included in eight reviews. The evidence gaps for outcome measures are consistent with the findings from the Mental Health Commission of Canada (Wozney et al., 2017), which indicated only 17 per cent of studies reported psychosocial outcomes, and 3 per cent reported substance use outcomes.

For population groups, there was a visible gap in the evidence on the effectiveness of e-mental health approaches for children and older adults. Five reviews included studies with children, and only one review included subgroup analysis for older adults. Many reviews combined analyses for both youth and adults, making it difficult to isolate the effects of interventions for youth, and particularly for children. Furthermore, the effects of e-mental health approaches amongst Māori and Pacific peoples, rural communities, and prisoners are largely unknown due to little or no RCTs being available.

The long-term effects of e-mental health approaches across population groups and outcomes is inconclusive. The review by Deady et al. (2017) indicated there was not enough data to determine the long-term effects of prevention approaches on depression and anxiety amongst the general population.

Overall, a small proportion (30 per cent) of studies had undertaken follow-up assessments of outcomes after 6 to 12 months post intervention (Wozney et al., 2017). Based on this gap, the evidence base can be strengthened by including measures to analyse long-term management, sustainability and/or re-usability of e-mental health approaches.

Ebert, Cuijpers, Muñoz, and Baumeister (2017) identified the need for information about potential risks and adverse events. Regarding potential risks, some researchers have expressed concerns about the lack of clinician or health sector involvement in the development of e-mental health interventions. Particularly for mobile apps, Donker et al. (2013) found eight evidence-based apps from more than 3,000 mental health apps freely available for public download.

Gaps in research methodology

There are key methodological limitations across existing studies that make it difficult to compare findings and conclude the effectiveness of e-mental health approaches (Hollis et al., 2017). The most commonly identified limitation in recent reviews of the literature is the need for RCTs with larger sample sizes to ensure sufficient statistical power (Ebert et al., 2017; Hollis et al., 2017; Wozney et al., 2017). Between 2010 and 2016, at least one-fifth (21 per cent) of studies had fewer than 30 participants in the e-mental health intervention, and two-thirds (66 per cent) had fewer than 100 participants (Wozney et al., 2017). Small sample sizes in combination with wide variation in adherence rates and types of interventions across studies makes it difficult to conclude the overall effectiveness of e-mental health approaches (Hollis et al., 2017).

Many reviews have combined heterogeneous intervention types and control groups into their analyses, making it difficult to identify specific types of interventions that work well for different population groups. For controlled trials, a lot of studies have included waitlist controls as a comparison group, however, there is a need for more research examining e-mental health approaches compared to treatment as usual or alternative cost-effective treatments. Furthermore, most RCTs for e-mental health approaches are not double-blinded to the condition groups, and so, they may be subject to self-reporting bias from participants and researchers (Hollis et al., 2017; Rooksby et al., 2015)

Thus far, comparisons between guided and un-guided interventions have provided mixed findings, and there is limited information about the effectiveness of e-mental health approaches across different settings (i.e., primary health care, community-based services, or self-help) (Ebert et al., 2017). Furthermore, information about the capital investment required for the development, implementation and maintenance e-mental health approaches within clinical settings is sparse with only six per cent of studies reporting cost measures (Donker et al., 2015; Wozney et al., 2017).

Discussion

The purpose of this rapid review was to better understand:

1. effective e-mental health approaches in responding to mild to moderate mental health issues and substance use problems (including approaches to reduce symptoms and impacts of existing mental health problems, and approaches to promote and enhance resilience)
2. current best practice internationally in evaluating and monitoring the use of e-therapy tools (including platforms and portals)
3. evidence of effectiveness of e-mental health for specific population groups (e.g. children, youth and emerging adults, indigenous populations (in particular Māori and Pacific youth if available) and prisoners)
4. key gaps in evidence where testing through a pilot study may contribute to building an evidence base.

Effective mental health approaches

This rapid review identified three main e-mental health platforms: Computerised and internet-based interventions; mobile phone interventions; and game-based approaches. Overall, the most common platform for e-mental health approaches in the recent literature were computerised and internet-based interventions, particularly those based on CBT. For youth, recent RCTs indicate computerised CBT interventions have a moderate to large effect on anxiety and depression outcomes. Similarly, the effect of computerised CBT interventions on adult anxiety was moderate to large, while the effect on depression was small to moderate. However, most reviews compared e-mental health interventions against combined waitlist and treatment as usual controls, making it difficult to draw a conclusion.

Findings indicate that computerised and internet-based interventions with therapist or other contact, and interventions with a longer duration result in better outcomes for depression amongst adults. Computerised acceptance and commitment therapy and mindfulness interventions have a small effect on depression and anxiety outcomes. Furthermore, reviews also indicate computerised and internet-based interventions have little or no effect on measures of substance use, suicide ideation or resiliency.

Mobile or smartphone apps appear to have a small to moderate effect on depression and anxiety outcomes when compared to active controls, while automated mobile messages have a moderate effect on alcohol consumption. Moreover, mobile apps which do not involve clinician or other contact appear to have a greater impact on depression than those which do.

Overall, game-based approaches appear to have a moderate effect on depression amongst adults and youth. Virtual reality exposure appears to have a large effect on social anxiety disorder symptoms amongst adults.

Best practice in evaluating and monitoring e-therapy tools

E-mental health approaches have the same evaluative process as traditional interventions. This largely involves RCTs using between groups designs where one group receives the intervention, and the other is a control condition. High quality RCTs also involve clearly specified target participant groups, clear details about interventions and their theoretical basis, and assessments at baseline, post-intervention and ideally a long-term follow-up. In addition, studies should include standardised and commonly used measures for clinical outcomes, psychosocial outcomes, usability, and cost-effectiveness. To support comparability across studies, effect sizes should be calculated and reported.

Effectiveness of e-mental health for specific population groups

An additional brief literature review focused on four specific population groups: children, youth, indigenous populations, and prisoners. Compared to youth and adults, the effectiveness of e-mental health approaches for children has a weaker evidence-base. Thus, while studies indicate promising results, the effectiveness of e-mental health approaches amongst children remains inconclusive. In contrast, recent research shows a wider variety of e-mental health approaches for youth have been trialled. There were several reviews focused on the effect of computerised or internet-based CBT approaches amongst youth, indicating a moderate to large effect on depression and anxiety outcomes compared to non-therapeutic and waitlist control conditions. Moreover, local RCT studies have examined the effectiveness of e-mental health approaches amongst youth population groups, especially the use of the SPARX computerised CBT intervention.

Overall, there was a paucity of research examining the effectiveness of e-mental health approaches amongst indigenous populations. Given indigenous populations have a high prevalence of mental health problems compared to the general population, this finding highlights a need to prioritise research in this area. A brief literature search indicated there were no RCTs focused on Pacific peoples, and research for Māori youth has been limited to the SPARX intervention. However, qualitative data is available for indigenous populations in New Zealand, Australia and Canada to help inform the future development of e-mental health approaches.

This rapid review found one RCT focused on prisoners with substance use disorder, which indicated non-guided TES was as equally effective as group sessions with an addiction counsellor at increasing the use of coping skills to support abstinence.

Key evidence gaps

Key evidence gaps identified in knowledge and research methodology should be considered during the development of future studies. Currently, gaps in knowledge about e-mental health approaches include the effectiveness of e-mental health approaches amongst children, older adults, Māori and Pacific peoples, and prisoners. There is also a need for information about resiliency outcomes, substance use, the long-term effects, and potential risks or adverse events. For research methodology, there is a need for RCTs with larger sample sizes, double blind studies, reporting of cost measures, as well as control groups involving alternative cost-effective interventions. Supporting the future development of high-quality e-mental health approaches will require identification of factors that influence engagement and adherence, and the involvement of clinical expertise.

Conclusion

This rapid review provides a summary of e-mental health research undertaken in the past five years. Overall, there are several variations of e-mental health approaches that may be considered for pilot studies, such as interventions delivered through computers and mobile phones.

While the evidence base is showing some positive results, especially for computerised CBT interventions amongst youth and adults, there is still a clear need for more high quality RCTs. More research is needed to determine the effectiveness of e-mental health approaches for psychosocial outcomes, cost-effectiveness, children, indigenous populations, and prisoners. In particular, there is a need for local research to prioritise the mental health needs of youth and Māori people who have a higher risk of mental health problems and experience challenges in accessing mental health services.

Appendix: Systematic reviews and meta-analyses for the effectiveness of e-mental health approaches

Table 4 summarises the systematic reviews and meta-analyses included in this rapid review.

Papers are presented in the following order: computer/internet CBT, computer/internet acceptance and commitment therapy (ACT), computer/internet mindfulness, computer/internet substance use, mobile/smartphone, and games. For each type of approach, papers are grouped in the following order: adults, all ages, children and youth, and youth.

Table 4. *Systematic Reviews and Meta-analyses for the Effectiveness of E-Mental Health Approaches*

Year	Reference	No. Studies	Total sample	Intervention	Control group	Target population	Guided Yes/No/Some	Outcome measures					Findings
								Anxiety Yes/No	Depression Yes/No	Other symptoms	Resilience Yes/No	Adherence Yes/No	
Computer/internet cognitive behaviour therapy (CBT)													
2017	Deady et al.	10 trials	4,522	Computer/internet CBT: eHealth interventions utilising cognitive behavioural techniques. Of the 10 trials, 7 were iCBT, 1 Psychoed + CBT, 1 ACT, 1 Emails)	waitlist control (2 studies), another intervention (8 studies)	Adults: University students and adults in the general population aged 18 – 64 years <i>without</i> a clinically diagnosed common mental disorder. Sub-clinical or nonclinical samples were included.	Some (4 studies provided no support)	Yes	Yes				At post-treatment, the overall mean difference between the intervention and control groups was 0.25 (95% CI, 0.09 to 0.41) for depression outcome studies and 0.31 (95% CI, 0.10 to 0.52) for anxiety outcome studies, indicating a small but positive effect of the eHealth interventions. At follow-up (at least 6 months), the pooled mean effect size for the four depression studies was 0.21 (95% CI, 0.04 to 0.38). Only one study with anxiety outcomes included a follow-up longer than 6 months and the overall mean difference between the intervention and control groups was 0.24 (95% CI, 0.05 to 0.43). Conclusion: Evidence suggests that eHealth prevention interventions for anxiety and depression are associated with small but positive effects on symptom reduction. However, there is inadequate evidence on the medium to long-term

Year	Reference	No. Studies	Total sample	Intervention	Control group	Target population	Guided Yes/No/Some	Outcome measures					Findings
								Anxiety Yes/No	Depression Yes/No	Other symptoms	Resilience Yes/No	Adherence Yes/No	
													effect of such interventions, and importantly, on the reduction of incidence of disorders. Further work to explore the impact of eHealth psychological interventions on long-term incidence rates.
2017	Leavey & Hawkins	5 studies for e-health CBT	E-health had an average of 62 participants (25-116)	Computer/internet CBT: CBT e-health, including internet and phone; internet and email, internet and text, email with links to website, CD-ROM	Control group	Adults: Average age in e-health studies was 38 years, proportion of females ranged from 46-82%	Yes			Suicide ideation			<p>Handley et al., (2013) reported no significant improvement in suicidal ideation for either the face-to-face or e-health groups and no significant differences between the two groups. Wagner et al., (2014) found significant improvement in suicidal ideation pre- to post scores for the face-to-face group but not the e-health group, and the between group difference post treatment was insignificant.</p> <p>Two studies utilised the provision of general information with referral links delivered online as the comparison group for unguided CBT delivered online. Both studies reported a significant reduction in suicidal ideation in the treatment condition as compared to the control group (d = 1.97) and d = 0.28). One study compared CBT delivered via e-health to TAU (Free to call a helpline as needed). The found no significant differences between the conditions post intervention or at 6-month follow-up in comparison to TAU.</p> <p>There was a statistically significant, small to medium effect for face-to-face delivered CBT in reducing suicidal ideation and behaviour although there was significant heterogeneity between the included studies. CBT delivered via e-health was not found to be efficacious in reducing suicidal ideation and behaviour in adults thought the</p>

Year	Reference	No. Studies	Total sample	Intervention	Control group	Target population	Guided Yes/No/Some	Outcome measures					Findings
								Anxiety Yes/No	Depression Yes/No	Other symptoms	Resilience Yes/No	Adherence Yes/No	
													<p>number of studies reviewed was small.</p> <p>Conclusion: The hypothesis that CBT delivered via e-health is comparable in efficacy to CBT delivered via face-to-face for reducing suicidal ideation and suicidal behaviour in adults was unsupported. Three of the five e-health studies found no evidence to support e-health for suicidal ideation. Of the remaining two studies, the evidence was inconclusive with one showing a large effect in favour of e-health in comparison to a control, and the other showing a small effect in favour of e-health, but also finding that suicidal ideation significantly improved pre- to post- test in the control condition.</p> <p>Due to the inability to conduct statistical analysis, it is hard to be conclusive, however, on the basis of these five studies, it appears that CBT delivered via e-health has not yet been shown to be effective in reducing suicidal ideation and suicidal behaviours.</p>
2017	Twomey & O'Reilly	12 studies	5,745	Computer/internet CBT: MOODGYM – developed in Australia, has 5 core sessions with written info, animations, and interactive exercises	Waitlist, TAU, computerised control conditions	Adults: Adults with elevated mental health symptoms and those seeking MH treatment	Yes	Yes	Yes			Yes	<p>Small effect on depression at post-intervention compared to control conditions (g = 0.36, 95% confidence interval: 0.17–0.56; I² = 78%), but became non-significant when publication bias was removed. Moderate effect size on anxiety (g = 0.57, 95% CI: 0.20–0.94) Adherence ranged 10-100%</p>
2017	Twomey et al.	8 RCTs	2,402	Computer/internet CBT: Deprexis – individually tailored CBT via participant selection of perceived needs and	Waitlist, TAU	Adults: Adults with elevated depression symptoms and those seeking	Some, 3 studies involved guidance		Yes				<p>Medium effect size on depression at post intervention (g = 0.54, 95% CI: 0.39–0.69) Similar effect sizes for guided vs non-guided intervention (g=0.65 vs g=0.50)</p>

Year	Reference	No. Studies	Total sample	Intervention	Control group	Target population	Guided Yes/No/Some	Outcome measures					Findings
								Anxiety Yes/No	Depression Yes/No	Other symptoms	Resilience Yes/No	Adherence Yes/No	
				preferences. Minimum of 6 modules, maximum 10.		treatment for depression							
2016	Andersson et al.	5	429	Computer/internet CBT: Internet-supported CBT (1 was unguided; 1 was iACT and 1 involved 2 clinic visits; 1 involved a smartphone). Treatment length ranged from 6 to 10 weeks	Face-to-face CBT (2 were group based)	Adults: General public; mean age ranged from 31 to 55 years	Yes (4/5 studies were guided)		Yes			Yes	The average effect size difference was Hedges $g = 0.12$ (95% CI -0.06 to 0.30) in the direction of favouring guided ICBT. On the basis of the 5 controlled studies guided ICBT and face-to-face CBT appears to be equally effective. Drop-out rates varied: 34% for ICBT and 43% group CBT in one study. Studies with smaller samples tended to report lower drop-out rates. About 1/3 of participants in one study at the 3 year follow-up had received additional psychological treatments during the follow-up period.
2016	Ebert et al.,	18 RCTs	2079	Computer/internet CBT: Internet based guided self-help treatment (e.g., feedback at end of module, weekly email support, email contact with therapist). Of the 18 studies, 12 included CBT, 5 PST, 1 ACT, 1 PD.	Control or comparison group (15/18 were waitlist controls, 2 were web-based discussion groups, 1 involved brief scheduled therapist support)	Adults: Aged 18+ with depression; mean age intervention group = 47.1 (SD = 8.2), and control group 46.4 (SD = 9.2)	Yes (all included feedback by coach, therapist or other)		Yes				The risk for a reliable deterioration from baseline to post-treatment was significantly lower in the intervention v control conditions (3.36 v 7.60; relative risk 0.47, 95% CI 0.29 to 0.75). Education moderated effects on deterioration, with patients with low education displaying a higher risk for deterioration than patients with higher education. Deterioration rates for patients with low education did not differ statistically significantly between intervention and control groups. The benefit-risk ratio for patients with low education indicated that 9.38 patients achieve a treatment response for each patient experiencing a symptom deterioration. Conclusion: Internet-based self-help is associated with a mean reduced risk for a symptom deterioration

Year	Reference	No. Studies	Total sample	Intervention	Control group	Target population	Guided Yes/No/Some	Outcome measures					Findings
								Anxiety Yes/No	Depression Yes/No	Other symptoms	Resilience Yes/No	Adherence Yes/No	
													compared to controls. Treatment and symptom progress of patients with low education should be closely monitored.
2016	Kampmann et al.	37 studies	2,991	Computer/internet CBT: 21 trials were iCBT (5-15 sessions) 13 trials were cognitive bias modification 13 trials were virtual reality exposure therapy	Waitlist, placebo	Adults: Minimum age 18 years, participants met the criteria for a diagnosis of SAD	Some	Social anxiety					iCBT and VRET less social anxiety symptoms than passive control (g=.84 and .82) When VRET was compared to passive control conditions at post assessment, the controlled effect size was large (g = 0.82, 95% CI [0.13–1.51], SE = 0.35, p = 0.019, k = 3). When compared to active control conditions, the effect was not significant at post assessment (g = -0.24, 95% CI [-0.71 to 0.23], SE = 0.24, p = 0.314, k = 3)
2014	Twomey, O'Reilly & Byrne	29 RCTs		Computer/internet CBT: Multi-modal CBT (i.e., CBT across delivery formats such as guided self-help, telephone based, computerised CBT and standard, one to one CBT. Included three studies for computerised/online CBT studies for CBT + TAU vs. primary care TAU; 3 studies for computerised CBT vs. no primary care treatment; 3 studies computerised CBT vs. primary care TAU.	No treatment, TAU	Adults: Primary care; depression or anxiety	Some	Yes	Yes				Multi-modal CBT was more effective than no primary care treatment (d = 0.59), and primary care TAU (d = 0.48) for anxiety and depression symptoms. Multi-modal CBT in addition to primary care TAU was shown to be more effective than primary care TAU for depression symptoms (d = 0.37). No comparisons were available for anxiety. Computerised/online CBT was more effective than no primary care treatment, yielding a medium effective size (d = 0.69, 95% CI, 0.44 to 0.99). For depression symptoms, computerised/online CBT in addition to primary care TAU could be compared with primary care TAU in three RCTs at post-intervention. Computerised/online CBT in addition to primary care TAU was more effective than primary care TAU, yielding a small effect size (d = 0.36, 95% CI, 0.03 – 0.69). Conclusion: The results indicate that multi-modal CBT is effective for

Year	Reference	No. Studies	Total sample	Intervention	Control group	Target population	Guided Yes/No/Some	Outcome measures					Findings	
								Anxiety Yes/No	Depression Yes/No	Other symptoms	Resilience Yes/No	Adherence Yes/No		
													anxiety and depression symptoms in primary care.	
2014	Arnberg et al.	39 studies	3,880	Computer/internet CBT: Mostly internet CBT over 8-12 weeks	Any established psychological treatments, waiting list, usual care, or attention control.	Adults: People with anxiety or mood disorders (but most child & adolescent studies were excluded due to risk of bias)	Some (most I-CBT had clinical/therapist-guided support)	Yes (Social phobia, PTSD, OCD, panic disorder)	Yes					<p>Large pooled effect for I-CBT on mild/moderate depression (d = 0.83; 95% CI 0.59, 1.07) compared to a waitlist condition</p> <p>pooled effect was large for I-CBT on generalised anxiety disorder compared to waitlist condition, but heterogeneous across the trials</p> <p>social phobia (d = 0.85;95% CI 0.66, 1.05)</p> <p>I-CBT had a cost per QALY of 29,384 USD compared to treatment as usual</p> <p>Conclusion: : I-CBT is a viable treatment option for adults with depression and some anxiety disorders</p> <p>Also, need for non-inferiority design RCTs</p>
2014	Van Ballegooijen et al.	24 studies		Computer/internet CBT: Guided iCBT interventions consisted of 5 to 9 sessions.	Face-to-face CBT treatments ranged from 12 to 28 sessions.	Adults: Depressed adults aged 18+ with no comorbid somatic disorder or substance abuse, community recruitment.	Yes					Yes	<p>Participants in face-to-face CBT completed on average 83.9% of their treatment, which did not differ significantly from participants in guided iCBT (80.8%).</p> <p>The percentage of completers (total intervention) was significantly higher in face-to-face CBT (84.7%) than in guided iCBT (65.1%), as was the percentage of completers of 80% or more of the intervention (face-to-face CBT 85.2%, guided iCBT 67.5%).</p> <p>Non-completers of face-to-face CBT completed on average 24.5% of their treatment, while non-completers of guided iCBT completed on average 42.1% of their treatment.</p> <p>Conclusion: we did not find studies that compared guided iCBT and face-to-face CBT in a single trial.</p> <p>Adherence to guided iCBT appears to be adequate and could be equal to adherence to face-to-face CBT.</p>	

Year	Reference	No. Studies	Total sample	Intervention	Control group	Target population	Guided Yes/No/Some	Outcome measures					Findings
								Anxiety Yes/No	Depression Yes/No	Other symptoms	Resilience Yes/No	Adherence Yes/No	
2013	Grist & Cavanagh	49 studies	5,503	Computer/internet CBT:	Waitlist (814 participants) Active control (n=1,387)	Adults: Adults with a common MH disorder, mean age=38.65 years	Some, (60% had more than 90mins of contact with a therapist)	Yes (69% studies)	Yes (29%, 2 studies looked at both)				Mean effect size of $g=.77$ for cCBT on common MH symptoms Comparisons between cCBT and inactive control groups had higher effect size ($g=1.11$) than compared to active control ($g=.40$)
2013	So et al.	14 RCTs	2807	Computer/internet CBT:	Waitlist and TAU	Adults: Aged 18+. Excluded studies on in-patients with severe symptoms, and people with comorbidities such as psychotic disorders, manic status, dementia, and severe physical conditions.	Some (9 studies were guided)		Yes		Yes	Yes	For the 16 comparisons comparing CCBT and control conditions, the pooled SMD was -0.48 (95% CI, -0.63 to -0.33), suggesting similar effect to the past reviews. There was no significant clinical effect at long term follow-up and no improvement of function found. A significantly higher drop-out rate was found for CCBT than for controls. The pooled SMD for waitlist controlled trials was - 0.63 (95% CI, -0.83 to -0.45) indicating a moderate effect. By contrast the pooled SMD for TAU-controlled trials was -.23 (95% CI, -0.37 to -0.09), indicating a small effect. Conclusion: Despite a short-term reduction in depression at post-treatment, the effect at long term follow-up and the function improvement were not significant, with significantly high drop-out. Considering the risk of bias, our meta-analysis implied that the clinical usefulness of current CCBT for adult depression may need to be re-considered downwards in terms of practical implementation and methodological validity.
2012	Richards & Richardson	19 RCTs from 23 papers	2996	Computer/internet CBT: Computer-based psychological treatments for depression.	Waitlist controls in 10 studies, treatment as usual in 8 studies, and another type of control in one.	Adults: Aged 18+ with depression (self-report or diagnosis), which may have had comorbid anxiety or physical health	Some (12 studies provided no support; 10 provided therapist support; 20 provided admin		Yes			Yes	Across 19 studies the meta-analysis revealed a moderate post-treatment pooled effect size $d = 0.56$ 95% CI, -0.71 to -0.41. Supported interventions yielded better outcomes, along with greater retention. The results reported statistically significant clinical

Year	Reference	No. Studies	Total sample	Intervention	Control group	Target population	Guided Yes/No/Some	Outcome measures					Findings
								Anxiety Yes/No	Depression Yes/No	Other symptoms	Resilience Yes/No	Adherence Yes/No	
				CBT interventions used in 17 studies. Some used CD-ROMs or online synchronous chat-based technology. The majority of programs used similar CBT content and deployed that content using web-based platforms, high-end multimedia and interactivity. Excluded recent development in computerised paradigms for depression such as cognitive bias modification.		problems. Participants could be from the general population or from a clinical group. Community samples in 12 studies, and primary and secondary care samples in 7 studies.	support of the program, but did not claim to be clinical)						improvement and recovery post-treatment. Studies which used therapist support and administrative support had a similar pooled effect size (d = 0.78 and d = 0.58) but the effect size for no support was lower (d = 0.36). The pooled effect size for studies which used less than 8 sessions was considerably higher than studies which used 8+ sessions (d = 0.75 vs d = 0.29). Pooled effect sizes were similar between studies conducted in community settings and primary or secondary care settings (d = 0.52 vs d = 0.46). The pooled effect size reached was almost twice as large for the general clinical treatment studies compared to studies performed on specific populations (d = 0.60 vs d = 0.33). Studies which used a waiting list control yielded greater effects than those which used a treatment as usual control group (d = 0.68 vs d = 0.39). Studies with no support had considerably higher levels of dropout compared to studies with admin or therapist support. The presence of human support, administrative or therapeutic, can have the impact of reducing dropout rates by up to 30-40%. Conclusion: The review and meta-analysis support the efficacy and effectiveness of computer-s psychological treatments for depression, in diverse settings and with different populations.
2017	Ophuis et al.	42 studies	Not specified	Computer/internet CBT:	Group CBT, attention control, internet	All ages: No restrictions on study populations	Some						Cost effectiveness: internet CBT appeared to be cost-effective compared to control conditions

Year	Reference	No. Studies	Total sample	Intervention	Control group	Target population	Guided Yes/No/Some	Outcome measures					Findings
								Anxiety Yes/No	Depression Yes/No	Other symptoms	Resilience Yes/No	Adherence Yes/No	
				Approx. 6 were internet CBT, this study also examined pharmacological interventions	supportive therapy								
2015	Donker et al.	16 studies	14,031	Computer/internet CBT: Most studies used CBT as the therapeutic mode of experimental intervention, and featured supported from a coach or therapist. 7 included email or chat. Intervention lengths varied from 4 weeks to 6 months.	Comparative treatments included group CBT, attention-placebo, TAU, unguided internet intervention, internet intervention + telephone support, and internet based problem-solving therapy.	All ages: All age groups were included	Yes (10 studies guided)	Yes (3 social phobia, 1 panic disorder, 1 health anxiety, 1 anxiety)	Yes (4 studies)	Smoking (3), alcohol (2), suicide prevention (1)			Results demonstrated that guided internet interventions for depression, anxiety, smoking cessation and alcohol consumption had favourable probabilities of being more cost-effective when compared to waitlist, TAU, group cognitive behavioural therapy (CBGT), attention control, telephone counselling or unguided internet CBT. Unguided internet interventions for suicide prevention, depression and smoking cessation demonstrated cost-effectiveness compared to TAU or attention control. In general, results from cost-utility analyses using more generic health outcomes (quality of life) were less favourable for unguided internet interventions. More economic valuations are needed, especially comparing internet guided internet interventions and face-to-face interventions or the most cost-effective intervention currently available directly instead of wait-list or attention controls, and economic evaluations for disorders not addressed (e.g., specific anxiety disorders, insomnia).
2014	Davies et al.	17 studies	1,795	Computer/internet CBT: Ranged 2-12 weeks The majority (n=13) were website-delivered and nine interventions were based on	Active control= received materials designed to mimic time and attention of the intervention Inactive control= waitlist/no treatment	All ages: 17-51 years	Yes (non-clinical/ layperson only)	Yes	Yes			Yes, attrition rates and satisfaction	In comparison to the inactive control, sensitivity meta-analyses supported intervention in improving anxiety (pooled standardized mean difference [SMD] -0.56; 95% CI -0.77 to -0.35, P<.001), depression (pooled SMD -0.43; 95% CI -0.63 to -0.22, P<.001), and stress (pooled SMD -0.73; 95% CI -1.27 to -0.19, P=.008). In comparison to active controls,

Year	Reference	No. Studies	Total sample	Intervention	Control group	Target population	Guided Yes/No/Some	Outcome measures					Findings
								Anxiety Yes/No	Depression Yes/No	Other symptoms	Resilience Yes/No	Adherence Yes/No	
				cognitive behavioural therapy (CBT).									sensitivity analyses did not support either condition for anxiety (pooled SMD -0.18; 95% CI -0.98 to 0.62, P=.66) or depression (pooled SMD -0.28; 95% CI -0.75 to -0.20, P=.25). In contrast to a comparison intervention, neither condition was supported in sensitivity analyses for anxiety (pooled SMD -0.10; 95% CI -0.39 to 0.18, P=.48) or depression (pooled SMD -0.33; 95% CI -0.43 to 1.09, P=.40).
2014	Christensen et al.	4 meta-analyses for depression and anxiety +29 RCTs for anxiety (2012-2013)	No details available	Computer/internet CBT: 55% CBT, ~10 weeks, majority were either solely or primarily self-help in conjunction with minimal therapist guidance	Not specified, only says that 2 of 29 studies compared to face-to-face therapy	All ages: 12-64 years	Some, most were unguided	Yes	Yes (6 studies focused on depression)			Yes	Between groups effect size of studies that looked at anxiety and depression was 0.8 (range 0.2-1.6) For the 29 anxiety papers: dropout at post-test, with mean dropout of 18% (SD=14%, range 0-64%) and only five studies with dropout rates above 30%.
2013	Twomey, O'Reilly & Bryne	25 cCBT programmes		Computer/internet CBT:	Wait-list control, face-to-face CBT, TAU,	All ages: Children, adolescents, and adults		Yes	Yes	Eating problems, stress, insomnia, pain and alcohol misuse			Conclusion: cCBT programmes, preferably administered as part of a stepped-care model, offer effective, low-cost and low-intensity interventions for a wide range of psychological problems. Their use could be beneficial given how underdeveloped primary care mental health services are in Ireland.
2016	Vigerland et al.	24 studies	1882	Computer/internet CBT: Internet delivered CBT (iCBT) included between 4 and 30 treatment modules (mean = 9.9) that were to be completed over a period of 3 to 26 weeks.	Waitlist control, face-to-face CBT.	Children and youth: Children and adolescents with a psychiatric condition aged <18 years.	Yes (21/25 studies included therapist support)	Yes	Yes	Yes			iCBT yielded moderate between group effect sizes when compared with waitlist, g = 0.62 (95% CI, 0.41 to 0.84). iCBT was not significantly better than an active control, pooled g= 0.10 (95% CI, -0.32 to 0.52). iCBT was not inferior when compared to traditional face-to-face CBT (non-significant pooled effect size, g = 0.22, 95% CI, -0.07 to 0.50). Conclusion: Results suggest that CBT for psychiatric and somatic

Year	Reference	No. Studies	Total sample	Intervention	Control group	Target population	Guided Yes/No/Some	Outcome measures					Findings
								Anxiety Yes/No	Depression Yes/No	Other symptoms	Resilience Yes/No	Adherence Yes/No	
													conditions in children and adolescents can be successfully adapted to an internet-delivered format.
2015	Ebert et al.	13 RCTs, 7 targeting anxiety, 4 depression, and 2 both anxiety and depression. Two studies aimed at children (<13) and 6 at adolescents (≥13), 5 mixed sample.	796	Computer/internet CBT: Computer, internet or mobile-based cognitive behavioural intervention targeting depression, anxiety or both. The intervention in the majority of studies could be completed in the home of participants (n = 9). Eleven/13 studies included guidance.	Control (no treatment, placebo e.g., active condition with no intended therapeutic properties). A non-treatment comparison was used in 10 studies, 3 studies used a placebo control.	Children and youth: Children or adolescents up to the age of 25 years with elevated levels of depressive/ anxiety symptoms	Yes (11/13 provided guidance)	Yes	Yes				<p>The overall mean effect size (Hedges' g) of cCBT on symptoms of anxiety or depression at post-test was g=0.72 (95% CI, 0.55 to 0.90). The superiority of cCBT over controls was evidence for interventions targeting anxiety (g=0.68, 95% CI, 0.45 to 0.92) and for depression (g=0.76, 95% CI, 0.41 to 0.12) as well as for transdiagnostic interventions (g=0.94, 95% CI, 0.23 to 2.66). Moderator analyses revealed that age group significantly moderated treatment outcome, with studies aimed at adolescent achieving better results (g=0.95, 95% CI 0.76 to 1.17), compared to studies aimed at children (g=0.51, 95%CI 0.11 to 0.92) and mixed samples (g = 0.48, 95% CI 0.25 to 0.71). Effect sizes were slightly lower than those found for cCBT for anxiety and depressive disorder in adults (g=0.88) [30], were comparable to those found in recent meta-analyses on traditional face-to-face CBT for anxiety disorders in youth (0.66) [15] and somewhat higher as those found for CBT for depression in youth (0.35) [16].</p> <p>Conclusions: Results provide evidence for the efficacy of cCBT in the treatment of anxiety and depressive symptoms in youth. Hence, such interventions may be a promising treatment alternative when evidence based face-to-face treatment is not feasible.</p>
2015	Pennant et al.	27 studies, 14 were	3389	Computer/internet CBT:	non-therapeutic control (e.g. wait-	Children and youth:	Yes	Yes	Yes				For young people (12-25 years) with risk of

Year	Reference	No. Studies	Total sample	Intervention	Control group	Target population	Guided Yes/No/Some	Outcome measures					Findings
								Anxiety Yes/No	Depression Yes/No	Other symptoms	Resilience Yes/No	Adherence Yes/No	
		cCBT, 3 were ABM		Any computerised psychological therapies (for example, CBT, problem solving therapy and interpersonal psychotherapy Computerised therapies could be delivered via the Internet, downloadable software, CD-ROMs or smartphone applications	list or no treatment) and studies comparing an intervention with another active intervention (e.g. face-to-face therapy)	Aged 5-25 years old.							diagnosed anxiety disorders or depression, computerised CBT (cCBT) had positive effects for symptoms of anxiety (SMD -0.77, 95% CI -1.45 to -0.09, k =6, N = 220) and depression (SMD -0.62, 95% CI -1.13 to -0.11, k = 7, N = 279). There was uncertainty around the effectiveness of cCBT in children (5-11 years). There was limited evidence for other (non cCBT) interventions.
2015	Rooksby et al	7 studies (4 RCTs)	No details	Computer/internet CBT:	Waitlist	Children and youth: The age of children included across studies ranged from 7 to16.	Yes	Yes					The findings together suggested that CBT programmes involving computerised elements were well received by children and their families, and its efficacy was almost as favourable as clinic-based CBT. The mixture of children and adolescents included the studies, diverse range of programmes, and lack of consistency between study designs made it difficult to identify key elements of these programmes or draw conclusions on the treatment efficacy. A fixed standardised effect size of 0.69 (95%CI 0.44, 0.94) on 'internalising problems outcomes' was found which was highly statistically significant (z = 5.45, p < 0.00001). The Q statistic was 1.44, df = 4, p > 0.8 showing low heterogeneity.
2016	Stasiak et al.	16 RCTs on 12 programs (5 targeting depression, 6 targeting anxiety, and		Computer/internet CBT: 9/12 programs were CBT based, others included mindfulness,	Most used wait-list as a comparator, two used equivalent face-to-face CBT, one used TAU, and	Children and youth: Children and adolescents (aged <18 years).	Some (5 studies included support by a clinician)	Yes	Yes			Yes	Overall, the results suggested that these interventions are effective in improving symptoms, although most studies have not been independently replicated, completion rates varied, and some studies were small.

Year	Reference	No. Studies	Total sample	Intervention	Control group	Target population	Guided Yes/No/Some	Outcome measures					Findings
								Anxiety Yes/No	Depression Yes/No	Other symptoms	Resilience Yes/No	Adherence Yes/No	
		1 a general mental health resource)		problem solving therapy. Programs included MoodGYM, Think Feel Do, Bite Back, The Journey, SPARX, Brave Online, Cool Teens CD, Camp Cope)	two used placebo-control.								Conclusion: A number of programs have been shown to be effective in well-designed RCTs. Replication and long-term follow-up studies are needed to confirm results.
2017	Hollis et al. (meta-review)	21 reviews, and 30 RCTs	5,273	Computer/internet CBT: 6 reviews were focused on cCBT	Waitlist, placebo (active non-therapeutic) waitlist,	Youth: Less than 25 years old.	Yes, many 5 of 6 CBT studies had parental involvement	Yes (4 reviews)	Yes (6 reviews, 4 reviews looked at both)	ASD, eating disorders, PTSD, ADHD			Meta-analyses showed small-to-moderate effects ($g=.16-.62$) for cCBT on depression outcomes, compared to waitlist and placebo conditions Moderate-to-large effect on anxiety ($g=.53-1.41$) Suggests that reviews may indicate greater effect among adolescents compared to children, but this may reflect baseline scores
2015	O'Dea et al	5 RCTs (2 for anxiety, 3 examined both anxiety and depression)	No details	Computer/internet CBT: 3 were CBT, 1 positive psych, 1 cognitive bias modification	Waitlist, placebo,	Youth: Aged 12-18	Some, only 1 study had clinical support	Yes (2)	Yes			Yes	In 4/5 studies e-mental health had positive effects on outcomes. Adherence for CBT internet programs was low, with 32-39% completing all modules
2014	Rice et al.	15 studies describing 10 trials	Not specified	Computer/internet CBT: Interventions ranged from 5 to 32 weeks duration. Interventions from the 10 trials included Cognitive Behavioural Analysis, MoodGYM, Cognitive behavioural skills training program, SPARX, CATCH-IT, Internet Problem Solving Therapy, Blues Blaster,	For the prevention studies, comparison groups varied from waitlist control, attention placebo, and those not receiving motivational interviewing. For intervention studies, comparison groups were either treatment as usual (pharmacotherapy and psychosocial	Youth: Aged between 12 and 25 years at risk of depression or not meeting current diagnostic criteria for major depressive disorder (MDD) (9 studies), meeting clinical diagnosis for MDD (5 studies), or a mixed sample (1 study)	Some (2/10 interventions included moderator or clinician input)		Yes			Yes	With the exception of one combined prevention and intervention study, all included trials reported positive findings. Dropout rates for 14/15 studies varied significantly ranging from 3 to 41%. Efficacy: Prevention Studies. The prevention studies demonstrated intervention efficacy among university students, secondary students (although effects were significant only for male participants), and adolescents identified as at-risk of depressive disorder. Several studies using the CATCH-IT intervention indicated that motivational interviewing provided

Year	Reference	No. Studies	Total sample	Intervention	Control group	Target population	Guided Yes/No/Some	Outcome measures					Findings
								Anxiety Yes/No	Depression Yes/No	Other symptoms	Resilience Yes/No	Adherence Yes/No	
				<p>Computerised CBT, and Master your Mood. MoodGYM, Cognitive behavioural analysis, and SPARX were delivered via computer in a group classroom setting, with supervision from a classroom teacher/ tutor. Two studies included moderator or clinician input. Focus on prevention (using a universal or targeted approach), treatment, or relapse prevention.</p>	<p>services), waitlist control, or brief psychoeducation.</p>							<p>by a primary care practitioner prior to intervention commencement aided the young person's engagement and symptom improvement. However, the CATCH-IT intervention had not been compared to no intervention or a comparison intervention.</p> <p>Efficacy: Intervention Studies: Intervention studies demonstrated superiority of the online intervention to the comparison treatment. Those involved the cognitive behavioural skills training program, SPARX, Computerised CBT, and Master your Mood. One of the more novel intervention studies (the large SPARX RCT intervention that integrated CBT concepts within an online fantasy game) demonstrated non-inferiority relative to treatment as usual provided by youth clinics, school-based counselling services, or general practitioners.</p> <p>Conclusion: Findings related to RCTs of online interventions in young people indicated largely positive effects.</p> <p>Online interventions with a broad cognitive behavioural focus appear to be promising in reducing depression symptomatology in young people.</p>	

				(only 1 study), online lesson, interactive family programs		patients. 5/10 were female only studies							for key factors including type of analysis (intention-to-treat, completers only), type of control (active, waitlist), age group (11-16, 17+ years), gender composition (female only, mixed), type of intervention (prevention, 'treatment'), guided versus unguided programs, mode of delivery (Internet, computer), individual versus family dyad and venue (home, research setting"
2012	Carey et al.	26	32,243	Computer/internet for substance use: Interaction with a computer alcohol intervention, only 1 study may have involved CBT	Non-active controls (waitlist, no treatment, assessment- only)	All ages: Mean age 20 years old university students	No			Alcohol			Lower intoxication quantity, frequency, and peak at short term follow up (d+s=0.13-0.29) compared to controls, but not maintained long term. Whereas, face to face intervention did show long term effects.
2015	Gulliver et al.	12 RCTs (20 interventions, 6 included in meta- analysis)	Range:65 to 517	Computer/internet for substance use: Computer programs (10 studies), internet (5), telephone (3), mobile SMS (2) targeting tobacco (6) and/or cannabis use (2)	TAU, attention control, no treatment control	Youth: University and college students 18-25 years	Some			Cannabis			Interventions increased the rate of tobacco abstinence by 1.5 times that of controls (Risk Ratio [RR] = 1.54; 95% Confidence Interval [CI] = 1.20-1.98). The effect sizes at post-intervention for interventions targeting marijuana were 0.38 and -0.01, and 0.28 for the multi-targeted intervention Neither of the marijuana interventions (2 studies) consisting of brief web- or computer-based personalized feedback programs, was effective at reducing or preventing marijuana use for participants in the intervention condition compared with no- intervention control conditions.
2013	Champion et al.	12 trials	21,633	Computer/internet for substance use: Via CD ROM, most were based on social influence theory to resist peer pressure for alcohol, tobacco and cannabis	Health education as usual	Youth: High school students aged 13- 15 years old	No			Alcohol, tobacco and cannabis			Interventions can be effective at reducing drug use, and intention to use. Effect sizes and odds ratios for substance use were small, only 5/6 studies showed long term effects on drug and alcohol consumption Limited trials examining school-based computer interventions - not enough for meta-analysis 4 trials examining alcohol had small effect sizes on use at post-intervention

				were classified as “generic motivation” Mean number of texts = 122 (SD = 88). Studies were included whether the text message intervention was offered as a stand alone treatment or in combination with another program.									the text messages in these studies ranged from 1-4 days. Another study found a moderate decrease in alcohol consumption (d = 0.39) based a 12 week intervention involving 60 text messages.
2017	Maresova et al.	6 RCTs	1870	Mobile/smartphone: Mobile apps for the improvement, detection or assessment of depressive symptoms. 4-12 weeks. Three interventions involved CBT.	Not specified	All ages: People with depression or depressive symptoms. Studies primarily focused on anxiety or other psychiatric disorders were excluded.	Some (at least 2 studies included therapist support)		Yes				<i>Effect sizes were not reported.</i> Conclusion: The number of mobile health applications is rapidly growing thanks to the rapid development of these technologies worldwide. The findings of the RCTs show that there is a big potential of mobile applications in the detection, diagnostics, and treatment of depression, particularly in mild and moderate stages of the disease. They seem to be especially relevant for self-monitoring of depressive symptoms in the early stages of depression. There is an urgent need of more longitudinal RCT in this field in order to prove conclusive efficacy of these mobile applications in the treatment of depression.
Games													
2016	Li et al.	9 studies, 4 were RCTs	460	Games: Exergames (a) involving technology-driven game playing; and (b) requiring participants to be physically active to exercise (go beyond simple hand finger movements) or to play the game	Occupational therapy or TAU	Adults: Healthy participants or those with other chronic or mental illnesses. Included studies focused on older adults.	Some, 1 had OT sessions		Yes				A random effects meta-analysis on eight studies resulted an overall significant effect size of $g = 0.21$. Demographic factors, depression severity, number of session, and game type were found to be significant moderators for the effectiveness. There was a significant effect size observed on older adults ($g = 0.56, z = 3.14, p < 0.01$). It was much larger than the nonsignificant effect size found on general adults ($g = 0.07$).
2014	Li et al.	10 RCTs included in meta-analysis	636	Games:	5 studies were compared to TAU, 3 waitlist,	All ages:	Some (3 were therapist		Yes				The meta-analysis revealed a moderate effect size of the game interventions for

		from 8 studies		Four types of game interventions – psycho-education and training, virtual reality exposure therapy, exercising, and entertainment – were identified. Excluded most of the current interventions in computerised cognitive behavioural therapy (CCBT) without game elements involved. Three interventions were either therapist administered or involved minimal contact therapy.	and 2 active treatment.	There were no limitations on the participants' age or the significance of the depression symptoms.	administered or involved minimal contact therapy)						depression therapy at post-treatment (d= -0.47, 95% CI, -0.69 to -0.24). Games in the virtual reality exposure therapy group (d= -0.67, 95% CI, -1.19 to -0.14) seem to achieve the biggest effect size, followed by the entertainment (d=-0.42, 95% CI -1.23 to 0.39) and psycho-education and training groups (d = -0.41, 95% CI -0.67 to -0.14). Interventions with therapist involvement were shown to have a weaker effect size than those without therapist involvement (d = -0.44 vs d = -0.54), despite there being no heterogeneity between the two subgroups. Studies aimed at adults were recorded as having the strongest effect size (d = -0.54, 95% CI, -0.86 to -0.21) in the subgroup analysis of target population (d=-0.47, 95% CI -0.80 to -0.15 for adolescents based on 6 studies). Studies that used a waiting list control condition yielded a greater effect (d = -0.66, 95% CI, -1.14 to -0.18) than those using treatment as usual (d= -0.39, 95% CI -0.68 to -0.11) or active treatment (d = -0.53, 95% CI -1.10 to 0.03) as controls. A subgroup analysis showed that interventions based on psycho-education and training had a smaller effect than those based on the other forms, and that self-help interventions yielded better outcomes than supported interventions. A higher effect was achieved when a waiting list was used as the control. Conclusion: The review and meta-analysis support the effectiveness of game-based digital interventions for depression. More large-scale, high quality RCT studies with sufficient long-term data for treatment evaluation are needed.
2014	Rodriguez et al.	8 studies	2,196	Games:	Only 2 studies had control conditions	Youth: Aged 11-18 years	No			Substance use			Only 1 study reported reduced frequency drug use. 6 reported

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