Effectiveness of e-mental health approaches

Rapid review
Effectiveness of e-mental health approaches

Published in July 2018 by Te Pou o te Whakaaro Nui

Te Pou o te Whakaaro Nui is a national centre of evidence based workforce development for the mental health, addiction and disability sectors in New Zealand.

PO Box 108-244, Symonds Street, Auckland, New Zealand.

Web  www.tepou.co.nz
Email  info@tepou.co.nz
Acknowledgements

This rapid review has been undertaken by Te Pou o te Whakaaro Nui (Te Pou). The co-authors of the report include Jennifer Lai and Dr Angela Jury. Research assistance support was also provided by Nicholas Gampell.

Te Pou thanks the Ministry of Health for undertaking the initial literature searches which largely formed the basis of this review.
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). 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).

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, Calear, 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.
14

Effectiveness of e-mental health approaches

(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**

**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, Pratap, 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)

<table>
<thead>
<tr>
<th>E-mental health approach</th>
<th>Children (&lt;13 years)</th>
<th>Youth (13-25 years)</th>
<th>Adults (&gt;25 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Depression</td>
<td>Anxiety</td>
<td>Depression</td>
</tr>
<tr>
<td>Computerised and internet-based approaches</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBT</td>
<td>small(^{*})</td>
<td>small(^{*})</td>
<td>moderate-large</td>
</tr>
<tr>
<td>ACT</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mindfulness</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Other platforms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile apps</td>
<td>-</td>
<td>-</td>
<td>small-moderate</td>
</tr>
<tr>
<td>Text messaging</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Games</td>
<td>-</td>
<td>-</td>
<td>moderate</td>
</tr>
<tr>
<td>Virtual reality</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: - = not identified in review; \(^{*}\) = requires more research; \(^{\wedge}\) = 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)

<table>
<thead>
<tr>
<th>E-mental health approach</th>
<th>Youth (13-25 years)</th>
<th>Adults (&gt;25 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol consumption</td>
<td>Small</td>
<td>Small</td>
</tr>
<tr>
<td>Cannabis use</td>
<td>Small-no effect</td>
<td>Small-no effect</td>
</tr>
</tbody>
</table>

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

**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

<table>
<thead>
<tr>
<th>Year</th>
<th>Reference</th>
<th>No. Studies</th>
<th>Total sample</th>
<th>Intervention</th>
<th>Control group</th>
<th>Target population</th>
<th>Guided Yes/No/Some</th>
<th>Outcome measures</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Computer/internet CBT: eHealth interventions utilising cognitive behavioural techniques. Of the 10 trials, 7 were iCBT, 1 Psychoed + CBT, 1 ACT, 1 Emails</td>
<td>waitlist control (2 studies), another intervention (8 studies)</td>
<td>Adults: University students and adults in the general population aged 18 – 64 years without a clinically diagnosed common mental disorder. Sub-clinical or nonclinical samples were included.</td>
<td>Some (4 studies provided no support)</td>
<td>Anxiety Yes/No</td>
<td>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 depression Yes/No</td>
</tr>
<tr>
<td>2017</td>
<td>Deady et al.</td>
<td>10 trials</td>
<td>4,522</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

Note: The table continues with entries for other types of e-mental health approaches. The findings section provides a detailed summary of the results from the studies included in the systematic reviews and meta-analyses.
<table>
<thead>
<tr>
<th>Year</th>
<th>Reference</th>
<th>No. Studies</th>
<th>Total sample</th>
<th>Intervention</th>
<th>Control group</th>
<th>Target population</th>
<th>Guided</th>
<th>Outcome measures</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>Leavey &amp; Hawkins</td>
<td>5 studies for e-health CBT</td>
<td>E-health had an average of 62 participants (25-116)</td>
<td>Computer/internet CBT: CBT e-health, including internet and phone; internet and email, internet and text, email with links to website, CD-ROM</td>
<td>Control group</td>
<td>Adults: Average age in e-health studies was 38 years, proportion of females ranged from 46-82%</td>
<td>Yes</td>
<td>Anxiety Yes/No, Depression Yes/No, Other symptoms Yes/No, Resilience Yes/No, Adherence Yes/No</td>
<td>Suicide ideation</td>
</tr>
</tbody>
</table>

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.

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.

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
<table>
<thead>
<tr>
<th>Year</th>
<th>Reference</th>
<th>No. Studies</th>
<th>Total sample</th>
<th>Intervention</th>
<th>Target population</th>
<th>Guided</th>
<th>Outcome measures</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes/No</td>
<td>Aniety</td>
<td>Depression</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes/No</td>
<td>Yes/No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>Twomey &amp; O'Reilly</td>
<td>12 studies</td>
<td>5,745</td>
<td>Computer/internet CBT: MOODGym – developed in Australia, has 5 core sessions with written info, animations, and interactive exercises</td>
<td>Waitlist, TAU, computerised control conditions</td>
<td>Adults: Adults with elevated mental health symptoms and those seeking MH treatment</td>
<td>Yes</td>
<td>Yes/No</td>
</tr>
<tr>
<td>2017</td>
<td>Twomey et al.</td>
<td>8 RCTs</td>
<td>2,402</td>
<td>Computer/internet CBT: Deprexis – individually tailored CBT via participant selection of perceived needs and</td>
<td>Waitlist, TAU</td>
<td>Adults: Adults with elevated depression symptoms and those seeking</td>
<td>Some, 3 studies involved guidance</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*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. 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.*
<table>
<thead>
<tr>
<th>Year</th>
<th>Reference</th>
<th>No. Studies</th>
<th>Total sample</th>
<th>Intervention</th>
<th>Control group</th>
<th>Target population</th>
<th>Guided Yes/No/Some</th>
<th>Outcome measures</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Andersson et al.</td>
<td>5</td>
<td>429</td>
<td>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</td>
<td>Face-to-face CBT (2 were group based)</td>
<td>Adults: General public; mean age ranged from 31 to 55 years</td>
<td>Yes (4/5 studies were guided)</td>
<td>Anxiety Yes/No</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Ebert et al.</td>
<td>18 RCTs</td>
<td>2079</td>
<td>Computer/internet CBT: Internet based guided self-help treatment (e.g., feedback at end of module, weekly email support, weekly contact with therapist). Of the 18 studies, 12 included CBT, 5 PST, 1 ACT, 1 PD.</td>
<td>Control or comparison group (15/18 were waitlist controls, 2 were web-based discussion groups, 1 involved brief scheduled therapist support)</td>
<td>Adults: Aged 18+ with depression; mean age intervention group = 47.1 (SD = 8.2), and control group 46.4 (SD = 9.2)</td>
<td>Yes (all included feedback by coach, therapist or other)</td>
<td>Depression Yes/No</td>
<td>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.</td>
</tr>
<tr>
<td>Year</td>
<td>Reference</td>
<td>No. Studies</td>
<td>Total sample</td>
<td>Intervention</td>
<td>Control group</td>
<td>Target population</td>
<td>Guided Yes/No/Some</td>
<td>Outcome measures</td>
<td>Findings</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
<td>-------------</td>
<td>--------------</td>
<td>--------------</td>
<td>---------------</td>
<td>------------------</td>
<td>-------------------</td>
<td>-----------------</td>
<td>----------</td>
</tr>
<tr>
<td>2016</td>
<td>Kampmann et al.</td>
<td>37 studies</td>
<td>2,991</td>
<td>Computer/internet CBT: 21 trials were iCBT (5-15 sessions) 13 trials were cognitive bias modification 13 trials were virtual reality exposure therapy</td>
<td>Waitlist, placebo</td>
<td>Adults: Minimum age 18 years, participants met the criteria for a diagnosis of SAD</td>
<td>Some</td>
<td>Social anxiety</td>
<td>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 = 0.92, 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)</td>
</tr>
<tr>
<td>2014</td>
<td>Twomey, O’Reilly &amp; Bryne</td>
<td>29 RCTs</td>
<td></td>
<td>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.</td>
<td>No treatment, TAU</td>
<td>Adults: Primary care; depression or anxiety</td>
<td>Some</td>
<td>Yes</td>
<td>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</td>
</tr>
</tbody>
</table>

Compared to controls. Treatment and symptom progress of patients with low education should be closely monitored.
<table>
<thead>
<tr>
<th>Year</th>
<th>Reference</th>
<th>No. Studies</th>
<th>Total sample</th>
<th>Intervention</th>
<th>Target population</th>
<th>Control group</th>
<th>Guided Yes/No/Some</th>
<th>Outcome measures</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>Arnberg et al.</td>
<td>39 studies</td>
<td>3,880</td>
<td>Computer/internet CBT: Mostly internet CBT over 8-12 weeks</td>
<td>Any established psychological treatments, waiting list, usual care, or attention control. Adults: People with anxiety or mood disorders (but most child &amp; adolescent studies were excluded due to risk of bias)</td>
<td>Some (most I-CBT had clinical/therapist-guided support)</td>
<td>Yes</td>
<td>Anxiety Yes/No Depression Yes/No Other symptoms Resilience Yes/No Adherence Yes/No</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anxiety &amp; depression symptoms in primary care</td>
<td>Large pooled effect for I-CBT on mild/moderate depression (d = 0.83; 95% CI 0.59, 1.07) compared to a waitlist condition pooled effect was large for I-CBT on generalised anxiety disorder compared to waitlist condition, but heterogeneous across the trials. Social phobia (d = 0.85; 95% CI 0.66, 1.05) I-CBT had a cost per QALY of 29,384 USD compared to treatment as usual. Conclusion: I-CBT is a viable treatment option for adults with depression and some anxiety disorders. Also, need for non-inferiority design RCTs.</td>
</tr>
<tr>
<td>2014</td>
<td>Van Ballegooijen et al.</td>
<td>24 studies</td>
<td></td>
<td>Computer/internet CBT: Guided iCBT interventions consisted of 5 to 9 sessions.</td>
<td>Face-to-face CBT treatments ranged from 12 to 28 sessions.</td>
<td>Adults: Depressed adults aged 18+ with no comorbid somatic disorder or substance abuse, community recruitment.</td>
<td>Yes</td>
<td>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%). 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%). 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. Conclusion: we did not find studies that compared guided iCBT and face-to-face CBT in a single trial. Adherence to guided iCBT appears to be adequate and could be equal to adherence to face-to-face CBT.</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Reference</td>
<td>No. Studies</td>
<td>Total sample</td>
<td>Intervention</td>
<td>Control group</td>
<td>Target population</td>
<td>Guided</td>
<td>Outcome measures</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------</td>
<td>-------------</td>
<td>--------------</td>
<td>-------------------------------------------------</td>
<td>---------------</td>
<td>---------------------------------------------------------</td>
<td>--------------</td>
<td>------------------</td>
<td></td>
</tr>
</tbody>
</table>
|       |                            |             |              |                                                 |               | Adult:  
|       |                            |             |              | Waitlist (814 participants) Active control (n=1,387) |               | Adults with a common MH disorder, mean age=38.65 years | Yes/Some     | Anxiety Yes/No   |
|       |                            |             |              |                                                 |               | Some, (60% had more than 90mins of contact with a therapist) | Yes (69% studies) | Depression Yes/No |
|       |                            |             |              |                                                 |               |                                                         | Yes          | Other symptoms Yes/No |
|       |                            |             |              |                                                 |               |                                                         | Yes          | Resilience Yes/No |
|       |                            |             |              |                                                 |               |                                                         | Adherence Yes/No |
|       |                            |             |              |                                                 |               |                                                         | Findings     |
| 2013  | Grist & Cavanagh           | 49 studies  | 5,503        | Computer/internet CBT:                           | Waitlist and TAU | Adults:  
|       |                            |             |              |                                                 |               | 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          | Adherence Yes/No |
|       |                            |             |              |                                                 |               |                                                         | Findings     |
| 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          | Adherence Yes/No |
|       |                            |             |              |                                                 |               |                                                         | Findings     |
| 2012  | Richards & Richardson      | 19 RCTs     | 2996         | Computer/internet CBT:                           | Waitlist controls in 10 studies, treatment as usual in 8 studies, and another type of control in one. | Adults:  
|       |                            | from 23 papers |              |                                                 |               | 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 |
|       |                            |             |              |                                                 |               |                                                         | Findings     |

**Findings**

- Mean effect size of g=0.77 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=0.40).
- 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 -0.23 (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.
<table>
<thead>
<tr>
<th>Year</th>
<th>Reference</th>
<th>No. Studies</th>
<th>Total sample</th>
<th>Intervention</th>
<th>Control group</th>
<th>Target population</th>
<th>Guided support</th>
<th>Outcome measures</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>42 studies</td>
<td>Not specified</td>
<td>Computer/internet CBT</td>
<td>Group CBT, attention control, internet</td>
<td>All ages: No restrictions on study populations</td>
<td>Some</td>
<td>Anxiety Yes/No</td>
<td>Improvement and recovery post-treatment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Depression Yes/No</td>
<td>Studies which used therapist support and administrative support had a similar pooled effect size (d = 0.78 and d = 0.50) 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).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Other symptoms Yes/No</td>
<td>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).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Resilience Yes/No</td>
<td>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).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Adherence Yes/No</td>
<td>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%.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>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.</td>
</tr>
</tbody>
</table>

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.
<table>
<thead>
<tr>
<th>Year</th>
<th>Reference</th>
<th>No. Studies</th>
<th>Total sample</th>
<th>Intervention</th>
<th>Control group</th>
<th>Target population</th>
<th>Guided Yes/No/Some</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>Davies et al.</td>
<td>17 studies</td>
<td>1,795</td>
<td>Computer/internet CBT:</td>
<td>Active control= received materials designed to mimic time and attention of the intervention; inactive control= waitlist/no treatment</td>
<td>All ages: 17-51 years; non-clinical/layperson only</td>
<td>Yes (non-clinical/layperson only)</td>
<td>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&lt;.001), depression (pooled SMD -0.43; 95% CI -0.63 to -0.22, P&lt;.001), and stress (pooled SMD - 0.73; 95% CI -1.27 to -0.19, P=.008). In comparison to active controls,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ranged 2-12 weeks The majority (n=13) were website-delivered and nine interventions were based on</td>
<td>Active control= received materials designed to mimic time and attention of the intervention; inactive control= waitlist/no treatment</td>
<td>All ages: 17-51 years; non-clinical/layperson only</td>
<td>Yes (non-clinical/layperson only)</td>
<td>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&lt;.001), depression (pooled SMD -0.43; 95% CI -0.63 to -0.22, P&lt;.001), and stress (pooled SMD - 0.73; 95% CI -1.27 to -0.19, P=.008). In comparison to active controls,</td>
</tr>
<tr>
<td>2015</td>
<td>Donker et al.</td>
<td>16 studies</td>
<td>14,031</td>
<td>Computer/internet CBT:</td>
<td>Comparative treatments included group CBT, attention-placebo, TAU, unguided internet intervention, internet intervention + telephone support, and internet based problem-solving therapy.</td>
<td>All ages: All age groups were included</td>
<td>Yes (10 studies guided)</td>
<td>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).</td>
</tr>
<tr>
<td>Year</td>
<td>Reference</td>
<td>No. Studies</td>
<td>Total sample</td>
<td>Intervention</td>
<td>Control group</td>
<td>Target population</td>
<td>Guided Yes/No/Some</td>
<td>Outcome measures</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
<td>-------------</td>
<td>--------------</td>
<td>--------------</td>
<td>---------------</td>
<td>------------------</td>
<td>-------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>2014</td>
<td>Christensen et al.</td>
<td>4 meta-analyses for depression and anxiety +29 RCTs for anxiety (2012-2013)</td>
<td>No details available</td>
<td>Computer/internet CBT: 55% CBT, ~10 weeks, majority were either solely or primarily self-help in conjunction with minimal therapist guidance</td>
<td>Not specified, only says that 2 of 29 studies compared to face-to-face therapy</td>
<td>All ages: 12-64 years</td>
<td>Yes</td>
<td>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).</td>
</tr>
<tr>
<td>2013</td>
<td>Twomey, O'Reilly &amp; Bryne</td>
<td>25 cCBT programmes</td>
<td>Computer/internet CBT: Wait-list control, face-to-face CBT, TAU</td>
<td>All ages: Children, adolescents, and adults</td>
<td>Yes</td>
<td>Yes (6 studies focussed on depression)</td>
<td>Between groups effect size of studies that looked at anxiety and depression was 0.8 (range 0.2-1.6). 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.</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>Vigerland et al.</td>
<td>24 studies</td>
<td>1882</td>
<td>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.</td>
<td>Waitlist control, face-to-face CBT.</td>
<td>Children and youth: Children and adolescents with a psychiatric condition aged &lt;18 years.</td>
<td>Yes (21/25 studies included therapist support)</td>
<td>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 problems could 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.</td>
</tr>
</tbody>
</table>

Outcome measures:
- Anxiety: Yes/No
- Depression: Yes/No
- Other symptoms: Yes/No
- Resilience: Yes/No
- Adherence: Yes/No
<table>
<thead>
<tr>
<th>Year</th>
<th>Reference</th>
<th>No. Studies</th>
<th>Total sample</th>
<th>Intervention</th>
<th>Control group</th>
<th>Target population</th>
<th>Guided Yes/No/Some</th>
<th>Outcome measures</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>conditions in children and adolescents can be successfully adapted to an internet-delivered format.</td>
</tr>
<tr>
<td>2015</td>
<td>Ebert et al.</td>
<td>13 RCTs, 7 targeting anxiety, 4 depression, and 2 both anxiety and depression. Two studies aimed at children (&lt;13) and 6 at adolescents (≥13), 5 mixed sample.</td>
<td>796</td>
<td>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.</td>
<td>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.</td>
<td>Children and youth: Children or adolescents up to the age of 25 years with elevated levels of depressive/anxiety symptoms</td>
<td>Yes (11/13 provided guidance)</td>
<td>Anxiety Yes/No</td>
<td>Yes</td>
</tr>
<tr>
<td>2015</td>
<td>Pennant et al.</td>
<td>27 studies, 14 were</td>
<td>3389</td>
<td>Computer/internet CBT: non-therapeutic control (e.g. wait-list)</td>
<td>Yes</td>
<td>Children and youth:</td>
<td>Yes</td>
<td>Depression Yes/No</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Other symptoms Yes/No</td>
<td>Resilience Yes/No</td>
</tr>
<tr>
<td>Year</td>
<td>Reference</td>
<td>No. Studies</td>
<td>Total sample</td>
<td>Intervention</td>
<td>Control group</td>
<td>Target population</td>
<td>Guided Yes/No/Some</td>
<td>Outcome measures</td>
<td>Findings</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
<td>-------------</td>
<td>--------------</td>
<td>--------------</td>
<td>---------------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>-----------------</td>
<td>----------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anxiety Yes/No</td>
<td>Depression Yes/No</td>
</tr>
<tr>
<td>2015</td>
<td>Rooksby et al</td>
<td>7 studies (4 RCTs)</td>
<td>No details</td>
<td>Computer/internet CBT:</td>
<td>Waitlist</td>
<td>Children and youth: \nAged 5-25 years old.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>2016</td>
<td>Stasiak et al</td>
<td>16 RCTs on 12 programs (5 targeting depression, 6 targeting anxiety, and 1 targeting other symptoms)</td>
<td>Computer/internet CBT:</td>
<td>Most used wait-list as a comparator, two used equivalent face-to-face CBT, one used TAU, and one used support by a clinician.</td>
<td>Children and adolescents (aged &lt;18 years).</td>
<td>Some (5 studies included support by a clinician)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year</td>
<td>Reference</td>
<td>No. Studies</td>
<td>Total sample</td>
<td>Intervention</td>
<td>Control group</td>
<td>Target population</td>
<td>Guided Yes/No/Some</td>
<td>Outcome measures</td>
<td>Findings</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
<td>-------------</td>
<td>--------------</td>
<td>--------------</td>
<td>---------------</td>
<td>------------------</td>
<td>-------------------</td>
<td>-----------------</td>
<td>----------</td>
</tr>
<tr>
<td>2017</td>
<td>Hollis et al. (meta-review)</td>
<td>21 reviews, and 30 RCTs</td>
<td>5,273</td>
<td>Computer/internet CBT: 6 reviews were focused on cCBT,</td>
<td>Youth: Less than 25 years old.</td>
<td>Yes (5 of 6 CBT studies had parental involvement)</td>
<td>Yes (4 reviews)</td>
<td>Anxiety Yes/No, Depression Yes/No, Other symptoms, Resilience Yes/No, Adherence Yes/No</td>
<td>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.</td>
</tr>
<tr>
<td>2015</td>
<td>O’Dea et al</td>
<td>5 RCTs (2 for anxiety, 3 examined both anxiety and depression)</td>
<td>No details</td>
<td>Computer/internet CBT: 3 were CBT, 1 positive psych, 1 cognitive bias modification,</td>
<td>Youth: Aged 12-18</td>
<td>Some, only 1 study had clinical support</td>
<td>Yes (2)</td>
<td>ASD, eating disorders, PTSD, ADHD</td>
<td>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.</td>
</tr>
<tr>
<td>2014</td>
<td>Rice et al</td>
<td>15 studies describing 10 trials</td>
<td>Not specified</td>
<td>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,</td>
<td>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)</td>
<td>Some (2/10 interventions included moderator or clinician input)</td>
<td>Yes</td>
<td>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...</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Reference</td>
<td>No. Studies</td>
<td>Total sample</td>
<td>Intervention</td>
<td>Control group</td>
<td>Target population</td>
<td>Guided Yes/No/Some</td>
<td>Outcome measures</td>
<td>Findings</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
<td>-------------</td>
<td>--------------</td>
<td>--------------</td>
<td>---------------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>------------------</td>
<td>----------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>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.</td>
<td>services, waitlist control, or brief psychoeducation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Authors</td>
<td>Studies</td>
<td>Participants</td>
<td>Intervention Details</td>
<td>Adherence</td>
<td>Outcome Measures</td>
<td>Findings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>---------</td>
<td>--------------</td>
<td>----------------------</td>
<td>-----------</td>
<td>-----------------</td>
<td>----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>Brown et al.</td>
<td>10</td>
<td>No details available</td>
<td>Computer/internet ACT: Internet Web-delivered acceptance and commitment therapy (ACT). Varied between 3-12 weeks, included 2-9 modules. Most compared active control and/or waitlist control. Adults: 2 studies recruited from clinics (eg pain clinics). 2 from undergrad students, remainder from general population. Some, 7 of 10 interventions were guided (trained psychologist or graduate psych students).</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (quality of life)</td>
<td>Between groups: Effect size for depression outcome was small and in favour of ACT (g=0.24, p=0.02). Effect size for anxiety was significant but effect size was too small (g=0.18, p=0.03). Within groups: effect sizes for depression &amp; anxiety were medium (g=-.73 &amp; .51, p&lt;.001). Quality of life had small effect (g=.44, p=.001). Adherence ranged between 48-100%</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>Spijkerman et al.</td>
<td>15</td>
<td>2,360</td>
<td>Computer/internet mindfulness: Online mindfulness-based interventions. Sessions were usually weekly, ranging from 2 to 12 sessions. The intervention duration varied from 2 to 12 weeks. Settings and platform varied. Active/ inactive controls. Adults: Aged 18 or older (range 18-58 years). Also included population with somatic illnesses, and non-clinical populations. Some, 9 studies had guidance.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Online MBIs have a small but significant beneficial impact on depression (g=0.29), anxiety (g=0.22), well-being (g=0.23) and mindfulness (g=0.32). The largest effect was found for stress, with a moderate effect size (g=0.51). For stress and mindfulness, exploratory subgroup analyses demonstrated significantly higher effect sizes for guided online MBIs than for unguided online MBIs. Adherence 39.5-92%</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>Hoch et al.</td>
<td>4 RCTs</td>
<td>1,928</td>
<td>Computer/internet for substance use: 2 were CBT, 1 chat room, 1 personalised feedback. Web-based screening only, educational info, delayed treatment. Adults: At risk cannabis users in the general population or college students (aged 17-19 years).</td>
<td>Some</td>
<td>Cannabis</td>
<td>The pooled mean difference was 4.07 and overall effect size was small (0.11) at 3-month follow-up in favour of digital interventions. Studies measured days of cannabis use or frequency of use.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>Wood et al.</td>
<td>10 studies</td>
<td>4,108</td>
<td>Computer/internet for substance use: 2 CBT, others include videos, worksheets, facts, skills, goal setting. Waitlist, TAU, therapist intervention. All ages: 6th, 7th grade students, and adults over 18 years.</td>
<td>Some</td>
<td>Substance use</td>
<td>Potentially effective at reducing frequency of drug use at mid-term (less than 12 months), and immediately Need for longer term evaluations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>Tait et al.</td>
<td>10 studies</td>
<td>4, 124</td>
<td>Computer/internet for substance use: Involved a variety of online chat with a counsellor, CBT. TAU, assessment only, information only. All ages: Youngest were 11 years old, and adults. Students, cannabis users or some, counsellor or family involvement.</td>
<td>Some, counsellor or family involvement</td>
<td>Cannabis</td>
<td>Effect size was small, g = 0.16 (95% CI 0.09-0.22, P &lt; 0.001) at post-treatment. Subgroup analyses did not reveal significant subgroup differences</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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)

<table>
<thead>
<tr>
<th>Year</th>
<th>Authors</th>
<th>N/No. of Interventions</th>
<th>Interventions</th>
<th>Type of Interventions</th>
<th>Age Group</th>
<th>Gender Composition</th>
<th>Type of Control</th>
<th>Outcome Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>Carey et al.</td>
<td>26</td>
<td>32,243</td>
<td>Computer/internet for substance use: Interaction with a computer alcohol intervention, only 1 study may have involved CBT</td>
<td>All ages: Mean age 20 years old university students</td>
<td>No</td>
<td>Alcohol</td>
<td>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.</td>
</tr>
<tr>
<td>2015</td>
<td>Gulliver et al.</td>
<td>12 RCTs (20 interventions, 6 included in meta-analysis)</td>
<td>Range:65 to 517</td>
<td>Computer/internet for substance use: Computer programs (10 studies), internet (5), telephone (3), mobile SMS (2) targeting tobacco (6) and/or cannabis use (2)</td>
<td>TAU, attention control, no treatment control</td>
<td>Youth: University and college students 18-25 years</td>
<td>Some</td>
<td>Cannabis</td>
</tr>
<tr>
<td>2013</td>
<td>Champion et al.</td>
<td>12 trials</td>
<td>21,633</td>
<td>Computer/internet for substance use: Via CD ROM, most were based on social influence theory to resist peer pressure for alcohol, tobacco and cannabis</td>
<td>Health education as usual</td>
<td>Youth: High school students aged 13-15 years old</td>
<td>No</td>
<td>Alcohol, tobacco and cannabis</td>
</tr>
<tr>
<td>Year</td>
<td>Authors</td>
<td>Studies</td>
<td>Participants</td>
<td>Interventions</td>
<td>Adults:</td>
<td>Study Type</td>
<td>Clinician Contact</td>
<td>Summary</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>---------</td>
<td>--------------</td>
<td>---------------</td>
<td>--------</td>
<td>------------</td>
<td>------------------</td>
<td>---------</td>
</tr>
<tr>
<td>2017</td>
<td>Firth et al.</td>
<td>9</td>
<td>1,837</td>
<td>Mobile/smartphone: Interactions were an average of 6.1 weeks. Wide range of intervention types, only 2 might have included CBT therapy.</td>
<td>Active control and waitlist (5 had waitlist condition).</td>
<td>Mean age=36.1 years.</td>
<td>1 study used smartphone intervention to support face-to-face therapy.</td>
<td>Yes</td>
</tr>
<tr>
<td>2017</td>
<td>Firth et al.</td>
<td>18 RCTs of 22 smartphone apps (14 published in last 2 years)</td>
<td>3,414</td>
<td>Mobile/smartphone: Smartphone interventions, with 3G or 4G internet connectivity, along with the ability to download, install and run external applications (“apps”). At least one week duration. Interventions were delivered solely or in part via smartphone devices aimed at improving mental health or well-being (with depression as a primary or secondary outcome). Smartphone interventions lasted between 4 and 24 weeks. Four of 18 studies were based on CBT and 2 mindfulness. Four studies included clinician contact.</td>
<td>Inactive (participants received no intervention during the trial period or were put into a waitlist) or active control groups (controlled for time and attention given by using apps not aimed at treating depression, in-person interventions, or other forms of activities or patient contact). RCTs comparing smartphone interventions to antidepressant medications were also eligible for inclusion.</td>
<td>Mean sample ages ranged from 18 to 59 years (median 39 years). Two studies recruited people with major depression, 2 with bipolar disorder, 1 young people in primary care with any mental health condition. Others recruited from the general population people with mild-to-moderate depression, suicidal thoughts/tendencies, probable ADHD, anxiety disorders, insomnia, or symptoms of PTSD. 1 study included older adults with memory complaints.</td>
<td>Some (4/18 included clinician contact)</td>
<td>Yes</td>
</tr>
</tbody>
</table>
promising self-management tool for depression. Future research should aim to distil which aspects of these technologies produce beneficial effects, and for which populations.

2017 Rathbone et al. 27 studies 4658 Mobile/smartphone: All studies needed to include a mHealth intervention, which was app or SMS based

randomized controlled trials (RCTs) (n=19), within-group studies (n=7), and 1 within-group study

All ages: No search criteria for demographics No Yes Yes Weight management, physical activity, smoking cessation, medication adherence

Studies show improvement in physical health and significant reductions of anxiety, stress, and depression

2013 Donker et al. 8 papers describing 5 apps 227 Mobile/smartphone: Evidence-based mental health apps that could be downloaded from app stories, including Mobilize, mobiletype, DBT coach, mobile stress management, and get happy program. Two studies included emotional self-awareness, 1 DBT, 3 stress inoculation training. Delivery length varied between 6 days and 8 weeks.

Waitlist, TAU, other recognised treatment. Attention-placebo control (4), active comparison (1), not-specified (1). Pre-post test design without a control group (2).

All ages: Two studies recruited adults in the community, 1 recruited from an outpatient clinic, and 2 studies from the workplace. Two studies recruited adolescents from general practice and 1 study female university students.

Some (5 studies describing 4 apps provided support from a mental health professional via phone or email contact)

Yes (3 stress) Yes (4) Substance use (1)

Results showed significant reductions in depression, stress and substance use. Within-group and between group intention-to-treat effect sizes ranged from 0.29-2.28 and 0.01 to -0.48 at post-test and follow-up respectively. Usability, helpfulness, and satisfaction ratings were moderate to high indicating that mHealth apps are perceived to be a useful vehicle for enhancing access to evidence-based monitoring and self-help.

Conclusion: mental health apps have the potential to be effective and may significantly improve accessibility. However, the majority of apps that are currently available lack scientific evidence about their efficacy. There are more than 3000 mental health apps freely available to download to date, compared to the 8 evidence-based apps we identified through our systematic review.

2015 Mason et al. 14 10,573 Mobile/smartphone: Text messaging typically an automated process via a web-based, computer program. 8/14 papers indicted the intervention was predicated on a particular theory, four did not report any theory, and 2 Baseline information

Youth: Adolescents and young adults aged 12 to 29. No study was exclusive to adolescents, but all included teens except for two studies that included only young adults.

Some Tobacco (11), alcohol (3)

Effect sizes were combined across studies to produce a summary effect size of 0.25, indicating that the combined intervention effect is small. There was a moderate positive ($r = 0.69$) correlation between the number of texts within an intervention and the resulting effect size, providing some evidence for a dose-response effect. Among the 3 studies that examined alcohol consumption specifically, 2 did not find any significant differences in alcohol consumption. The duration of
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.

<table>
<thead>
<tr>
<th>Year</th>
<th>Authors</th>
<th>Studies Included</th>
<th>Sample Size</th>
<th>Intervention Details</th>
<th>Controls</th>
<th>Contact</th>
<th>Effect Size</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>Maresova et al.</td>
<td>6 RCTs</td>
<td>1870</td>
<td>Mobile/smartphone: Mobile apps for the improvement, detection or assessment of depressive symptoms. 4-12 weeks. Three interventions involved CBT.</td>
<td>Not specified</td>
<td>All ages: People with depression or depressive symptoms. Studies primarily focused on anxiety or other psychiatric disorders were excluded.</td>
<td>Some (at least 2 studies included therapist support)</td>
<td>Yes</td>
</tr>
<tr>
<td>2016</td>
<td>Li et al.</td>
<td>9 studies, 4 were RCTs</td>
<td>460</td>
<td>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</td>
<td>Adults: Healthy participants or those with other chronic or mental illnesses. Included studies focused on older adults.</td>
<td>Some, 1 had OT sessions</td>
<td>Yes</td>
<td>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 ($g = 0.56$, $z = 3.14$, $p &lt; 0.01$). It was much larger than the nonsignificant effect size found on general adults ($g = 0.07$).</td>
</tr>
<tr>
<td>2014</td>
<td>Li et al.</td>
<td>10 RCTs included in meta-analysis</td>
<td>636</td>
<td>Games: 5 studies were compared to TAU, 3 waitlist,</td>
<td>All ages: Some (3 were therapist</td>
<td>Yes</td>
<td>The meta-analysis revealed a moderate effect size of the game interventions for</td>
<td></td>
</tr>
</tbody>
</table>
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. There were no limitations on the participants’ age or the significance of the depression symptoms. administered or involved minimal contact therapy)

<table>
<thead>
<tr>
<th>Year</th>
<th>Authors</th>
<th>Studies</th>
<th>Sample Size</th>
<th>Games:</th>
<th>Youth:</th>
<th>Controls</th>
<th>Substance use</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>Rodriguez et al.</td>
<td>8 studies</td>
<td>2,196</td>
<td>Only 2 studies had control conditions</td>
<td>Aged 11-18 years</td>
<td>No</td>
<td></td>
<td>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. Only 1 study reported reduced frequency drug use. 6 reported</td>
</tr>
</tbody>
</table>
Serious educational games for alcohol, tobacco, cannabis, methamphetamine, ecstasy. Games via online or CD-ROM lessons or episodes based on educational or social influence approach.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>increased content knowledge, 2 reported negative attitudes</td>
<td>Evidence for effect on drug use is limited.</td>
</tr>
</tbody>
</table>


References


Effectiveness of e-mental health approaches