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Computer-based Treatment Programs for Youth Anxiety: A Systematic Review

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Abstract

The primary aim of this review was to determine whether computer-based treatment programs delivered asynchronously are able to produce a reduction in youth anxiety. Secondary aims were to examine the treatment components and level of therapist assistance inherent to these programs. Searches were conducted using the Web of Knowledge and manuscript quality was assessed using the Effective Public Health Practice Project (EPHPP) Tool. Eleven studies assessing six different computer-based anxiety treatment programs fulfilled the criteria. It was found that programs comprising a variety of CBT anxiety management strategies and which included exposure therapy (BRAVE, Cool Teens and Camp Cope-A-Lot), were able to produce reductions in diagnostic status, severity and self-reported anxiety symptoms. However, those programs being trialled in terms of their ability to reduce both anxiety and depression symptoms or which focused on a single CBT strategy (and which did *not* include exposure), were not as successful in reducing youth anxiety. Furthermore, higher levels of therapist assistance seemed to be associated with better treatment outcomes. In relation to other measures, computer-based programs were generally found to improve levels of overall functioning and internalising problems, but the results for self-rated depression and other measures were inconsistent. Computer-based treatment is an exciting and progressive area of research, with numerous avenues for extension and advancement.

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Keywords: Youth, Anxiety, Computer, Treatment, Systematic Review

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Introduction

"I've travelled the length and breadth of this country and talked with the best people, and I can assure you that data processing is a fad that won't last the year".

These words, allegedly uttered by the editor in charge of business books for Prentice Hall in 1957, could not have turned out to be further from the truth. Today, computer technology is present in the majority of households, with desktops, laptops, tablets, mp3 players, and smart phones being prolific among those of all ages. Among a myriad of other applications, computer technology is used for shopping, social networking, paying bills, communication, learning, and gathering information. It is of no surprise then, that there is increasing interest in the use of technology in treating those with psychological problems, including young people. Indeed, researchers have investigated the use of technology in treating youth depression, eating disorders, substance abuse, pain, eating disorders, body image problems, and anxiety (see Donovan, Spence, & March, 2013 for a review). Technology has been investigated within the youth treatment literature as either an adjunct to face-to-face therapy (e.g., the use of smart phones to monitor mood) or as a therapeutic approach in and of itself. It is the latter with which this discussion is concerned.

Why bother investigating the use of computer-based treatment for youth? This is a valid question to which there are a number of answers. First, youth are familiar and comfortable with technology, often using applications such as email, blogs, chat rooms, and instant messaging to communicate with others (Subrahmanyam & Lin, 2007). Second, young people frequently use the internet to find information and access help for their psychological and emotional problems (Gould, Munfakh, Lubell, Kleinman, & Parker, 2002; Nicholas, Oliver, Lee, & O'Brien, 2004). Third, youth have been found to particularly like and appreciate, the anonymity and accessibility of the internet (Nicholas et al., 2004). Thus, it would seem that young people are at ease not only with technology itself, but also with its use as a method for health care provision. Perhaps the most important reason for us to turn to computer-based technologies for the treatment of youth mental health issues however, is that the majority of young people, for a variety of reasons, do not seek or obtain help for their psychological difficulties (Merikangas, He, Brody, et al., 2010). Children, and particularly teenagers, are worried about confidentiality and the stigma around mental health issues, embarrassed about attending mental health services, and concerned that they will not be understood or

taken seriously by mental health workers. Knowledge is often lacking around the appropriateness of services, and practicalities such as cost, long wait lists, busy family schedules, and the accessibility and availability of services, can also prevent access to treatment (Boyd et al., 2007).

The use of computers as a therapeutic medium may circumvent many of these barriers to treatment, and thus present an alternative approach that has the potential to reach many more young people. Computer-based therapies provide the much sought after anonymity and privacy that young people value. They offer convenience, with the young person being able to complete sessions at any time or location, an attribute particularly advantageous for busy families and / or those living in rural and remote areas where services are fewer and significant travel is required to obtain them. Finally, computer-based treatment has the potential to be considerably more cost-effective and gets around the problem of long wait-lists in private and community settings.

Before examining the use of technology in treating youth anxiety specifically, it is first important to describe the attributes of computer-based treatment programs more generally. Some computerised treatments are delivered in real-time by a 'therapist', whereas others are delivered through computer programs or websites with interactive content (but no live therapist delivery). Live computerised treatments include therapy delivered via online chat forums, videoteleconferencing, or other online platforms such as Skype® (e.g. Himle et al., 2006 or Storch et al., 2011). Structured computerized programs with embedded interactive therapeutic content can typically be accessed through web-based programs or CD-ROM packages (Donovan et al., 2013). This paper reviews only those programs in which the patient interacts with computerised treatment programs or websites, rather than therapy delivered by a live therapist.

When considering such programs, it is also important to consider that they differ in their mode of delivery and the level of therapist contact involved. Therapist involvement can range from no therapist involvement (i.e., the programs are entirely self-help) through minimal therapist involvement via sporadic email / phone contact, through to interventions where both face-to-face and computer-based sessions are applied in combination. Internet-based interventions involve the young person logging on to the internet and completing the program online, thus allowing therapists to monitor youth responses to quizzes, questions etc if required. CD-ROM applications provide the young person with a CD-ROM for program information and content, and thus are not encumbered by internet speed and accessibility that can be problematic for internet-based approaches.

The focus of this paper is on the use of computer-based programs delivered asynchronously (with no real time delivery) in the treatment of youth anxiety disorders. Youth anxiety disorders are highly prevalent, non-transient, and are associated with numerous short- and long-term problematic consequences (Broeren, Muris, Diamantopoulou, & Baker, 2013; Essau, Conradt, & Petermann, 2000; Merikangas, He, Brody, et al., 2010; Merikangas, He, Burstein, et al., 2010). There is a strong evidence base for the efficacious treatment of child anxiety disorders, particularly with respect to cognitive behaviour therapy (Cartwright-Hatton, Roberts, Chitsabesan, Fothergill, & Harrington, 2004; Reynolds, Wilson, Austin, & Hooper, 2012; Silverman, Pina, & Viswesvaran, 2008). As noted above however, the majority of youth with anxiety problems do not receive assistance. Indeed, it has been estimated that around 75% of youth with anxiety do not seek help for their problems (Essau et al., 2000; Sawyer et al., 2001). Thus, it is clear that alternative treatment approaches are required to increase treatment uptake.

It is difficult to believe that the first paper on computer-based treatment for youth anxiety disorders was published more than ten years ago. Richardson, Stallard, and Velleman (2010) published a systematic review of computerised CBT for the prevention and treatment of anxiety and depression in children and adolescents. In that review, only four studies investigating anxiety had been published. Since that time, there has been considerably more research interest in this area and thus, it is timely that an updated systematic review is conducted. The primary aim of this review is to determine whether youth aged 3-18 years with anxiety, who have participated in a computer-based treatment program directly targeting their anxiety, demonstrate a reduction in anxiety. A secondary aim is to examine the computer-based interventions for anxiety available to date in terms of treatment components and level of therapist assistance.

Method

Inclusion & Exclusion Criteria

Papers for inclusion in this review comprised English language manuscripts describing computer-based treatments for youth anxiety disorders. To be included in the review, studies were required to involve youth participants aged between 3-18 years with elevated levels of anxiety prior to receipt of computer-based treatment. In addition, inclusion in the review was contingent upon anxiety reduction being at least one of the aims of the computer-based intervention employed in the study. Thus, to be included in the review, studies were required to report outcome measures that were related to diagnostic status, anxiety symptoms, or both. Furthermore, it was necessary for the computer-based intervention under investigation to include integrated program material whereby the particular skill under consideration was explained, taught and delivered within the computerised program itself. Thus, studies testing face-to-face therapy delivered via webcam or technological adjuncts were not included (e.g. Himle et al., 2006; Storch et al., 2011). Finally, it was decided that, due to the relatively small number of papers in this area, the parameters around study design would be more liberal than in other reviews. Thus, study designs that were able to be included in the review comprised randomized controlled trials, uncontrolled trials, and case series.

Studies were excluded from the review if youth participants were aged over 18 years, if anxiety reduction was not an aim of the computer-based intervention tested, if youth did not have elevated levels of anxiety prior to treatment (or if the studies were prevention rather than treatment oriented), if anxiety outcomes were not reported, or if the intervention did not include integrated treatment material. Reviews, position papers, theoretical papers, and papers assessing mechanisms of change or predictors of outcome, were not included.

Search Strategy

Searches were conducted using Web of Knowledge to ensure that multiple databases were included. Search terms included (child* OR youth OR adolesce*) AND (anxiety* OR phobia OR obsessive compulsive disorder OR panic disorder OR post traumatic stress disorder) AND (computer* OR internet* OR online OR web* OR CD Rom) AND (treat* OR therap* OR program* OR interv* OR rct OR random* control* OR cbt OR self-help) and were searched within Title, Abstract, and Keyword ('Topic') parameters. All papers up until the 3rd of September 2013 were included in the search.

Screening

Following entry of search terms, parameters of the results were refined to exclude articles from irrelevant research areas, and only retain articles from relevant disciplines (e.g. paediatrics, psychiatry, psychology and various social and behavioural science research areas). Non-article results (e.g. letters, books) and non-English articles were excluded following this step. Initially, titles of all articles were screened for inclusion and exclusion criteria to remove articles not relevant to the review. For the remaining articles, abstracts were screened for inclusion and exclusion criteria and when it was unclear whether or not the article should be included, the full text was studied to determine inclusion or exclusion in the review.

Quality Assessment Method

As noted above, due to the relatively small number of studies in this area, it was decided that randomised controlled trials, uncontrolled trials and case series reports, could be included in the review as long as all inclusion criteria were met. For this reason, it was necessary to employ a quality assessment method capable of assessing a variety of research designs. It was decided that six of the eight categories outlined by the Quality Assessment Tool (QAT) for Quantitative Studies used in the Effective Public Health Practice Project (EPPHPP: Thomas, Ciliska, Dobbins, & Micuccis, 2004) would be used, together with the associated dictionary.

Using this method, both authors independently rated each study on six parameters, in addition to providing an overall rating of quality. Given the nature of the research being reviewed, some modifications were required when rating the studies. Studies were rated in each area as strong, moderate or weak in relation to what could sensibly

be expected in a trial investigating psychological therapy for youth anxiety. In line with the QAT, the reviewers rated the selected papers on:

1. Study design. Studies involving RCTs and clinical control trials (where allocation to condition was not random) were given a study design quality rating of 'strong'. Uncontrolled trials were rated as 'moderate'. All other designs, including case series, were provided with a quality rating of 'weak'.
2. Confounds. Studies where pre-treatment comparisons were made between groups on demographic *and* outcome measures, *and* 80% of relevant confounds were controlled for, were given a confound quality rating of 'strong'. Studies where pre-treatment comparisons were made between groups on demographic and outcome measures *and* 60-79% of relevant confounds were controlled for, were rated as 'moderate'. Studies where pre-treatment comparisons were not described *or* where they were made but less than 60% of relevant confounds were controlled for, were given a rating of 'weak'.
3. Blinding. Studies in which assessors were blind to condition *and* where participants were blind to the research question, were rated as 'strong'. Studies where assessors were blind to condition *or* participants were blind to the research question *or* where blinding was not described, were assigned a rating of 'moderate'. Studies where assessors were not blind to condition *nor* were participants blind to the research question, were rated as 'weak'.
4. Data collection methods. Studies where clinical diagnostic status and severity were ascertained through a structured clinical interview and were used as outcome measures, were given a data collection method quality rating of 'strong'. Studies where psychometrically sound (i.e. highly valid and reliable) self-report inventories were used, but diagnostic interview methods were not employed, were provided with a rating of 'moderate'. Studies where diagnostic interview were not employed *and* psychometrically poor self-report measures were used, were rated as 'weak'.
5. Retention. Studies were given a retention quality rating of 'strong' if 80% or more participants were retained at the final follow-up period. Studies were rated as 'moderate' if between 60% and 79% of participants were retained by the final follow-up period *or* retention was not applicable (e.g., in case studies). Studies where less than 60% participants were retained at the final follow-up period *or* where retention was not described, were rated as 'weak'.
6. Analysis. Studies received an analysis quality rating of 'strong' if they reported intent to treat analyses *and* the analyses were appropriate for the research questions. A rating of 'moderate' was given to studies where only completer analyses were reported and the analyses were appropriate for the research question. A 'weak' rating was given when studies included analyses that were not appropriate for the research questions.
7. Overall rating. Using the method outlined by Langan, Blake, and Lonsdale (2013), an overall quality rating was given. A study was described as 'strong' if it was not assigned any weak ratings, 'moderate' if assigned one weak rating, and 'weak' if assigned two or more weak ratings.

Results

Article Selection

Figure 1 summarises the process of inclusion and exclusion of the articles for review. The initial search yielded 2,704 articles, and 1,974 were excluded following application of refined parameters. There were 617 articles excluded after screening the title and a further 92 articles were excluded after screening the abstract. A total of 21 full-text articles were scanned, with 11 articles fulfilling the inclusion criteria and subsequently included in this review. Despite the broad date range submitted to search engines, studies included for this systematic review spanned only seven years from research published in 2006 to the most recent studies in 2013. Reasons for exclusion are provided in Figure 1.

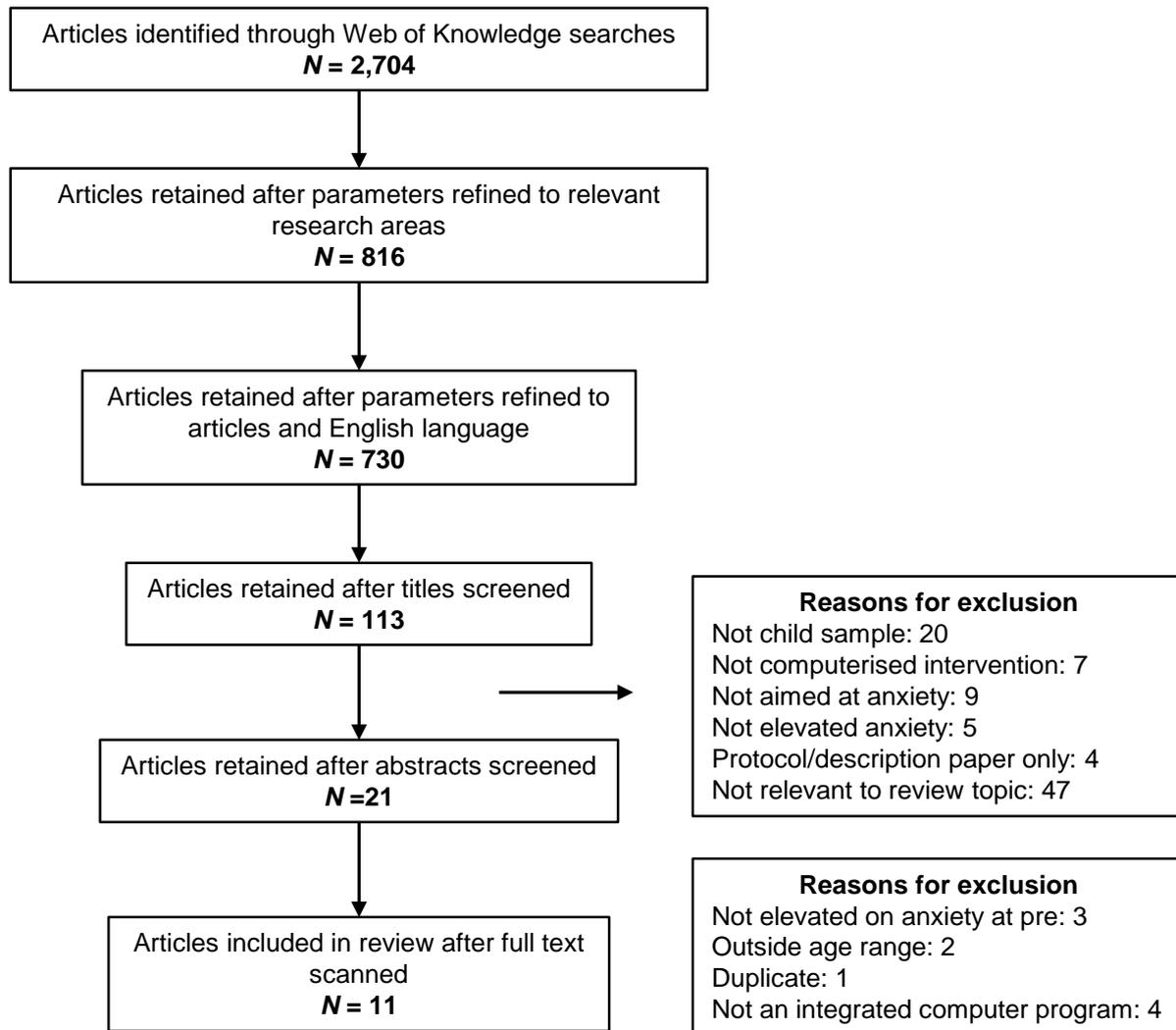


Figure 1: Article Selection

Interventions

Table 1 provides a description of the intervention programs used in the reviewed studies. A total of six different computer-based programs were used in the 11 studies reviewed. Four of the studies reviewed used versions of BRAVE (The BRAVE Program or BRAVE-ONLINE), two used Cool Teens, two used Camp Cope-A-Lot, one used a Problem Solving Training program, one used Think-Feel-Do, and one used Cognitive Bias Modification. In terms of BRAVE, the initial version of the program was a partial group-based and partial internet program, and is hereafter identified as The BRAVE Program while later versions are identified as BRAVE-ONLINE (For Children and Teenagers). All involve the same program, with differences only in the mode of delivery. All six programs were CBT-based, with four (Camp Cope-A-Lot, BRAVE, Cool Teens and Cognitive Bias Modification) developed specifically for anxiety and two (Problem Solving Training and Think-Feel-Do) developed to treat both anxiety and depression. As is evident from Table 1, the number of sessions involved in the programs ranged from 5 to 20, and session duration ranged from 15 to 60 minutes (with session duration unspecified for the Problem Solving Training program). Three of the programs (BRAVE, Problem Solving Training and Cognitive Bias Modification) were internet-based and three (Camp Cope-A-Lot, Cool Teens and Think-Feel-Do) were CD-ROM based.

The programs were found to differ in terms of both parent and therapist involvement. The BRAVE program comprised six (child) or five (teen) parent sessions of 60 minutes duration each, and Camp Cope-A-Lot included two parent sessions. Although Cool Teens did not include parent CD-ROM sessions, three additional telephone consultations between therapist and parent were incorporated into the RCT conducted on the program. Parent

sessions were not included in the Problem Solving Training, Think-Feel-Do or Cognitive Bias Modification programs.

With respect to therapist involvement, Camp Cope-A-Lot and the initial version of BRAVE (The BRAVE Program) were found to provide the most therapist assistance. In both of these programs, six of the 12 child sessions were conducted face-to-face with a therapist. Four of the parent sessions in The BRAVE Program and two of the parent sessions in Camp Cope-A-Lot were also conducted face-to-face. Similarly, although all session content was delivered through CD-ROM for the Think-Feel-Do program, a therapist was present during each session to answer questions. No face-to-face therapist contact was involved in the later versions of BRAVE (BRAVE-ONLINE for Children or Teenagers), Cool Teens, Problem Solving Training, or Cognitive Bias Modification. However, the BRAVE-ONLINE programs and the Problem Solving Training program involved weekly email contact. Similarly, both Cool Teens and the BRAVE-ONLINE for Children and Teenagers programs involved phone calls with a therapist, one in the case of the BRAVE-ONLINE and 11 (8 teen and 3 parent) in the case of Cool Teens.

With respect to treatment components, it is evident from Table 1 that the strategies included within BRAVE, Cool Teens and Camp Cope-A-Lot were very similar. Think-Feel-Do comprised many similar strategies to those delivered in BRAVE, Cool Teens and Camp Cope-A-Lot. However, exposure was not included. Problem Solving Training focused entirely on problem solving strategies and Cognitive Bias Modification focused entirely on changing attentional and interpretive biases and thus, these two programs did not include any of the other traditional anxiety management strategies including exposure.

Table 1: Treatment Program Details

Authors	Intervention Description	Component Treatment Strategies
Spence, Holmes, March, and Lipp (2006)	<ul style="list-style-type: none"> The BRAVE Program Half of the sessions were delivered via internet and half were delivered face-to-face in a group format Child: 10 weekly sessions + 2 booster sessions (1 and 3 months post-treatment) Parent: 6 weekly sessions + 2 booster sessions (1 and 3 months post-treatment) Sessions were 60mins duration Therapist involvement: therapist present for half of the treatment sessions (group sessions). Therapist not present for internet sessions 	<p>Child sessions:</p> <ul style="list-style-type: none"> Internet: identification of physiological signs of anxiety, problem-solving, self-reinforcement, application of anxiety management techniques. Clinic: cognitive restructuring, exposure, relapse prevention <p>Parent sessions:</p> <ul style="list-style-type: none"> Psychoeducation about: child anxiety; contingency management and; ways of assisting the child with relaxation training, cognitive restructuring, graded exposure and problem solving
March, Spence, and Donovan (2009)	<ul style="list-style-type: none"> BRAVE-ONLINE for Children Sessions delivered via Internet program Child: 10 sessions + 2 booster sessions (1 and 3 months post-treatment) Parent: 6 sessions + 2 booster sessions (1 and 3 months post-treatment) Sessions were 60mins duration Therapist involvement: short weekly therapist emails; one half-hour therapist phone call (15 mins with the parent and 15 mins with the child) following session 5 for exposure hierarchy construction. Therapist not present for the internet sessions 	<p>Child sessions:</p> <ul style="list-style-type: none"> Physiological symptoms of anxiety, relaxation, cognitive strategies (coping self-talk and cognitive restructuring), exposure, problem-solving, and reinforcement of brave behaviour. <p>Parent sessions:</p> <ul style="list-style-type: none"> Psychoeducation about anxiety, contingency management, relaxation training, information about cognitive restructuring, graded exposure and problem-solving

Authors	Intervention Description	Component Treatment Strategies
Spence et al. (2011)	<ul style="list-style-type: none"> • BRAVE-ONLINE for Teenagers • Sessions delivered via Internet program • Teen: 10 weekly sessions + 2 booster sessions (1 and 3 months post-treatment) • Parent: 5 weekly sessions + 2 booster sessions (1 and 3 months post-treatment) • Sessions were 60mins duration • Therapist involvement: short weekly therapist emails; one 15-minute therapist phone call with the teen for exposure hierarchy construction. Therapist not present for the internet sessions. 	<p>Teen sessions:</p> <ul style="list-style-type: none"> • Psychoeducation, relaxation training, recognition of the physiological responses to anxiety, cognitive strategies of self-talk and cognitive restructuring, exposure, problem-solving, self-reinforcement <p>Parent sessions:</p> <ul style="list-style-type: none"> • Acquisition of the teen strategies + parenting strategies to help teenagers use skills and to better manage teen anxiety
Spence et al. (2008)	<ul style="list-style-type: none"> • BRAVE-ONLINE for Children (as per March et al., 2009) • BRAVE-ONLINE for Teenagers (as per Spence et al., 2011) 	As per March et al., (2009) and Spence et al., (2011)
Cunningham et al. (2009)	<ul style="list-style-type: none"> • Cool Teens • Sessions delivered via CD-ROM program • Teen sessions: 8 modules of 15-30 minutes duration • Therapist involvement: a fortnightly telephone call (5-20mins) with a clinical psychologist. Therapist not present for the CD-ROM sessions. 	<p>Teen sessions:</p> <ul style="list-style-type: none"> • Psychoeducation, goal setting, cognitive restructuring, exposure, coping skills, maintenance <p>Parent sessions:</p> <ul style="list-style-type: none"> • None
Wuthrich et al. (2012)	<ul style="list-style-type: none"> • Cool Teens • Sessions delivered via CD-ROM program • 8 modules of 30 minutes duration • Therapist involvement: <ul style="list-style-type: none"> • Brief (mean duration 15.62 mins) teen-therapist telephone sessions after weeks 1, 2, 3, 4, 5, 7, 9, and 11 • Brief (mean duration 17.16 mins) parent-therapist telephone sessions after weeks 1, 4 and 7 • Therapist not present for the CD-ROM sessions. 	<p>Teen sessions:</p> <ul style="list-style-type: none"> • Psychoeducation, goal setting, cognitive restructuring, exposure, coping skills, maintenance <p>Parent sessions:</p> <ul style="list-style-type: none"> • No sessions. However, parents received brief handouts on teen session content as well as 3 telephone calls during the program
Khanna and Kendall (2010)	<ul style="list-style-type: none"> • Camp Cope-A-Lot • 6 sessions delivered via CD-ROM + 6 sessions delivered face-to-face (individual) • 12 weekly child sessions of 35 mins with optional video game rewards • 2 parent sessions (conducted at child Sessions 3 and 7) • Therapist involvement: therapist present for half of the treatment sessions. Therapist not present for CD-ROM sessions 	<p>Child sessions:</p> <ul style="list-style-type: none"> • 6 CD-ROM sessions: psychoeducation, recognition of the physiological signs of anxiety, relaxation, thoughts, coping thoughts, problem solving and self reward • 6 face-to face sessions: exposure and rehearsal <p>Parent sessions:</p> <ul style="list-style-type: none"> • unspecified

Authors	Intervention Description	Component Treatment Strategies
Blocher, Fujikawa, Sung, Jackson, and Jones (2013)	<ul style="list-style-type: none"> • Camp Cope A Lot • As per Khanna & Kendall (2010), but with some modifications for an epileptic population: <ul style="list-style-type: none"> • 60 minute sessions (rather than 35 min) • Additional written materials for parents and children • More concrete language used • Therapist assisted children who had difficulties with writing and spelling • Greater focus on behavioural rather than cognitive strategies for those children who needed it • Reinforcement activities tailored to child • Met with parents during weeks 1 and 12 as well • 3-mth booster session included • Therapist involvement – as per Khanna and Kendall (2012) but with two extra parent sessions 	As per Khanna and Kendall (2010)
Hoek, Schuurmans, Koot, and Cuijpers (2012)	<ul style="list-style-type: none"> • Problem Solving Training • Sessions delivered via Internet program • 5 weekly adolescent sessions • Duration of sessions unspecified • Therapist involvement: weekly email. Therapist not present for the internet sessions. 	Youth sessions: <ul style="list-style-type: none"> • Problem solving Parent sessions: <ul style="list-style-type: none"> • None
Stallard, Richardson, Velleman, and Attwood (2011)	<ul style="list-style-type: none"> • Think, Feel, Do • Sessions delivered via CD-ROM • 6 'usually weekly' sessions of 30-45 mins duration. Sometimes the sessions were of higher frequency (but no specifics provided) • Therapist involvement: therapist present for each session to discuss and elaborate on content and provide support and clarification 	Child sessions: <ul style="list-style-type: none"> • Psychoeducation, emotion recognition, thinking traps, cognitive restructuring, emotional regulation (including relaxation), problem-solving. Parent sessions: <ul style="list-style-type: none"> • None
Sportel, de Hullu, de Jong, and Nauta (2013)	<ul style="list-style-type: none"> • Cognitive Bias Modification • Sessions delivered via Internet program • 20 sessions of 40 mins duration delivered at the rate of two per week • Therapist involvement: therapists were not present for the internet sessions 	Adolescent Sessions: <ul style="list-style-type: none"> • 9 sessions of interpretive bias modification • 8 sessions of attention bias modification • 3 sessions of strengthening of associations between socio-evaluative situations and positive outcomes using a conditioning task • A short evaluative conditioning task of 240 trials was added to 10 of the sessions using a classical conditioning paradigm Parent Sessions: <ul style="list-style-type: none"> • None

Participants, Study Design & Measures

Table 2 outlines the participants, design and outcome measures of all studies included in the review. With respect to the participants, young people aged 7-21 years were involved in the studies reviewed. The participants in one study (Blocher et al., 2013) comprised children with comorbid epilepsy and anxiety disorders. The majority of studies (8 of the 11) involved only youth with clinical-level anxiety disorders. Of the other three studies, one, (Sportel et al., 2013) included youth with elevated (but not necessarily diagnostic) anxiety, another (Hoek et al., 2012) included participants with elevated depression or anxiety symptoms according to self-report measures, and another, (Stallard et al., 2011) involved participants with *either* clinical depression or anxiety.

With respect to design, eight of the 11 studies were randomised control trials (RCTs: Hoek et al., 2012; Khanna & Kendall, 2010; March et al., 2009; Spence et al., 2011; Spence et al., 2006; Sportel et al., 2013; Stallard et al., 2011; Wuthrich et al., 2012), one (Blocher et al., 2013) was an uncontrolled trial and two (Cunningham et al., 2009; Spence et al., 2008) were case series. Of the eight RCTs, four involved a face-to-face comparison group, one involved an active control group, and seven involved a waitlist control group. Follow-up periods differed between studies, with the longest follow-up period being 12-months and the shortest being a post-treatment assessment of 4-6 weeks.

A variety of outcome measures were used in the reviewed studies. Table 2 provides the details of these measures, including their full names. Eight of the 11 studies employed a semi-structured diagnostic interview (the ADIS-C/P: Silverman & Albano, 1996) to determine diagnostic status and severity. Two others assessed clinical diagnostic status using other diagnostic interviews, namely the DISC-IV (Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000) and the K-SADS (Kaufman, Birmaher, Brent, & Rao, 1997) but did not use these interviews with respect to outcome. Six studies provided a measure of overall functioning of the young person. Of these, four used the clinician-rated CGAS (Shaffer et al., 1983), one used the self-reported ALIS (Schniering, Rapee, Forbes, Wuthrich, & Ehrenreich, 2011) and one used the self-reported AWS (Birlerson, 1981). Anxiety symptoms were measured using a variety of measures. Seven of the 10 studies used the SCAS (either parent, child or both versions: Spence, 1998, 1999), one used the RCMAS (Reynolds & Richmond, 1985), two used the MASC (March, Parker, Sullivan, Stallings, & Conners, 1997), one used the SCARED (Birmaher et al., 1997), one used the HADS-A (Zigmond & Snaith, 1983), one used the ASTM (Cunningham et al., 2009), and one used the Social Phobia subscale of the RCADS (Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000). With respect to internalising symptoms, five used the CBCL-Int (Achenbach & Rescorla, 2001), two used the YSR-Int (Achenbach & Rescorla, 2001) and two used the SDQEmot (Goodman, Meltzer, & Bailey, 1998). Five studies also measured depression symptoms, with three using the CDI (Kovacs, 1981) and two using the CES-D (Radloff, 1977). Other less frequently used measures included those of child automatic thoughts (CATS: Schniering & Rapee, 2002), self-esteem (RSEI: Rosenberg, 1965), schemas (SCQ: Stallard & Rayner, 2005), additional subscales of the SDQ (i.e., hyperactivity, conduct, pro-social and total), the total score of the CBCL, attentional bias (visual probe task: Sportel et al., 2013), interpretive bias (AIBQ and Recognition task: Miers, Blote, Bogels, & Westenberg, 2008; Sportel et al., 2013), and threat-related automatic associations (stIAT: de Hullu, de Jong, Sportel, & Nauta, 2011).

Table 2: Study Details

Authors	Participants	Design	Outcome Measures
Spence et al. (2006)	72 children (42 male and 30 female) aged 7-14 years with a clinical-level anxiety disorder	Randomised block allocation to: <ul style="list-style-type: none"> • CLIN-NET ($N = 27$) - received half the sessions through group-based, face-to-face CBT and half online • CLINIC ($N = 22$) – received group-based, face-to face CBT • WL ($N = 23$) – waitlist control group • Assessment points: pre, post, 6-mth FU, 12-mth FU 	ADIS-C/P SCAS-C SCAS-P RCMAS CBCL-Int CDI
March et al. (2009)	73 children (33 male and 40 female) aged 7-12 years with a clinical-level anxiety disorder	Random allocation to: <ul style="list-style-type: none"> • NET ($N = 40$) – received BRAVE-ONLINE for Children • WL ($N = 33$) – waitlist control group • Assessment points: pre, post and 6-mth FU 	ADIS-C/P CGAS SCAS-C SCAS-P CBCL-Int CES-D

Authors	Participants	Design	Outcome Measures
Spence et al. (2011)	115 young people (47 male and 68 female) aged 12-18 years with a clinical-level anxiety disorder	Random allocation to: <ul style="list-style-type: none"> • NET ($N = 44$) – received BRAVE-ONLINE for Teenagers • CLIN ($N = 44$) – received face-to-face individual CBT • WLC ($N = 27$) – waitlist control group • Assessment points: pre, post, 6-mth FU, 12-mth FU 	ADIS-C/P CGAS SCAS-C SCAS-P CBCL-Int YSR-Int
Spence et al. (2008)	Two children (a ten-year old male and a 17 year-old female) with a clinical-level anxiety disorder	<ul style="list-style-type: none"> • 2 x case studies • Case 1: received BRAVE-ONLINE for Children • Case 2: received BRAVE-ONLINE for Teenagers • Assessment points <ul style="list-style-type: none"> • Case 1 (child) pre, post and 6-mth FU • Case 2 (teen) pre and post 	ADIS-C/P CGAS SCAS-C SCAS-P CBCL-Int YSR-Int (teen)
Cunningham et al. (2009)	Five adolescents aged 14-16 years (4 females and 1 male) with a clinical-level anxiety disorder	<ul style="list-style-type: none"> • 5 x case studies • Received Cool Teens • Assessment points: pre, post and 3-mth FU 	ADIS-C/P SCAS-C SCAS-P CATS ASTM
Wuthrich et al. (2012)	43 adolescents (27 females and 16 males) aged 14-17 years with a clinical-level anxiety disorder	Random allocation to: <ul style="list-style-type: none"> • Cool Teens ($N = 24$) – received Cool Teens • WL ($N = 19$) – waitlist control group • Assessment points: pre, post and 3-mth FU 	ADIS-C/P SCAS-C SCAS-P SDQEmot CATS ALIS
Khanna and Kendall (2010)	49 children (16 females and 33 males) aged 7-13 years with a clinical-level anxiety disorder	Random allocation to: <ul style="list-style-type: none"> • CCAL ($N = 16$) – received Camp Cope-a-Lot • ICBT ($N = 17$) – received 12 weekly, 50-minute, individual, face-to-face CBT sessions • CESA ($N = 16$) – active control that received 12 weekly, 50-minute sessions comprising 30 mins of therapist guided education and support and 20 mins of child computer use. • Assessment points: pre, post and 3-mth FU 	ADIS-C/P CGAS MASC CDI
Blocher et al. (2013)	15 children with epilepsy (8 female and 7 male) with a mean age of 11 years and a clinical-level anxiety disorder (identified through clinical interview with KSADS)	<ul style="list-style-type: none"> • Uncontrolled trial where all participants received the Camp Cope-a-Lot CD-ROM program with small modifications for an epileptic population • Assessment points: pre, week 7 of treatment, post and 3-mth FU 	MASC SCARED (child) SCARED (parent) CBCL-total CBCL-Int CDI

Authors	Participants	Design	Outcome Measures
Hoek et al. (2012)	45 adolescents (34 female and 11 male) aged 12-21 years who were in the mild to moderate range on the CES-D or HADS-A. 73.3% of participants were interviewed with the NIMH-DISC, but it was not used as an outcome measure.	Randomised block allocation to: <ul style="list-style-type: none"> • PST (<i>N</i> = 22) – received the problem solving program • WL (<i>N</i> = 23) – waitlist control • Assessment points: pre, 3-weeks, post and 4-mth FU 	CES-D HADS-A
Stallard et al. (2011)	20 youth aged 11-17 years with either clinical anxiety or mild/moderate depression. No explanation of how diagnosis was ascertained or how many young people with anxiety vs depression. Gender split was not specified on the 20 children, but of the 15 completers, 10 were male and 5 were female.	Random allocation to: <ul style="list-style-type: none"> • TFD – received Think-Feel-Do • WL – waitlist control group Assessment time points: <ul style="list-style-type: none"> • TFD – pre and post (6 weeks) • WL – pre and post (4 weeks) 	SDQ parent SCAS child AWS RSEI SCQ
Sportel et al (2013)	240 youth (66 males and 174 females) aged 12-15 years who scored above cut-offs on the RCADS social phobia subscale and / or the TAI and who were determined to be of low-level social anxiety (clinician severity rating = 0-4) on the ADIS-C. Although the ADIS was used to determine diagnostic status, diagnosis (i.e., a severity rating of 4 or more) was not a requirement of the study. 16.3% of CBM condition, 10.7% of CBT, and 11.4% of CTRL condition held a clinical diagnosis of Social Phobia at pre-test.	Randomized in a stratified design at school level to: <ul style="list-style-type: none"> • CBM – received Cognitive Bias Modification program • CBT – received 10 weekly, group-based, face-to-face CBT sessions of 1.5 hours duration • CTRL – waitlist control group • Assessment points: pre, post, 6-mth FU, 12-mth FU 	ADIS-C/P RCADS (SP) TAI stIAT Visual probe task Recognition task AIBQ

Note. ADIS-C/P: Anxiety Disorders Interview Schedule – Child and Parent Version ; SCAS-S/P: Spence Children's Anxiety Scale - Child and Parent Version; RCMAS: Revised Children's Manifest Anxiety Scale; CBCL-Int/Total: Child Behavior Checklist – Internalising Scale/Total Score; CDI: Child Depression Inventory; CGAS: Children's Global Assessment Scale; CES-D: Centre of Epidemiological Studies Scale –Depression; YSR-Int: Youth Self-Report – Internalising Scale; CATS: Children's Automatic Thoughts Scale; ASTM: Anxiety symptom tracking measure; SDQEmot: Strengths and Difficulties Questionnaire emotional symptoms scale; ALIS: Adolescent Life Interference Scale; MASC: Multidimensional Anxiety Symptom Checklist; NIMH DISC-IV: National Institute of Mental Health Diagnostic Interview Schedule for Children Version IV; HADS-A: Hospital Anxiety and Depression Scale; K-SADS-PL: Kiddie-Schedule for Affective Disorders and Schizophrenia – Present and Lifetime version; SCARED: Screen for Child Anxiety Related Disorders; AWS: The Adolescent Well Being Scale; RSEI: The Rosenberg Self-Esteem Inventory; SCQ: The schema Questionnaire for Children; RCADS (SP): Social Phobia subscale of the Revised Child Anxiety and Depression Scale; TAI: Spielberger Test Anxiety Inventory; stIAT: Single Target Implicit Association Test; AIBQ: Adolescent Interpretation and Belief Questionnaire; Pre: pre-treatment; Post: post-treatment; FU: follow-up

Quality of Papers

Table 3 provides the outcome of the quality assessment ratings. As is evident from Table 3, the quality of the papers overall was quite good. Six of the 11 papers received an overall quality rating of strong, three were rated as moderate, and two were rated as weak. It would seem that the strengths of papers in this field are in the areas of treatment design and data collection methods. With respect to treatment design, eight were rated as strong and comprised RCTs, one uncontrolled study was rated as moderate, and the two case study series were rated as

weak. Similarly, with respect to data collection methods, eight included diagnostic interviews as outcome measures and were rated as strong, and three were rated as moderate.

Table 3: Quality of Papers

Authors	Study Design	Confounds	Blinding	Data Collection Methods	Retention	Analysis Level	Overall
Spence et al. (2006)	Strong	Strong	Moderate	Strong	Strong	Strong	Strong
March et al. (2009)	Strong	Strong	Moderate	Strong	Moderate	Strong	Strong
Spence et al. (2011)	Strong	Strong	Moderate	Strong	Strong	Strong	Strong
Spence et al. (2008)	Weak	Weak	Moderate	Strong	Moderate	Weak	Weak
Cunningham et al. (2009)	Weak	Weak	Moderate	Strong	Moderate	Weak	Weak
Wuthrich et al. (2012)	Strong	Moderate	Moderate	Strong	Strong	Strong	Strong
Khanna & Kendall (2010)	Strong	Strong	Moderate	Strong	Moderate	Moderate	Strong
Blocher et al. (2013)	Moderate	Weak	Moderate	Moderate	Strong	Strong	Moderate
Hoek et al. (2012)	Strong	Strong	Moderate	Moderate	Moderate	Strong	Strong
Stallard et al. (2011)	Strong	Weak	Moderate	Moderate	Moderate	Moderate	Moderate
Sportel et al. (2013)	Strong	Strong	Moderate	Strong	Weak	Strong	Moderate

Blinding appears to be an area of relative weakness in this field, with all papers being rated as moderate. In the studies reviewed, the assessor was blind to the condition of the child. However, blinding families to both the condition they are placed in and the research aims of the study, would be considered unethical in this area. Thus, a rating of 'strong' for blinding is difficult to achieve.

Outcomes

Table 4 provides a very detailed description of the findings of the 11 studies reviewed. Therefore, this section will provide a general overview of the results found in terms of a) diagnostic status and severity, b) overall level of functioning, c) anxiety symptom self-report measures, d) depression symptom self-report measures and e) 'other' measures.

Diagnostic Status and Severity.

Programs for which diagnostic and severity outcome measures were provided included BRAVE (in all four studies, although one was a case series), Cool Teens (in both studies, although one was a case series), Camp Cope-A-Lot (in one of two studies), and Cognitive Bias Modification. As can be seen from Table 4, the results were varied. However, a few general comments can be made with respect to diagnostic status and severity. First, because so few participants in the trial involving Cognitive Bias Modification were diagnostic to begin with, the results pertaining to diagnostic outcome are uninterpretable and hence will not be discussed further in this section. Second, it would seem that BRAVE, Cool Teens and Camp Cope-A-Lot were able to produce diagnostic and severity status improvements. Third, in the studies involving BRAVE and Camp-Cope-A-Lot where comparisons were made between the computer-based intervention and a face-to-face condition, the improvements were equivalent. Fourth, BRAVE, Cool Teens and Camp-Cope-A-Lot included a suite of similar CBT strategies, and most importantly, included exposure. Finally, it would seem that better remission rates were evident for programs that included greater therapist contact. Both Camp Cope-A-Lot and the first version of BRAVE (Spence et al., 2006) comprised a program where half of the sessions were delivered via computer and half were delivered face-to-face, and both of these programs demonstrated high remission rates (particularly Camp Cope-A-Lot). Thus, it may be that greater therapist involvement is associated with better outcome.

Table 4: Results on Outcome Measures

Authors	Results on Outcome Measures
Spence et al. (2006)	<p>Loss of primary dx:</p> <ul style="list-style-type: none"> • Post: 56% of CLIN-NET, 65% of CLINIC and 13% of WL groups were free of their primary diagnosis. CLIN-NET and CLINIC demonstrated significantly greater improvements compared to WL. No significant difference between CLIN-NET and CLINIC. • 6-mth FU: 60.9% of CLIN-NET and 78.9% of CLINIC were free of their primary diagnosis. No significant difference between CLIN-NET AND CLINIC. • 12-mth FU: 73.9% of CLIN-NET and 89.5% of CLINIC were free of their primary diagnosis. No significant difference between CLIN-NET AND CLINIC. <p>Loss of all anxiety dx:</p> <ul style="list-style-type: none"> • Post: 44% of CLIN-NET, 55% of CLINIC and 8.7% of WLC groups were free of all anxiety diagnoses. CLIN-NET and CLINIC demonstrated significantly greater improvements compared to WL. No significant difference between CLIN-NET and CLINIC. • 6-mth FU: 56.5% of CLIN-NET and 57.9% of CLINIC were free of all anxiety diagnoses. No significant difference between CLIN-NET and CLINIC. • 12-mth FU: 60.9% of CLIN-NET and 84.2% of CLINIC were free of all anxiety diagnoses. No significant difference between CLIN-NET and CLINIC. <p>Clinician rated clinical severity rating of primary diagnosis from ADIS</p> <ul style="list-style-type: none"> • Post: CLIN-NET and CLINIC significantly greater improvements compared to WL; no significant difference between CLIN-NET and CLINIC. • 6- and 12-mth FU: treatment effects were maintained equally for both groups. <p>SCAS-C</p> <ul style="list-style-type: none"> • Post: CLIN-NET significantly greater improvements compared to WLC; CLINIC and WL not significantly different from each other. CLIN-NET not significantly different to CLINIC after controls were set. • 6- and 12-mth FU: treatment effects were maintained equally for both groups. <p>SCAS-P</p> <ul style="list-style-type: none"> • Post: CLIN-NET showed no significant differences in improvement compared to either WL or CLINIC. CLINIC showed significant improvements compared to WL. • 6- and 12-mth FU: Both CLINIC and CLIN-NET demonstrated significant further improvement. <p>RCMAS</p> <ul style="list-style-type: none"> • Post: All groups improved equally from pre to post. • 6- and 12-mth FU: improvements were maintained equally for both groups. <p>CBCL-Int:</p> <ul style="list-style-type: none"> • Post: <ul style="list-style-type: none"> • CLIN-NET and CLINIC demonstrated significantly greater improvements compared to WL. No significant difference between CLIN-NET and CLINIC. • No significant differences in clinically reliable change for CLIN-NET compared to either CLINIC or WL. CLINIC showed significantly greater clinically reliable change than WL. • Percentage of youth who were no longer in the clinical range was significantly greater for the CLIN-NET and CLINIC groups compared to the WL. No significant differences between CLIN-NET and CLINIC. • 6- and 12-mth FU: <ul style="list-style-type: none"> • 6- and 12-mth FU: Both CLINIC and CLIN-NET demonstrated significant further improvement. • 6-mth FU: a significantly greater percentage of CLINIC compared to CLIN_NET demonstrated clinically reliable change; no significant difference between groups on percentage of children no longer in the clinical range • 12-mth FU: no significant differences between groups on either clinically reliable change or percentage of children no longer in the clinical range. <p>CDI:</p> <ul style="list-style-type: none"> • Post: CLIN-NET showed significantly greater improvements compared to WL. No significant difference between CLINIC and WL or between CLIN-NET and CLINIC.

Authors	Results on Outcome Measures
March et al. (2009)	<ul style="list-style-type: none"> • 6- and 12-mth FU: treatment effects were maintained equally for both groups. <hr/> <p>Loss of primary dx:</p> <ul style="list-style-type: none"> • Post: 30% of NET and 10.3% of WL were free of their primary diagnosis. No significant difference between NET and WL. • 6-mth FU: 75% of NET were free of their primary diagnosis. <p>Loss of all anxiety dx:</p> <ul style="list-style-type: none"> • Post: 16.7% of NET and 3.4% of WL were free of all anxiety diagnoses. No significant difference between NET and WL. • 6-mth FU: 60.7% of NET were free of their primary diagnosis. <p>Number of dx:</p> <ul style="list-style-type: none"> • Post: Both NET and WL showed equal reduction. • 6-mth FU: significant further improvements for NET from post to 6-month FU. <p>Clinical severity (according to ADIS)</p> <ul style="list-style-type: none"> • Post: NET showed significantly greater improvement compared to WL. • 6-mth FU: significant further improvements for NET from post to 6-month FU. <p>CGAS:</p> <ul style="list-style-type: none"> • Post: NET showed significantly greater improvement compared to WL. • 6-mth FU: significant further improvements for NET from post to 6-month FU. <p>SCAS-C</p> <ul style="list-style-type: none"> • Post: both NET and WL showed equal significant improvement. • 6-mth FU: significant further improvements for NET from post to 6-month FU. <p>SCAS-P</p> <ul style="list-style-type: none"> • Post: NET showed significantly greater improvement compared to WL. • 6-mth FU: significant further improvements for NET from post to 6-month FU. <p>CES-D:</p> <ul style="list-style-type: none"> • Post: No significant improvement for NET or WL. • 6-mth FU: No significant improvement. <p>CBCL-Int:</p> <ul style="list-style-type: none"> • Post: <ul style="list-style-type: none"> • NET showed significantly greater improvement compared to WL. • No significant difference between groups on percentage of children no longer in the clinical range • 6- mth FU: <ul style="list-style-type: none"> • 6-month follow-up: significant further improvements for NET from post to 6-month FU. • No change from post to FU on percentage of children no longer in the clinical range.

Authors	Results on Outcome Measures
Spence et al. (2011)	<p>Loss of primary dx:</p> <ul style="list-style-type: none"> • Post: 36.6% of NET, 32.5% of CLIN, and 4.2% of WL were free of their primary diagnosis. NET and CLIN demonstrated significantly greater improvements compared to WL. No significant difference between NET and CLIN. • 6-mth FU: 62.2% of NET and 58.3% of CLIN were free of their primary diagnosis. No significant difference between NET and CLIN. • 12-mth FU: 78.4% of NET; 80.6% of CLIN. No significant difference between NET and CLIN. <p>Loss of all anxiety dx:</p> <ul style="list-style-type: none"> • Post: 19.5% of NET, 22.5% of CLIN, and 4.2% of WL were free of their primary diagnosis. No significant differences between groups. • 6-mth FU: 54.1% of NET and 50.0% of CLIN were free of their primary diagnosis. No significant difference between NET and CLIN. • 12-mth FU: 62.2% of NET; 72.2% of CLIN. No significant difference between NET and CLIN. <p>Clinical severity (according to ADIS)</p> <ul style="list-style-type: none"> • Post: NET and CLIN demonstrated significantly greater improvements compared to WL. • 6- and 12-mth FU: significant and equal improvement for NET and CLIN <p>CGAS:</p> <ul style="list-style-type: none"> • Post: NET and CLIN demonstrated significantly greater improvements compared to WL. • 6- and 12-mth FU: significant and equal improvement for NET and CLIN <p>SCAS-C</p> <ul style="list-style-type: none"> • Post: NET, CLIN and WL all improved equally over time. • 6- and 12-mth FU: significant and equal improvement for NET and CLIN <p>SCAS-P</p> <ul style="list-style-type: none"> • Post: CLIN improved significantly over time but <i>not</i> significantly more than the NET or WL • 6- and 12-mth FU: significant and equal improvement for NET and CLIN. <p>CBCL-Int:</p> <ul style="list-style-type: none"> • Post: CLIN and NET showed a significant reduction over time but <i>not</i> significantly more than the WL • 6- and 12-mth FU: significant and equal improvement for NET and CLIN. <p>YSR:</p> <ul style="list-style-type: none"> • Post: significant and equal improvement for all groups • 6- and 12-mth FU: significant and equal improvement for NET and CLIN

Authors	Results on Outcome Measures
Spence et al. (2008)	<p>Loss of primary and comorbid diagnoses:</p> <ul style="list-style-type: none"> • Case 1: retained primary diagnosis at post but not at 6-month follow-up; retained secondary diagnosis at post but not at 6-mth FU; lost tertiary diagnosis at post and 6-mth FU. • Case 2: lost primary and all anxiety diagnoses at post-treatment. <p>Clinical severity of primary diagnosis:</p> <ul style="list-style-type: none"> • Case 1: improved from a severity of 7 at pre, to 4 at post, to 0 at 6-mth FU • Case 2: improved from a severity of 6 at pre to 0 at post. <p>CGAS:</p> <ul style="list-style-type: none"> • Case 1: improved from 50 at pre to 69 at post to 74 at 6-mth FU. • Case 2: improved from 39 at pre- to 71 at post-treatment. <p>SCAS-C</p> <ul style="list-style-type: none"> • Case 1: no clinically reliable change evident on any of the subscales or total score at either post or FU. • Case 2: clinically reliable change evident on the social phobia subscale and the Total score at post. <p>SCAS-P</p> <ul style="list-style-type: none"> • Case 1: clinically reliable change was evident at post for the OCD, SAD, and GAD subscales as well as for the Total score. • Case 2: clinically reliable change evident on the social phobia, panic, and GAD subscales as well as the Total score at post <p>CBCL-Int</p> <ul style="list-style-type: none"> • Case 1: clinically reliable change was evident at 6-mth FU. • Case 2: clinically reliable change evident at post. <p>YSR-Int</p> <ul style="list-style-type: none"> • Case 2: clinically reliable change evident at post.

Authors	Results on Outcome Measures
Cunningham et al. (2009)	<p>Loss of primary dx:</p> <ul style="list-style-type: none"> • Cases 1 and 2: retained primary diagnosis at post and 3-mth FU • Case 3: retained primary diagnosis at post, but lost it at 3-mth FU • Case 4: lost primary diagnosis at post and 3-mth FU • Case study 5: lost primary diagnosis at post but regained it at 3-mth FU <p>CSR:</p> <ul style="list-style-type: none"> • Case 1: reduced from a severity of 7 at pre, to 6 at post, and increased again to 7 at FU • Case 2: increased from a severity of 6 at pre, to 7 at post and FU • Case 3: reduced from a severity of 6 at pre, to 5 at post to 3 at FU • Case 4: reduced from a severity of 6 at pre, to 2 at post, to 0 at FU • Case 5: reduced from a severity of 6 at pre, to 2 at post, and increased again to 5 at FU <p>Number of anxiety diagnoses:</p> <ul style="list-style-type: none"> • Case 1: stayed at 5 from pre to post, and increased to 6 at FU • Case 2: increased from 2 at pre to 3 at post and FU • Case 3: reduced from 3 at pre to 1 at post to 0 at FU • Case 4: reduced from 5 at pre to 1 at post to 0 at FU • Case 5: reduced from 1 at pre to 0 at post and FU <p>SCAS-C</p> <ul style="list-style-type: none"> • Case 2 showed 'some gains' at 3-mth FU • Case 5 showed 'some gains' at post <p>SCAS-P</p> <ul style="list-style-type: none"> • Case 1 showed 'some reduction' (time point unspecified) • Case 3 was 'much improved' at 3-mth FU • Case 5 showed improvement at post <p>CATS</p> <ul style="list-style-type: none"> • Case 2 showed 'some gains' at 3-mth FU • Case 5 showed 'some gains' at post <p>ASTM</p> <ul style="list-style-type: none"> • Case 1 showed a 'large improvement' • Case 2 'improved greatly' at post • No means provided and details on time points where changes occurred were not always provided

Authors	Results on Outcome Measures
Wuthrich et al. (2012)	<p>Loss of primary diagnosis:</p> <ul style="list-style-type: none"> • Post: 41% of Cool Teens group compared to 0% of WL lost their primary diagnosis • 3-mth FU: 26% of Cool Teens group lost their primary diagnosis <p>Loss of all anxiety diagnoses:</p> <ul style="list-style-type: none"> • Post: 23.5% of Cool Teens group compared to 0% of WL lost all anxiety diagnoses • 3-mth FU: 20% of Cool Teens group lost all anxiety diagnoses <p>Number of diagnoses:</p> <ul style="list-style-type: none"> • Post: significantly greater improvement by Cool Teens group compared to WL • 3-mth FU: improvements maintained by Cool Teens group at FU <p>Clinical severity of primary diagnosis:</p> <ul style="list-style-type: none"> • Post: significantly greater improvement by Cool Teens group compared to WL • 3 mth FU: improvements maintained by Cool Teens group at FU <p>Mean severity across all diagnoses:</p> <ul style="list-style-type: none"> • Post: significantly greater improvement by Cool Teens group compared to WL • 3-mth FU: improvements maintained by Cool Teens group at FU <p>SCAS-C</p> <ul style="list-style-type: none"> • Post: significantly greater improvement by Cool Teens group compared to WL • 3-mth FU: improvements maintained by Cool Teens group at FU <p>SCAS-P</p> <ul style="list-style-type: none"> • Post: significantly greater improvement by Cool Teens group compared to WL • 3-mth FU: improvements maintained by Cool Teens group at FU <p>SDQEmot</p> <ul style="list-style-type: none"> • Post: significantly greater improvement by Cool Teens group compared to WL • 3-mth FU: improvements maintained by Cool Teens group at FU <p>CATS</p> <ul style="list-style-type: none"> • Post: equal and significant improvement by both Cool Teens and WL groups • 3-mth FU: improvements maintained by Cool Teens group at FU <p>ALIS</p> <ul style="list-style-type: none"> • Post: significantly greater improvement by Cool Teens group compared to WL • 3 mth FU: improvements maintained by Cool Teens group at FU
Khanna & Kendall (2010)	<p>Loss of primary dx:</p> <ul style="list-style-type: none"> • Post: 81% of CCAL, 70% of ICBT, and 19% of CESA were free of their primary diagnosis. CCAL and ICBT demonstrated significantly greater improvements compared to CESA. • 3-mth FU: not reported <p>Severity of primary dx:</p> <ul style="list-style-type: none"> • Post: CCAL and ICBT demonstrated significantly greater improvements compared to CESA • 3-mth FU: CCAL and ICBT both showed equal improvement over the 3 time points (where significant differences lay was not stated) <p>CGAS</p> <ul style="list-style-type: none"> • Post: CCAL and ICBT demonstrated significantly greater improvements compared to CESA • 3-mth FU: CCAL and ICBT both showed equal improvement over the 3 time points (where significant differences lay was not stated) <p>MASC</p> <ul style="list-style-type: none"> • Post: All 3 conditions improved significantly and equally • 3-mth FU: CCAL and ICBT both showed equal improvement over the 3 time points (where significant differences lay was not stated) <p>CDI</p> <ul style="list-style-type: none"> • Post: All 3 conditions improved significantly and equally • 3-mth FU: CCAL and ICBT both showed equal improvement over the 3 time points (where significant differences lay was not stated)

Authors	Results on Outcome Measures
Blocher et al. (2013)	<p>MASC</p> <ul style="list-style-type: none"> • Significant improvement from pre to post and from pre to 3-mth FU <p>SCARED (child)</p> <ul style="list-style-type: none"> • Significant improvement from pre to: week 7, post and 3-mth FU • 73% did not have a clinically elevated score at post <p>SCARED (parent)</p> <ul style="list-style-type: none"> • No significant effects, but exploratory analyses demonstrated significant improvements from pre to: post and 3-mth FU <p>CDI</p> <ul style="list-style-type: none"> • Significant improvement from pre to: post and 3-mth FU <p>CBCL</p> <ul style="list-style-type: none"> • Total problems: significant improvement from pre to: post and 3-mth FU • Int: trend only, but then post hoc found a significant difference from pre to post.
Hoek et al. (2012)	<p>CES-D</p> <ul style="list-style-type: none"> • PST and WL groups showed equal improvement • Of the 80% of participants above the clinical cut-off, 37.5% and 25% had dropped below the clinical cut-off at post and 4-mth FU points respectively, with no significant differences between PST and WL. <p>HADS-A</p> <ul style="list-style-type: none"> • No improvement over time for either group • Of the 68.9% of participants above the clinical cut-off, 60% and 52.4% had dropped below the clinical cut-off at post and 4-mth FU respectively, with no significant differences between PST and WL.
Stallard et al. (2011)	<p>SCAS Child</p> <ul style="list-style-type: none"> • WL – significant improvements on Physical injury subscale only from pre to 4-week post • TFD – significant improvements on Social Phobia subscale only from pre to 6-week post <p>SDQ Parent</p> <ul style="list-style-type: none"> • WL – no change on any subscale from pre to 4-week post • TFD – significant improvements on the Emotional and Hyperactivity subscales as well as the Total Scale from pre to 6-week post <p>AWS</p> <ul style="list-style-type: none"> • WL: no significant improvements from pre to 4-week post • TFD: significant improvement from pre to 6-week post <p>RSEI</p> <ul style="list-style-type: none"> • Significant improvements for WL and TFD groups from pre to their respective posts <p>SCQ</p> <ul style="list-style-type: none"> • Significant improvements for WL and TFD groups from pre to their respective posts

Authors	Results on Outcome Measures
Sportel et al (2013)	<p>ADIS-C/P</p> <ul style="list-style-type: none"> • Only conducted at pre and post and not all were diagnostic at pre • Pre: 16.3% of CBM, 10.7% of CBT, and 11.4% of CTRL held a clinical diagnosis of social phobia • Post: 13.2% of CBM, 11.8% of CBT, and 3.5% of CTRL held a clinical diagnosis of social phobia • No FU data collected <p>RCADS (SP)</p> <ul style="list-style-type: none"> • Post – all 3 conditions reduced equally • Post to 6mth-FU –no difference between CBM and CNTRL; CBT reduced to a larger extent than CTRL; no difference between CBT and CBM • Pre to 12mth-FU – all 3 conditions reduced equally <p>TAI</p> <ul style="list-style-type: none"> • Post – no difference between CBM and CNTRL; no difference between CBM and CBT; CBT showed a greater reduction than CNTRL • Post to 6-mth FU: no difference between CBM and CNTRL; no difference between CBM and CBT; CBT showed a greater reduction than CNTRL • Pre to 12-mth FU: no difference between CBM and CNTRL; no difference between CBM and CBT; CBT showed a greater reduction than CNTRL <p>stIAT</p> <ul style="list-style-type: none"> • Post – CBT showed less reduction in negative associations compared to CBM and CNTRL; no difference between CBM and CNTRL • 6-mth FU to 12-mth FU: greater increase in positive automatic associations for CBM compared to CBT and CNTRL • Pre to 12-mth FU: greater reduction in threat-related associations for CBM compared to CBT <p>Visual probe tasks (attentional bias)</p> <ul style="list-style-type: none"> • Post - no change in any group on attentional bias to threatening faces; attentional bias to friendly faces increased in CBM compared to CNTRL <p>Recognition task (interpretive bias)</p> <ul style="list-style-type: none"> • Post – interpretations became less negative in CBM compared to CBT and CNTRL; interpretations became more positive in the CBM compared to CBT and CNTRL <p>AIBQ (interpretive bias)</p> <ul style="list-style-type: none"> • Post – interpretations became less negative in the CBM compared to CNTRL; all 3 conditions increased equally in positive interpretations

Note: As per Stallard et al (2010), completer results were reported; Pre= prior to treatment; Post = immediately following treatment; FU = follow-up; OCD = obsessive compulsive disorder; GAD = generalized anxiety disorder; SAD = separation anxiety disorder

Overall Functioning.

Measures of overall functioning were used in six studies to assess BRAVE, Cool Teens and Camp Cope-A-Lot. In all studies, the computer-based treatments were effective in improving the overall functioning of youth and the effects were either maintained or improved upon at follow-up time points. Furthermore, in studies where a face-to-face comparison group was included, the computer-based interventions demonstrated equal improvement in terms of overall functioning.

Self-reported Anxiety Symptoms.

All of the studies reviewed included self-reported anxiety symptom measures of various types. Table 4 illustrates the complexity and inconsistency of results on self-reported anxiety measures. Indeed, there were differences in findings depending on the program, the study conducted, the measure used, the follow-up point examined, and whether the report was by child or parent. Although by no means consistent, it can be said that overall, the computer-based programs involving a range of CBT strategies and in particular exposure, (i.e., BRAVE, Cool Teens and Camp Cope-A-Lot), were able to produce reductions in self-reported anxiety. In contrast, the programs

that contained only one CBT strategy and / or did *not* include exposure (i.e., the Problem Solving Program, Think-Feel-Do, and Cognitive Bias Modification) were not able to produce clear reductions on these measures. Furthermore, it can be said that in the studies investigating BRAVE and Camp Cope-A-Lot that included a face-to-face comparison intervention, no differences were found between those participating in computer-based interventions and those involved in the computer-based intervention, on self-reported anxiety symptoms.

Internalising Symptoms.

Internalising symptoms were measured in six studies involving BRAVE, Cool Teens and Think-Feel-Do. Overall, it would seem that the computer-based programs were effective in their ability to reduce internalising symptoms. Indeed, all six studies reported significant improvements on at least one internalising measure. Finally, the one study that included a face-to-face comparison group (Spence et al., 2011) reported that the computer-based and face-to-face interventions produced equivalent reductions in internalising symptoms.

Self-reported Depression Symptoms.

Depression was measured in studies assessing BRAVE, Camp Cope-A-Lot and Problem Solving Training. Of the four studies that included measures of depression, two reported significant reductions in depression following computer-based treatment, and two did not. Given the inconsistency of the results obtained, it is difficult to draw any strong conclusions regarding the ability of anxiety-focused computer-based programs to reduce symptoms of depression.

'Other' Measures.

Additional measures that did not fit clearly into the categories described above were used in studies assessing Cool Teens, Camp Cope-A-Lot, Think-Feel-Do and Cognitive Bias Modification. The results obtained differ depending on the program and the particular construct under consideration. The Cool Teens program was found to produce mixed results with respect to improvements in children's automatic thoughts. The Camp Cope-A-Lot program was found to produce significant improvements on the Total Problems Scale of the CBCL. The Think-Feel-Do program was able to show improvements in hyperactivity and overall strengths and difficulties while the waitlist group was not, both groups improved in terms of self-esteem and schemas, and neither group improved in terms of conduct or prosocial behaviour. Finally, the Cognitive Bias Modification Program was able to produce improvements in threat-related automatic associations, attentional bias, and interpretive bias.

Discussion

This paper provided an updated systematic review on computer-based treatment programs for youth anxiety. Its primary aim was to determine whether young people aged 3-18 years with anxiety, who had participated in a computer-based treatment program for anxiety, showed reductions in anxiety levels. A secondary aim was to examine the computer-based treatment programs for youth anxiety with respect to their treatment components and level of therapist assistance.

Eleven studies were selected that assessed six different CBT computer-based treatment programs. The programs included BRAVE, Cool Teens, Camp Cope-A-Lot, Problem Solving Training, Think-Feel-Do, and Cognitive Modification Bias. Three of the programs were Internet-based (BRAVE, Problem Solving Training, and Cognitive Modification Bias) and the remaining three were CD-ROM based. Three of the programs (BRAVE, Cool Teens, and Camp Cope-A-Lot) included a range of similar CBT strategies and in particular, included exposure. The other three programs did not include exposure, focusing on either single CBT strategies (Problem Solving Training and Cognitive Bias Modification) or including components relevant also to depression (Think-Feel-Do). The treatment programs under review, differed with respect to the number and duration of sessions, and the level of parent and therapist involvement.

The participants involved in the studies were aged from 7-21 years and eight of the 11 studies included only youth with clinical level anxiety disorders. With respect to study design, eight of the studies were RCTs, one was an uncontrolled clinical trial and two were case series. With respect to the quality of the studies reviewed, six were

rated as strong, three as moderate and two as weak. It would seem that relative strengths of studies in this area include treatment design and data collection methods, while a relative weakness was blinding.

The measures employed and the outcomes obtained were varied and reflect a general inconsistency within the youth anxiety field. There is much debate as to the appropriate methods for measuring treatment outcome, although it is clear that multi-method, multi-informant and multiple time points are essential in providing a comprehensive evaluation of program efficacy. With respect to diagnostic status and severity, it was found that those programs comprising a variety of CBT anxiety management strategies and which included exposure therapy (i.e., BRAVE, Cool Teens and Camp Cope-A-Lot) were found to be effective in producing reductions in diagnostic status and severity. These same programs were able to produce reductions in self-reported anxiety symptoms that were maintained over time and that were comparable to face-to-face therapy. However, programs that did *not* include exposure and that were either being trialled in terms of their ability to reduce both anxiety and depression symptoms or that focused on a single CBT strategy, were not successful in reducing self-rated anxiety symptoms. In relation to other measures, computer-based programs were generally found to improve levels of overall functioning and internalising problems, but the results for self-rated depression and other measures were inconsistent.

Several important conclusions can be drawn from the above findings. First, research in this area is generally of high quality and computer-based treatment programs for youth anxiety disorders are generally efficacious when compared to no therapy / education support. Second, when compared to face-to-face therapy, the computer-based programs included in this review demonstrated equal efficacy in terms of being able to produce improvements in diagnostic status, severity and self-report measures. It would therefore seem that computer-based approaches are a viable alternative to face-to-face therapy that may circumvent many of the barriers to treatment. Third, programs that involve a range of CBT strategies and which include exposure, appear more efficacious (although no direct comparisons were made). This is perhaps not surprising given the attitude of many, that exposure is the key component in anxiety management programs. Finally, computerised programs with greater therapist involvement appear to produce stronger effects in terms of diagnostic status (although no direct comparisons were made).

Although the results of this paper illustrate the advancements in our knowledge since the review by Richardson et al. (2010), the area of computer-based research remains in its infancy and there is much still to learn. As will be outlined below, there are a number of ways in which future research may extend and improve upon the research that has been conducted to date.

Where do we go from here?

Due to the early stages of this research area, there are a myriad of different avenues that future research may take. First, the preschool population (children under the age of 7) is notably absent in this review. Although the authors note that Donovan and March have recently completed an RCT of a computer-based program for preschool anxiety that is currently under review, preschoolers are clearly a neglected population. Given the potential for early intervention to prevent future problematic trajectories, research with preschool children (and their parents) is essential.

Another avenue for future research involves the potential for entirely self-help programs that do not rely on therapist assistance. Only one of the studies reviewed here (Sportel et al., 2013) tested the program in a purely self-help format, yet there are clear advantages of such an approach in terms of cost and labour efficiency. The results of this review suggest that greater therapist involvement tends to lead to better results. However, the studies are few, and even if it is the case that greater therapist involvement leads to better treatment outcomes, many young people may prefer to engage in programs where therapist interaction is not required. The investigation of self-help programs is therefore essential in order to determine their ability to reach this population. Indeed, the self-help format has the potential to reach an even greater number of affected young people than therapist-assisted interventions. In addition, research is required to determine *which* anxious youth might benefit from a pure self-help approach and *which* may require increased therapist involvement. Thus, studies involving the investigation of predictors of treatment outcome are essential. Furthermore, the idea of a stepped approach is not new, and self-

help programs are prolific in the adult computer-based program literature. There is therefore considerable scope for future research to investigate the potential usefulness of a self-help approach and / or stepped models of care.

Related to the important notion of providing purely self-help approaches, at least for some youth, is the importance of investigating more fully the *ways in which children learn* via computer and the *mechanisms of change* of the computer based programs themselves. Through determination of these factors, improvements may be made to both therapist-assisted and self-help computer-based programs, to further enhance their efficacy.

Yet another important area of empirical enquiry is the closer examination of treatment components included in the computer-based programs. Firstly, do we need them all? The results of this review suggest that exposure appears to be particularly important, but what of the other components? How many do we really need? This issue is yet to be resolved within the face-to-face youth anxiety treatment literature and may be particularly important in providing efficient, cost effective computer-based treatment. Indeed, this question may be potentially easier to examine using computer-based delivery as 'modules' and regular assessments can be delivered independently, combined or sequentially to large numbers of people, with relative ease. Second, if therapist intervention is required, which components of therapy is it most required for? Have Khanna and Kendall got it right? The Camp Cope-A-Lot program comprises 6 sessions of skill building via computer and 6 exposure and rehearsal sessions with a therapist. The RCT associated with this program certainly produced the highest remission rates post-treatment, albeit with the downside of requiring a therapist for half of the sessions. Future research should investigate the most efficient means of therapist involvement to determine if and when it is required.

Another area for future research lies in determining *who* can act as therapists in these computer-based therapies. Despite assertions by many that non-psychologists or those without prior CBT knowledge are able to deliver these treatments, the empirical tests of the programs universally involve mental health professionals with at least some knowledge and experience. The level of CBT knowledge required to be a therapist may well be determined by the amount of CBT content embedded in the program itself versus the amount delivered by the therapist. For those programs with high levels of embedded content (e.g. BRAVE and Cool Teens), delivery by school guidance officers, nurses or teachers may be possible and would provide a more cost-efficient and accessible approach. To date however, this remains untested and provides an exciting avenue for future research.

Yet another future area for empirical enquiry is to take the computer-based approaches and use them within paediatric health populations. Of the 11 studies included in this review, only the one by Blocher et al (2013) used this approach, testing Camp Cope-A-Lot with children with epilepsy. Numerous other health populations could be targeted however, including children with diabetes and cancer.

Finally, despite the efficacy of the programs included in this review, translational research is required to make them available to the wider population. Commercialisation of these programs is difficult, and government uptake for distribution on a wide scale is lacking. The promise these programs hold is immense, with the potential to reach thousands more children suffering with anxiety than is currently possible. Finding methods for translating this research into practice is perhaps the biggest challenge facing researchers in this area and should be a priority in years to come.

References

- Achenbach, T. M., & Rescorla, L. A. (2001). *Manual for the ASEBA school-age forms and profiles*. University of Vermont, Research Centre for Children, Youth and Families. Burlington, VT.
- Birleson, P. (1981). The validity of depressive disorder in childhood and the development of a self-rating scale: A research report *Journal of Child Psychology and Psychiatry*, 22(1), 73-88. <http://dx.doi.org/10.1111/j.1469-7610.1981.tb00533.x>
- Birmaher, B., Khetarpal, S., Brent, D., Cully, M., Balach, L., Kaufman, J., & Neer, S. M. (1997). The Screen for Child Anxiety Related Emotional Disorders (SCARED): Scale construction and psychometric characteristics. *Journal of the American Academy of Child & Adolescent Psychiatry*, 36(4), 545-553. <http://dx.doi.org/10.1097/00004583-199704000-00018>

- Blocher, J. B., Fujikawa, M., Sung, C., Jackson, D. C., & Jones, J. E. (2013). Computer-assisted cognitive behavioral therapy for children with epilepsy and anxiety: A pilot study. *Epilepsy & Behavior*, 27(1), 70-76. <http://dx.doi.org/10.1016/j.yebeh.2012.12.014>
- Boyd, C., Francis, K., Aisbett, D., Newnham, K., Sewell, J., Dawes, G., & Nurse, S. (2007). Australian rural adolescents' experiences of accessing psychological help for a mental health problem. *Australian Journal of Rural Health*, 15(3), 196-200. <http://dx.doi.org/10.1111/j.1440-1584.2007.00884.x>
- Broeren, S., Muris, P., Diamantopoulou, S., & Baker, J. R. (2013). The course of childhood anxiety symptoms: Developmental trajectories and child-related factors in normal children. *Journal of Abnormal Child Psychology*, 41(1), 81-95. <http://dx.doi.org/10.1007/s10802-012-9669-9>
- Cartwright-Hatton, S., Roberts, C., Chitsabesan, P., Fothergill, C., & Harrington, R. (2004). Systematic review of the efficacy of cognitive behaviour therapies for childhood and adolescent anxiety disorders. *British Journal of Clinical Psychology*, 43(4), 421-436. <http://dx.doi.org/10.1348/0144665042388928>
- Chorpita, B. F., Yim, L., Moffitt, C. E., Umemoto, L. A., & Francis, S. E. (2000). Assessment of symptoms of DSM-IV anxiety and depression in children: A revised child anxiety and depression scale. *Behaviour Research and Therapy*, 38, 835-855. [http://dx.doi.org/10.1016/S0005-7967\(99\)00130-8](http://dx.doi.org/10.1016/S0005-7967(99)00130-8)
- Cunningham, M., Wuthrich, V., Rapee, R., Lyneham, H., Schniering, C., & Hudson, J. (2009). The Cool Teens CD-ROM for anxiety disorders in adolescents. *European Child & Adolescent Psychiatry*, 18(2), 125-129. <http://dx.doi.org/10.1007/s00787-008-0703-y>
- de Hullu, E., de Jong, P. J., Sportel, B. E., & Nauta, M. H. (2011). Threat-related automatic associations in socially anxious adolescents. *Behaviour Research and Therapy*, 49, 518-522. <http://dx.doi.org/10.1016/j.brat.2011.05.008>
- Donovan, C. L., Spence, S. H., & March, S. (2013). Using new technologies to deliver cognitive behaviour therapy with children and adolescents. In P. Graham & S. Reynolds (Eds.), *Cognitive Behaviour Therapy for Children and Families: 3rd Edition* (pp. 351-370). Cambridge: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9781139344456.031>
- Essau, C. A., Conradt, J., & Petermann, F. (2000). Frequency, Comorbidity, and Psychosocial Impairment of Anxiety Disorders in German Adolescents. *Journal of Anxiety Disorders*, 14(3), 263-279. [http://dx.doi.org/10.1016/S0887-6185\(99\)00039-0](http://dx.doi.org/10.1016/S0887-6185(99)00039-0)
- Goodman, R., Meltzer, H., & Bailey, V. (1998). The strengths and difficulties questionnaire: A pilot study on the validity of the self-report version. *European Child & Adolescent Psychiatry*, 7(3), 125-130. <http://dx.doi.org/10.1007/s007870050057>
- Gould, M. S., Munfakh, J. L., Lubell, K., Kleinman, M., & Parker, S. (2002). Seeking help from the internet during adolescence. *Journal of the American Academy of Child & Adolescent Psychiatry*, 41(10), 1182-1189. <http://dx.doi.org/10.1097/00004583-200210000-00007>
- Himle, J. A., Fischer, D. J., Muroff, J. R., Van Etten, M. L., Lokers, L. M., Abelson, J. L., & Hanna, G. L. (2006). Videoconferencing-based cognitive-behavioral therapy for obsessive-compulsive disorder. *Behaviour Research and Therapy*, 44(12), 1821-1829. <http://dx.doi.org/10.1016/j.brat.2005.12.010>
- Hoek, W., Schuurmans, J., Koot, H. M., & Cuijpers, P. (2012). Effects of Internet-Based Guided Self-Help Problem-Solving Therapy for Adolescents with Depression and Anxiety: A Randomized Controlled Trial. *PLoS One*, 7(8), e43485. <http://dx.doi.org/10.1371/journal.pone.0043485>
- Kaufman, J., Birmaher, B., Brent, D., & Rao, U. (1997). Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime version (K-SADS-PL): Initial reliability and validity data. *Journal of the American Academy of Child & Adolescent Psychiatry*, 36(7), 980-988. <http://dx.doi.org/10.1097/00004583-199707000-00021>
- Khanna, M. S., & Kendall, P. C. (2010). Computer-assisted cognitive behavioral therapy for child anxiety: Results of a randomized clinical trial. *Journal of Consulting & Clinical Psychology*, 78(5), 737-745. <http://dx.doi.org/10.1037/a0019739>
- Kovacs, M. (1981). Rating scales to assess depression in school-aged children. *Act Paedopsychiatrica: International Journal of Child and Adolescent Psychiatry*, 46, 305-315.
- Langan, E., Blake, C., & Lonsdale, C. (2013). Systematic review of the effectiveness of interpersonal coach education interventions on athlete outcomes. *Psychology of Sport and Exercise*, 14(1), 37-49. <http://dx.doi.org/10.1016/j.psychsport.2012.06.007>

- March, J. S., Parker, J. D. A., Sullivan, K., Stallings, P., & Conners, C. K. (1997). The Multidimensional Anxiety Scale for Children (MASC): Factor structure, reliability, and validity. *Journal of the American Academy of Child & Adolescent Psychiatry*, 36(4), 554-565. <http://dx.doi.org/10.1097/00004583-199704000-00019>
- March, S., Spence, S. H., & Donovan, C. L. (2009). The Efficacy of an Internet-Based Cognitive-Behavioral Therapy Intervention for Child Anxiety Disorders. *Journal of Pediatric Psychology*, 34(5), 474-487. <http://dx.doi.org/10.1093/jpepsy/jsn099>
- Merikangas, K. R., He, J.-P., Brody, D., Fisher, P. W., Bourdon, K., & Koretz, D. S. (2010). Prevalence and Treatment of Mental Disorders Among US Children in the 2001–2004 NHANES. *Pediatrics*, 125(1), 75-81. <http://dx.doi.org/10.1542/peds.2008-2598>
- Merikangas, K. R., He, J.-p., Burstein, M., Swanson, S. A., Avenevoli, S., Cui, L.,... Swendsen, J. (2010). Lifetime Prevalence of Mental Disorders in U.S. Adolescents: Results from the National Comorbidity Survey Replication-Adolescent Supplement (NCS-A). *Journal of the American Academy of Child & Adolescent Psychiatry*, 49(10), 980-989. <http://dx.doi.org/10.1016/j.jaac.2010.05.017>
- Miers, A. C., Blote, A. W., Bogels, S. M., & Westenberg, P. M. (2008). Interpretation bias and social anxiety in adolescents *Journal of Anxiety Disorders*, 22, 1462-1471.
- Nicholas, J., Oliver, K., Lee, K., & O'Brien, M. (2004). Help-seeking behaviour and the Internet: An investigation among Australian adolescents. *AeJAMH (Australian e-Journal for the Advancement of Mental Health)*, 3(1), [np]. Retrieved from <http://www.auseinet.com/journal/vol3iss1/index.php>
- Radloff, L. S. (1977). The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1(3), 385-401. <http://dx.doi.org/10.1177/014662167700100306>
- Reynolds, C., & Richmond, B. O. (1985). *The Revised Children's Manifest Anxiety Scale: Manual*. New York: Western Psychological Services.
- Reynolds, S., Wilson, C., Austin, J., & Hooper, L. (2012). Effects of psychotherapy for anxiety in children and adolescents: A meta-analytic review. *Clinical Psychology Review*, 32(4), 251-262. <http://dx.doi.org/10.1016/j.cpr.2012.01.005>
- Richardson, T., Stallard, P., & Velleman, S. (2010). Computerised Cognitive Behavioural Therapy for the Prevention and Treatment of Depression and Anxiety in Children and Adolescents: A Systematic Review. *Clinical Child and Family Psychology Review*, 13(3), 275-275-290. <http://dx.doi.org/10.1007/s10567-010-0069-9>
- Rosenberg, M. (1965). *Society and the Adolescent Self Image*. Princeton, NJ: Princeton University Press.
- Sawyer, M. G., Arney, F. M., Baghurst, P. A., Clark, J. J., Graetz, B. W., Kosky, R. J.,... Zubrick, S. R. (2001). The mental health of young people in Australia: key findings from the child and adolescent component of the national survey of mental health and well-being. [Article]. *Australian & New Zealand Journal of Psychiatry*, 35(6), 806. <http://dx.doi.org/10.1046/j.1440-1614.2001.00964.x>
- Schniering, C. A., & Rapee, R. M. (2002). Development and validation of a measure of children's automatic thoughts: the children's automatic thoughts scale. *Behaviour Research and Therapy*, 40(9), 1091-1109. [http://dx.doi.org/10.1016/S0005-7967\(02\)00022-0](http://dx.doi.org/10.1016/S0005-7967(02)00022-0)
- Schniering, C. A., Rapee, R. M., Forbes, Wuthrich, V. M., & Ehrenreich. (2011). *Adolescent Life Interference Scale: ALIS*. Macquarie University.
- Shaffer, D., Fisher, P., Lucas, C. P., Dulcan, M. K., & Schwab-Stone, M. E. (2000). NIMH Diagnostic Interview Schedule for Children Version IV (NIMH DISC-IV): Description, differences from previous versions, and reliability of some common diagnoses. *Journal of the American Academy of Child & Adolescent Psychiatry*, 39, 28-38. <http://dx.doi.org/10.1097/00004583-200001000-00014>
- Shaffer, D., Gould, M. S., Brasic, J., Ambrosini, P., Fisher, P., Bird, H., & Aluwahlia, S. (1983). A Children's Global Assessment Scale (CGAS). *Arch Gen Psychiatry*, 40(11), 1228-1231. <http://dx.doi.org/10.1001/archpsyc.1983.01790100074010>
- Silverman, W. K., & Albano, A. M. (1996). *Anxiety disorders interview schedule for children for DSM-IV: Child and parent versions*. San Antonio: TX: The Psychological Corporation - Harcourt, Brace & Company.
- Silverman, W. K., Pina, A. A., & Viswesvaran, C. (2008). Evidence-Based Psychosocial Treatments for Phobic and Anxiety Disorders in Children and Adolescents. *Journal of Clinical Child & Adolescent Psychology*, 37(1), 105-130. <http://dx.doi.org/10.1080/15374410701817907>
- Spence, S. H. (1998). A measure of anxiety symptoms among children. *Behaviour Research and Therapy*, 36(5), 545-566. [http://dx.doi.org/10.1016/S0005-7967\(98\)00034-5](http://dx.doi.org/10.1016/S0005-7967(98)00034-5)

- Spence, S. H. (1999). *Spence Children's Anxiety Scale (Parent Version)*. University of Queensland. Brisbane.
- Spence, S. H., Donovan, C. L., March, S., Gamble, A., Anderson, R., Prosser, S.,... Kenardy, J. (2008). Online CBT in the Treatment of Child and Adolescent Anxiety Disorders: Issues in the Development of BRAVE-ONLINE and Two Case Illustrations. *Behavioural and Cognitive Psychotherapy*, 36(Special Issue 04), 411-430. <http://dx.doi.org/10.1017/S135246580800444X>
- Spence, S. H., Donovan, C. L., March, S., Gamble, A., Anderson, R. E., Prosser, S., & Kenardy, J. (2011). A Randomized Controlled Trial of Online Versus Clinic-Based CBT for Adolescent Anxiety. *Journal of Consulting & Clinical Psychology*, 79(5):629-42. <http://dx.doi.org/10.1037/a0024512>
- Spence, S. H., Holmes, J. M., March, S., & Lipp, O. V. (2006). The feasibility and outcome of clinic plus internet delivery of cognitive-behavior therapy for childhood anxiety. *Journal of Consulting & Clinical Psychology*, 74(3):614-21. <http://dx.doi.org/10.1037/0022-006X.74.3.614>
- Sportel, B. E., de Hullu, E., de Jong, P. J., & Nauta, M. H. (2013). Cognitive Bias Modification versus CBT in Reducing Adolescent Social Anxiety: A Randomized Controlled Trial. *PLoS One*, 8(5), e64355. <http://dx.doi.org/10.1371/journal.pone.0064355>
- Stallard, P., & Rayner, H. (2005). The Development and Preliminary Evaluation of a Schema Questionnaire for Children (SQC). *Behavioural and Cognitive Psychotherapy*, 33(02), 217-224. <http://dx.doi.org/10.1017/S1352465804001912>
- Stallard, P., Richardson, T., Velleman, S., & Attwood, M. (2011). Computerized CBT (Think, Feel, Do) for Depression and Anxiety in Children and Adolescents: Outcomes and Feedback from a Pilot Randomized Controlled Trial. *Behavioural and Cognitive Psychotherapy*, 39(03), 273-284. <http://dx.doi.org/10.1017/S135246581000086X>
- Storch, E. A., Caporino, N. E., Morgan, J. R., Lewin, A. B., Rojas, A., Brauer, L.,... Murphy, T. K. (2011). Preliminary investigation of web-camera delivered cognitive-behavioral therapy for youth with obsessive-compulsive disorder. *Psychiatry Research*, 189(3), 407-412. <http://dx.doi.org/10.1016/j.psychres.2011.05.047>
- Subrahmanyam, K., & Lin, G. (2007). Adolescents on the net: Internet use and well-being. *Adolescence*, 42(168), 659-677.
- Thomas, B. J., Ciliska, D., Dobbins, M., & Micuccis, S. (2004). A process for systematically reviewing the literature: providing the research evidence for public health nursing interventions. *Worldviews on Evidence-Based Nursing*, 1(3), 176-184. <http://dx.doi.org/10.1111/j.1524-475X.2004.04006.x>
- Wuthrich, V. M., Rapee, R. M., Cunningham, M. J., Lyneham, H. J., Hudson, J. L., & Schniering, C. A. (2012). A Randomized Controlled Trial of the Cool Teens CD-ROM Computerized Program for Adolescent Anxiety. *Journal of the American Academy of Child & Adolescent Psychiatry*, 51(3), 261-270. <http://dx.doi.org/10.1016/j.jaac.2011.12.002>
- Zigmond, A. S., & Snaith, R. P. (1983). The Hospital Anxiety and Depression Scale. *Acta Psychiatrica Scandinavica*, 67(6), 361-370. <http://dx.doi.org/10.1111/j.1600-0447.1983.tb09716.x>