

# Review of internet-based prevention and treatment programs for anxiety and depression in children and adolescents

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A number of effective face-to-face prevention, early intervention and treatment programs have been developed to reduce the prevalence of anxiety and depression in children and adolescents.<sup>1-4</sup> More recently, delivery of these programs through the internet has become a focus, given the need to disseminate them more widely, particularly to rural and remote areas, and to offer flexible and anonymous delivery.<sup>5,6</sup>

Unlike many face-to-face interventions, internet-based programs can be completed at any time, and program fidelity can be protected if programs are automated.<sup>5</sup> The running costs of internet-based applications are also lower than traditional face-to-face interventions, as therapists and program leaders may not be needed, or may not have to provide intense contact. The ability to monitor user progress and outcomes is also made easier<sup>5,7</sup> through automated data collection and feedback. In addition, the interactivity and visual attractiveness of internet-based programs can make them more appealing and engaging to children and adolescents.<sup>8</sup>

Although there are a number of clear benefits associated with the delivery of internet-based programs for anxiety and depression, particularly for adults,<sup>9</sup> very few such programs have been developed for children and adolescents. There have also been no previous reviews of internet-delivered programs for child and adolescent anxiety and depression. We aimed to systematically identify and describe the internet-based programs that are currently available for child and adolescent anxiety and depression, and summarise the research outcomes for these programs.

## METHODS

### Search strategy

The Cochrane Library, PsycINFO and PubMed databases were electronically searched in June 2009 with the key search terms “online OR Internet OR computer\*”, “youth OR child\* OR adolescen\* OR teen\*”, “anx\* OR depress\* OR mood” and “inter-ven\* OR prevent\* OR treat\* OR program”. The titles and abstracts of the 438 articles initially identified were screened by one of

## ABSTRACT

**Objective:** To identify and describe current internet-based prevention and treatment programs for anxiety and depression in children and adolescents.

**Data sources:** Systematic search of the Cochrane Library, PsycINFO and PubMed databases conducted in June 2009.

**Study selection:** Studies of internet-based programs that addressed anxiety or depression in children and adolescents. No restrictions were placed on study quality.

**Data synthesis:** Eight studies of four intervention programs were identified. Programs were delivered via schools, in primary care, through mental health clinics or open access websites. Two were treatment programs, three offered universal prevention, two were indicated prevention programs, and one was a selective prevention program. Study quality was mixed, with three randomised controlled trials in which participants were randomly allocated to the intervention or control condition, one randomised uncontrolled trial, two controlled trials in which participants were not randomly assigned to conditions, and two uncontrolled pre-post evaluations. Two studies targeted anxiety in children, while the remainder addressed depression, or anxiety and depression, in adolescents. All the interventions were based on cognitive behaviour therapy, and six of the eight studies reported post-intervention reductions in symptoms of anxiety and/or depression or improvements in diagnostic ratings. Three of these studies also reported improvements at follow-up.

**Conclusion:** Our findings provide early support for the effectiveness of internet-based programs for child and adolescent anxiety and depression. More extensive and rigorous research is needed to further establish the conditions through which effectiveness is enhanced, as well as to develop additional programs to address gaps in the field.

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us (ALC) to establish their relevance to this review. Irrelevant articles that did not discuss anxiety or depression in children and adolescents were excluded at this stage. The 28 studies identified as relevant were retained for examination of the full article (by ALC) to see whether they described programs that met our inclusion criteria.

### Inclusion criteria

The inclusion criteria for this review were that: (a) the program participants were children (aged 5–12 years) or adolescents (13–19 years); (b) the primary aim of the program was to treat or prevent the symptoms or incidence of anxiety and/or depression; (c) the program was delivered via the internet; and (d) at least one evaluation of the program's efficacy had been conducted and published in a peer-reviewed, English-language journal. As the focus of the review was on identifying and describing all available and preliminarily evaluated programs, no restrictions were placed on study quality or format.

### Data extraction and synthesis

Program descriptions and research summaries are reported for each of the programs that fulfilled the inclusion criteria. Given the small number and heterogeneous quality of studies, and the difficulty in extracting effect sizes from some of the data descriptions, a meta-analysis was not conducted. Where possible, between-group effect sizes were estimated using Cohen's *d*,<sup>10</sup> with positive effect sizes indicating a positive intervention effect. Programs were categorised according to the setting in which they were delivered and described as either prevention or treatment programs. Prevention programs were further classified as being universal, selective or indicated. Universal prevention programs are interventions that are presented to all individuals within a setting or population regardless of symptoms; selective programs are presented to “at-risk” individuals (eg, children of depressed or divorced parents); and indicated programs are delivered to individuals with elevated, but subclinical, levels of anxiety or depression.<sup>11</sup>

Evaluation studies of internet-based intervention programs for anxiety and depression in children and adolescents

Program	Study	Disorder	Program type	Design	Control	No. of participants	Age (years)	Post-intervention ES	Follow-up ES (months)
BRAVE-ONLINE	12*	Anxiety	Treatment	RCT	Wait-list	72	7–14	nr <sup>†</sup>	nr (6, 12)
	13	Anxiety	Treatment	RCT	Wait-list	73	7–12	0.56 <sup>†</sup>	No follow-up
Project CATCH-IT	14	Depression	Selective	Pre–post	na	14	18–24	MI, 0.43 <sup>‡</sup>	No follow-up
	15,16	Depression	Indicated	RT	na	83	14–21	MI, 0.54 <sup>‡</sup> BA, 0.82 <sup>‡</sup>	MI, 0.85 <sup>‡</sup> (3) BA, 0.89 <sup>‡</sup> (3)
MoodGYM	17	Depression	Universal	CT	NI	78	15–16	0.11	-0.29 (4)
	18	Depression	Universal	CT	NI	157	15–16	0.18 <sup>†</sup>	0.28 <sup>†</sup> (5)
	19	Depression and anxiety	Universal	RCT	Wait-list	1477	13–17	Depression: 0.43 <sup>‡§</sup> Anxiety: 0.15 <sup>†</sup>	Depression: 0.27 <sup>‡§</sup> Anxiety: 0.25 <sup>†</sup> (6)
<i>Grip op je dip</i> online	20	Depression	Indicated	Pre–post	na	140	16–25	1.49 <sup>‡</sup>	No follow-up

ES = between-group effect size (unless otherwise specified). RCT = randomised controlled trial, in which participants were randomly allocated to the intervention or control condition. RT = randomised uncontrolled trial. CT = controlled trial, in which participants were not randomly assigned to the intervention or control condition. Pre–post = no control group. na = not applicable. NI = no intervention control. nr = not reportable. MI = motivational interview before intervention. BA = brief advice before intervention. \* This study also included a face-to-face intervention group. The face-to-face intervention had a significant effect on anxiety symptoms. There was no significant difference between the face-to-face intervention group and the BRAVE-ONLINE intervention group. † Intervention had a significant positive effect on anxiety or depressive symptoms. ‡ Within-group effect size. § For males only.

RESULTS

Program settings

Eight studies of four internet-based programs for anxiety and depression were identified (Box). Two of the programs (BRAVE-ONLINE and Project CATCH-IT) were delivered in a primary care or mental health treatment setting.<sup>12–16</sup> Both these programs were supported by health care professionals, either within the medical setting or remotely by email or telephone, who motivated users and supported their use of the program. One school-based program (MoodGYM)<sup>17–19</sup> met inclusion criteria for the review. A second school-based program was identified (<http://www.climateschools.tv>) but could not be included because no evaluation trials were found. The fourth program (*Grip op je dip* online) was offered via an open access website.<sup>20</sup> Another program available through an open access website was identified (<http://www.reachoutcentral.com.au>) but was excluded because no published evaluations were available.

Program descriptions

BRAVE for Children - ONLINE and BRAVE for Teenagers - ONLINE (<http://brave.psy.uq.edu.au>) are anxiety treatment programs designed to treat social phobia, generalised anxiety disorder, separation anxiety and specific phobia in children (8–12 years) and adolescents (13–17 years), respectively. Based on cognitive behaviour therapy (CBT), these programs consist of 10 weekly sessions for children and adoles-

cents, two booster sessions presented 1 and 3 months after the intervention, and five or six parent sessions. The programs present information on managing anxiety, recognising the physiological symptoms of anxiety, graded exposure and problem-solving techniques. The programs include reading materials, question and answer exercises, games and quizzes. Users of the BRAVE-ONLINE programs complete the intervention in their own time, with brief, weekly email contact with a therapist, who reviews homework and session activities. The therapist also assists in the development of an exposure hierarchy by email or telephone.

Project CATCH-IT (<http://catchit-public.bsd.uchicago.edu>) is a free, internet-based training program based on behavioural activation, CBT and interpersonal psychotherapy. The program aims to teach adolescents how to reduce behaviour that increases their vulnerability for depressive disorders (eg, rumination, negative appraisals) and increase protective behaviour (eg, social support, behavioural scheduling). The 14-module program includes core concept explanations, adolescent stories, skill-building exercises, feedback and internet-based rewards. Project CATCH-IT is currently delivered within the primary care setting and has been evaluated with differing levels of professional support, including brief advice and motivational interviewing. These ongoing evaluations will establish how much professional support is required.

MoodGYM (<http://www.moodgym.anu.edu.au>) is a free, interactive, internet-based

program designed to prevent and decrease symptoms of depression in young people. Based on CBT, the MoodGYM program aims to change dysfunctional thoughts and beliefs, improve self-esteem and interpersonal relationships, and teach important life skills, such as problem solving and relaxation. The program consists of five interactive modules, which contain information, animated demonstrations, quizzes and “homework” exercises. When delivered in the classroom, the MoodGYM program is presented during one class period each week for 5 weeks.

*Grip op je dip* online (Master your Mood online; <http://www.gripopjedip.nl>) is a free, Dutch-language, CBT-based program aimed at 16–25-year-olds. Based on the face-to-face *Grip op je dip* course, the online program consists of six moderated chat sessions attended by six to eight participants. In between chat sessions, participants are required to complete homework reading and exercises in preparation for the next session. During the program, participants discuss the relationship between thoughts, feelings and behaviour, ways to detect and contest negative thoughts, and how to increase pleasant activities.

DISCUSSION

Overall, we identified four internet-based programs for anxiety and depression in children and adolescents. All the programs were based on CBT and were delivered over 5–14 sessions (median, eight sessions). Of the eight evaluation studies identified, six

reported post-intervention reductions in symptoms of anxiety and/or depression or improvements in diagnostic ratings. Three of these studies also reported reductions or improvements at follow-up. This finding provides early support for the efficacy and effectiveness of internet-based programs for anxiety and depression in children and adolescents.

The identified programs were successfully delivered in a variety of settings, with differing levels of professional support. This finding highlights the versatility of internet-based programs and that only brief professional support, if any, is necessary in their delivery. This is a clear benefit, given the lack of services and professional support currently available for youth mental health.<sup>21,22</sup> With so few studies evaluating each program, further research is necessary to compare the effect of support, the efficacy of different prevention approaches (eg, universal prevention v treatment) and the presentation of programs within different settings (eg, schools v primary care). This research would establish the delivery capacity of each program within each of these domains and identify the most effective means of implementation.

There are different benefits associated with delivering internet-based programs within each setting. For instance, one of the main benefits of involving health care professionals in the delivery of internet-based programs is that they can effectively monitor the progress of users and refer them on to further treatment or support if necessary. School-based internet programs have the advantage of extensive contact with young people, greater access to computer facilities and a reduced need to train teachers to deliver the program, while open access websites allow universal access to a program and are not dependent on external services to offer it.

Most of the studies identified in this review were prevention programs targeting depression in adolescents. Although MoodGYM also has some effect on anxiety symptoms, no prevention programs were found that specifically targeted adolescent anxiety. With respect to treatment, no depression programs targeting the adolescent group were identified. For children, no anxiety or depression prevention programs, or depression treatment programs, were identified. This finding clearly highlights a gap and a need to consider the development of these internet-based programs particularly for children.

Of the eight studies identified, only three were randomised controlled trials, and few reported on user satisfaction. Future evaluation studies should ensure that the highest quality of trial design is implemented and user experience data are collected, to ensure that accurate and defensible results are reported.

Our findings provide early support for the effectiveness of internet-based intervention programs for anxiety and depression in children and adolescents and suggest that they can be delivered in a variety of settings. Further program development is needed to fill current gaps in the field. More rigorous research is also needed and should include determining the extent of program support, the satisfaction of users, and intervention effects at longer-term follow-up.

**COMPETING INTERESTS**

Alison Calear was lead investigator on the MoodGYM school trials, and Helen Christensen is one of the developers of the MoodGYM program. We derive no financial income from the MoodGYM site.

**AUTHOR DETAILS**

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