The Use of Computers to Facilitate Effective Cognitive Behavioural Therapy for Children and Adolescents with Anxiety

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ABSTRACT

Anxiety disorders are the most prevalent mental health issue for children and adolescents. The issue is important for teachers and schools as anxiety disorders can cause significant learning difficulties as well as problems with social and emotional development. Cognitive behavioural therapy is currently the best available treatment for anxiety disorders. However, it is not readily accessible for many children and adolescents. The purpose of this review is to investigate an area of development in the treatment of anxiety for children and adolescents by answering the question: Can cognitive behavioural therapy (CBT) provide successful treatment outcomes for school-aged children and adolescents with anxiety if delivered using a technology-based platform (cCBT), as opposed to traditional face-to-face delivery? The research shows cCBT treatment results in effective post-treatment and follow-up outcomes for children and adolescents with anxiety when compared to no-treatment controls. The review concludes that CBT delivery using a technology-based platform results in similar treatment outcomes to traditional face-to-face delivery, while at the same time increasing the accessibility of CBT for children and adolescents with anxiety.

Keywords
Anxiety, Cognitive Behavioural Therapy, Computers, Children, Adolescents

INTRODUCTION

Anxiety disorders are considered to be the most prevalent mental health issue for children and adolescents in New Zealand. Findings from Dunedin and Christchurch longitudinal studies suggest that the prevalence of anxiety disorders increases from around 7% in childhood to just under 20% by 18 years (Fergusson & Woodward, 2002).

Anxiety is an important issue for the education sector because students with anxiety often experience significant difficulty at school, both academically and socially (Grover, Ginsburg, & Ialongo, 2007; Lowe & Raad, 2008; van

Ameringena, Mancinia, & Farvoldenb, 2003). Anxiety in adolescence is also a predictor of on-going mental health issues into adulthood (Hofstra, van der Ende, & Verhulst, 2002; Pine, Cohen, Gurley, Brook, & Ma, 1998) with Woodward and Fergusson (2001) showing significant associations between anxiety disorders in adolescence and risks of further anxiety disorders, major depression, substance dependence, and suicidal behaviour.

One of the most researched treatments for anxiety in children and adolescents is cognitive behavioural therapy (CBT) (Chorpita et al., 2011). In Ishikawa, Okajima, Matsuoka, and Sakano's (2007) meta-analysis of CBT treatment for anxiety disorders in children and adolescents, 20 studies were analysed showing an effect size of 0.68 for CBT compared to no-treatment groups.

Notwithstanding this evidence, much still remains to be determined about the individual factors that influence CBT treatment outcomes (Rapee, Schniering, & Hudson, 2009). However, until such time as research indicates otherwise, the evidence shows that CBT is the best available empirically supported treatment for child and adolescent anxiety.

Despite the evidence for successful treatment outcomes, Collins, Westra, Dozois, and Burns (2004) identified that anxiety disorders among children and adolescents often go untreated. Stallard, Richardson, and Velleman (2010) suggest CBT treatment for children and adolescents is limited by two key factors – the availability of trained therapists, and the accessibility of those therapists.

In an effort to increase treatment for children and adolescents with anxiety, modifications to traditional CBT service delivery formats have been developed. One encouraging area of research has been computer-based CBT (cCBT) (Greist, 2008; Kendall, Khanna, Edson, Cummings, & Harris, 2011). cCBT software programmes have been developed that do not require additional therapist supervision, while others share the treatment load between a therapist and the computer programme.

Using computers to deliver or assist the delivery of CBT for children and adolescents provides several advantages as discussed by Kendall, Settipani, and Cummings (2012). By reducing the requirement for face-to-face therapy, cCBT can provide a cheaper and more readily available service. In addition, therapy can be provided in a variety of settings that are comfortable for the child or adolescent, for example home or school, at times that are convenient for the family. cCBT also provides children and adolescents with a level of privacy that can overcome any perceived stigma from accessing mental health services. Given the analysis of the research area of interest, the clinically relevant question that will form the basis of the systematic review is: Can CBT provide successful treatment outcomes for school-aged children and adolescents with anxiety if delivered using a technology-based platform, as opposed to traditional face-to-face CBT?

The purpose of this review is to systematically identify and analyse research into the efficacy and feasibility of cCBT in the treatment of children and adolescents with anxiety in order to answer this question.

METHOD

Search procedures

The search aimed to identify those articles providing evidence of the effectiveness of cCBT for the treatment of anxiety in children and adolescents. Systematic searches were conducted over five electronic databases: Web of Knowledge, Education Resources Information Center (ERIC), ProQuest Central, PsycINFO, and Education Research Complete. Searches were limited to peer-reviewed studies written in English. One group of keywords was used in a search of the abstract field for all six database searches. The keywords used with truncation and Boolean operators were anxiety, posttraumatic stress disorder, obsessive-compulsive disorder, intervention, computer, technology, child, adolescent, teen, and school. The date of publication was limited to those articles published since 2005.

To increase the likelihood that all the relevant studies had been accounted for, a manual search was conducted on the reference lists of the articles identified in the database search. This process yielded a total of 245 papers.

Inclusion and exclusion criteria

The second stage was to ascertain from the title, abstract or the full text whether the studies met the inclusion criteria. The criteria required the participants to be school-aged children and adolescents between the ages of 5 and 18, being provided a cCBT treatment for anxiety. Preventative as well as indicated treatments were included. For indicated treatments an anxiety disorder was required as the primary diagnosis. No participants diagnosed with comorbid disorders were excluded. The treatment needed to utilise computer technology for at least 50 per cent of the delivery and contain treatment components consistent with CBT. Any studies that only treated adolescents with social anxiety were excluded, but if a study included some adolescents with social anxiety it could be included.

Best evidence

From stage two all of the articles remaining were found to have studied the same four cCBT programmes. The programmes were: Cool Teens; BRAVE (with variations); Camp Cope-A-Lot; and MoodGYM. The articles were further analysed to include only those that had produced the highest quality research evidence for each treatment. All four cCBT programmes were the subject of studies that reported empirical data on the treatment following a pre-test post-test randomised control design. This became a final inclusion criterion, and any of the preliminary single case design or introductory articles for these programmes were excluded.

RESULTS

The systematic data base search procedures and the use of inclusion and exclusion criteria resulted in the identification of six studies for this review. Table 1 summarises the sample characteristics: the study design; the cCBT treatment; attrition; the primary diagnosis measure; and the main findings of the six studies.

Table 1 TABLE OF EVIDENCE

Summary of studies using online cognitive behavioural therapy for children and adolescents with anxiety

CITATION AND STUDY DETAILS	DESIGN	CCBT PROGRAMME	ATTRITION	PRIMARY OUTCOME MEASURE	MAIN FINDINGS

Spence, Holmes, March, & Lipp. (2006)
Australia
Sample: SAD, GAD, SP, Spec.P
Age: 7 – 14
n = 72
	Random allocation:
	n=22 clinic based CBT;
	n=27 cCBT;
	n= 23 wait list
		BRAVE- ONLINE computer assisted programme.
		
		Children: 5 clinic sessions of 1hr/week and 5 internet sessions at 1 hour.
		Parents: 3 clinic sessions at 1hour/week and 3 internet sessions at 1 hour.
		Plus 1 month booster clinic session and 3 month booster internet session.
			2 out of 27 dropped out of cCBT intervention.
			56% of children and 52% of parents completed 3 month booster.
				ADIS P	cCBT associated with:
					In terms of efficacy 56% of the cCBT children, compared with 65% of clinic-based and 14% of WL, no longer met criteria for anxiety diagnosis post-treatment.
					At 12 month follow-up 73.9% no longer met criteria for primary anxiety disorder.
					High levels of acceptability; high levels of retention.
					Consumer satisfaction for parent and child equal to full clinic-based therapy; and high levels of compliance.

March, Spence, & Donovan (2009) Australia Sample: SAD, GAD, SP, Spec.P Age: 7 – 12 n = 73	Random allocation: n=40 cCBT; n=33 wait list	BRAVE for Children – ONLINE Children: 10 online sessions of 1 hour/week. Parents: 6 online sessions of 1 hour/week. Children and parents: 1 and 3 month booster sessions. Weekly online contact with therapist; 2 telephone calls with therapist.	11 out of 40 dropped out of cCBT treatment. At post-treatment 60% of parents and 33.3% of children finished treatment. At 6 month follow-up 34.4% of parents and 41.3% of children had completed both booster sessions.	ADIS P/C	cCBT associated with: In terms of efficacy 30% of the cCBT children, compared with 10.3% of WL, no longer met criteria for anxiety diagnosis post-treatment. At 6 month follow-up 75% of cCBT children no longer met criteria for primary anxiety disorder. Moderate levels of satisfaction; and high levels of credibility.

CITATION AND STUDY DETAILS	DESIGN	CCBT PROGRAMME	ATTRITION	PRIMARY OUTCOME MEASURE	MAIN FINDINGS

Spence et al. (2011)
Australia;
Sample: SAD, GAD, SoP, Spec.P
Age: 12 - 18
n = 115
	Random allocation:
	n=44 clinic based CBT;
	n=44 cCBT;
	n=27 wait list
		BRAVE for Teenagers – ONLINE
		
		Adolescents: 10 online sessions of 1 hour once a week and 1 telephone call with therapist after week 5.
		Parent: 5 online sessions of 1 hour once a week.
		Adolescents and parent: 1 and 3 month booster sessions.
		Weekly online contact with therapist.
			7 out of 44 dropped out of cCBT treatment
			At post-treatment 39% of adolescents and 60% of parents finished treatment.
			At 12 month follow-up 57% of adolescents and 79% of parents had completed all treatment sessions.
				ADIS P/C	cCBT associated with:
					In terms of efficacy 35% of the cCBT children, compared with 31% of clinic-based and 10.3% of WL, no longer met criteria for anxiety diagnosis post-treatment.
					At 6 month follow-up 58% of cCBT children, compared with 54% of clinic-based, no longer met criteria for primary anxiety disorder.
					At 12 month follow-up 72% of cCBT children, compared with 74% of clinic-based, no longer met criteria for primary anxiety disorder.
					Moderate to high levels of satisfaction.

Wuthrich et al. (2012) Australia Sample: GAD SAD SoP Spec P Panic D OCD Other Age: 14 – 17 n=43	Random allocation: n=24 cCBT; n=19 wait list	COOL TEENS – CD-ROM 8 modules; 30 minutes each; Parent handout. Therapist telephone support (less than 3 hours).	5 out of 24 dropped out of intervention. All modules completed.	ADIS P/C	cCBT associated with: In terms of efficacy 41% of the cCBT children, compared with 0% of WL, no longer met criteria for anxiety diagnosis post-treatment. At 3 month follow-up 26% of cCBT children no longer met criteria for primary anxiety disorder. High levels of acceptability to adolescents.

CITATION AND STUDY DETAILS	DESIGN	CCBT PROGRAMME	ATTRITION	PRIMARY OUTCOME MEASURE	MAIN FINDINGS

Khanna & Kendall (2010)
Sample: GAD SAD SoP Spec P Panic
Age: 7 – 13
n=49
	Random allocation:
	n=16 cCBT;
	n=17 clinic based CBT;
	n=16 controlled for therapist contact, education about anxiety, computer interaction, expectations, maturation, and the passage of time.
		Camp Cope-A-Lot – CD ROM
		
		Children: 12 computer assisted sessions of 35mins; 6 independent sessions and six 'coach' assisted.
		
		Parents: 2 coach sessions
			There were no dropouts from the cCBT treatment.	ADIS P/C	cCBT associated with:
					In terms of efficacy 81% of the cCBT children, compared with 70% of clinic-based and 19% of control, no longer met criteria for anxiety diagnosis post-treatment.
					Gains maintained at 3 month follow-up.
					Greater therapist adherence to protocol cCBT; greater flexibility for individualising CBT; no therapeutic alliance differences; high satisfaction of children cCBT; feasible implementation by providers with no CBT training.

Calear, Christensen, Mackinnon, Griffiths, & O'Kearney (2009) Sample: General population Age: 12 – 17 n = 1477	Cluster, stratified, random allocation: n=563 cCBT; n=914 wait list.	MoodGYM – 5 modules 1 session/wk (1hour) for 5 weeks. Fully automated; Teacher supervised.	62% completed 3 or more modules. 32.7% completed all 5 modules.	RCMAS	cCBT associated with: In terms of effectiveness the study showed a significant effect with the reduction of the RCMAS score for those participants in the intervention compared with the WL.

Abbreviations: SAD = separation anxiety disorder; GAD = generalised anxiety disorder; SP = social phobia; Spec.P = specific phobia; ADIS P/C = Anxiety disorders interview schedule for DSM-IV: Parent and child version; RCMAS = Revised children's manifest anxiety scale; WL = Wait List

Sample/Participants

Of the six studies, one used a cCBT programme that provided a preventative or universal methodology aimed at building resilience and enhancing mental health for whole school populations (Calear et al., 2009). The remaining five studies indicated treatment studies for diagnosed anxious children and adolescents (Khanna & Kendall, 2010; March et al., 2009; Spence et al., 2006; Spence et al., 2011; Wuthrich et al., 2012).

The universal study (Calear et al., 2009) was conducted over 30 schools with 1477 school children aged between 12 and 17 years (44% male, 56% female). The indicated studies had a combined total of 352 participants aged between 7 and 18 years: 171 (49%) male and 181 (51%) female. The majority of participants were diagnosed with either generalised anxiety disorder (39%) or social phobia (34%). The remaining participants had diagnosis of separation anxiety disorder (17%) and specific phobia (7%). Only Wuthrich et al. (2012) and Khanna and Kendall (2010) included participants with panic disorder (2%) and obsessive-compulsive disorder (1%). The incidence of secondary anxiety diagnosis among the participants was high at an average of 75%.

The indicated studies all used Silverman and Albano's (1996) Child and Parent Interview from the Anxiety Disorders Interview Schedule for Children (ADIS-C & ADIS-P) to provide the participants' primary anxiety diagnosis. The clinical severity rating of the sample, across all five studies, ranged from 5.6 to 6.9 out of a possible 8.0. A 4.0 is considered a moderate level of anxiety, with the levels in the sample indicative of disabling anxiety disorders (Silverman & Albano, 1996).

Calear et al. (2009) used the Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1985) to measure the participants' pre-treatment anxiety. This questionnaire cannot be used to identify or diagnose an anxiety disorder so diagnostic data were unavailable for this study. The mean scale score of anxiety for the participants in the treatment condition pre-treatment was 8.8 out of a possible 28.

Exclusion criteria across the five indicated studies varied, with the most predominant exclusions being children and adolescents with IQs below 80, and those children and adolescents currently receiving other psychotherapy treatments. Participants with the most severe symptoms such as diagnosed psychosis were excluded from the trials and recommended immediate alternative treatment. The possibility of these children and adolescents being wait-listed was not an ethical option.

Parents of the children and adolescents were actively involved in all but the universal study. In the Wuthrich et al. (2012) study parental support was encouraged with an educational handout provided. However, in the remainder of the indicated studies, active parental participation was required, with parents completing between two and six treatment education or therapy sessions.

Type of treatment

Three of the five indicated studies (March et al., 2009; Spence et al., 2006; Spence et al., 2011) looked at cCBT programmes that were adapted from an Australian clinic-based CBT anxiety treatment programme known as the BRAVE programme (Spence et al., 2006). The 2006 study was computer assisted with the treatment delivery evenly split over ten weeks between

internet sessions and group clinic sessions with a therapist. The 2009 and 2011 studies shifted the delivery to the BRAVE computer programme, with all ten sessions being conducted via the internet with therapist support provided via telephone. All sessions were an hour in duration and provided at weekly intervals. The BRAVE programmes were the only treatment programmes to provide booster sessions, one month and three months after initial treatment completion.

The Wuthrich et al. (2012) study considered an Australian eight-week cCBT programme delivered by CD-ROM, known as Cool Teens. Each week the participants completed a 30 minute module. Therapist support was provided via telephone at specified points in the programme.

Khanna and Kendall (2010) focused on an Australian CD-ROM delivered computer assisted programme, known as Camp Cope-A-Lot, based on an empirically supported CBT programme called Coping Cat (Kendall & Hedtke, 2006). Treatment delivery was evenly split over 12 weeks between CD-ROM and 'coach' led sessions. Each session was 35 minutes.

Calear et al. (2009) studied the Australian universal prevention programme known as MoodGYM. Delivered via the internet, it required teacher supervision and was completed over five weeks. Each week one module was completed at school in class time taking approximately one hour.

Level of expertise required to implement cCBT programmes

The studies varied in the level of expertise required from professionals in addition to the computer-based aspect of the programme delivered.

The earliest BRAVE treatment programme (Spence et al., 2006) required a qualified psychologist trained in CBT to provide five one-hour group treatment sessions. The level of expertise required for the later internet-based BRAVE treatment programmes (March et al., 2009; Spence et al., 2011) was not specified but the input reduced significantly to telephone and email contact only. The BRAVE programmes were manualised.

The Wuthrich et al. (2012) study did not specify the expertise and training required for the 'therapist' treatment support. The input was less than three hours telephone time for each participant.

Khanna and Kendall (2010) were very specific about the expertise required for the Camp Cope-A-Lot treatment programme. Six 35 minute sessions were required by a 'therapist', but the therapist did not have to be a registered psychologist with experience in CBT. The therapist volunteers comprised five school psychologists, ten psychology doctoral candidates, and one clinical psychologist with no experience in CBT for children with anxiety. The therapists received materials to direct them and an orientation session and were supervised weekly with regard to safety monitoring only for the participants.

The universal programme (Calear et al., 2009) included the least amount of expertise and input. Delivery of this programme required the participants' teachers to read the associated manual and supervise the weekly sessions. There was no formal in-class discussion undertaken about the programme with the teacher.

Outcomes for anxiety symptoms and severity

All of the studies showed positive treatment outcomes for anxiety symptoms and severity compared with wait-list controls. Calear et al. (2009), using the RCMAS, did not provide individual diagnosis information; therefore, the analysis of post-treatment outcomes simply showed the overall change in anxiety symptoms as a mean measure across the whole sample. On average, the RCMAS scores of participants in the intervention were 1.02 points lower (out of a scale of 28), which showed a significant effect when compared with those participants in the wait-list control. This effect continued at the 6-month follow-up with participants in the intervention condition reducing their RCMAS score by an average of 1.57 points more than the participants in the wait-list control.

The five indicated studies all using the ADIS P or ADIS P/C to assess the participants' anxiety symptoms and their severity showed substantial differences in the treatment outcomes of cCBT. Khanna and Kendall's (2010) outcomes showed 81% of the participants in the intervention condition no longer met the criteria for their primary anxiety diagnosis post-treatment compared with 19% of the control condition. This study did not use a wait-list control, instead implementing a non-CBT control condition that controlled for therapist contact, education about anxiety, computer interaction, expectations, maturation, and the passage of time. The gains made by the intervention participants were maintained at the three-month follow-up.

The three studies based on the BRAVE programme all had similar treatment outcomes. The Spence et al. (2006) study showed that 56% of intervention participants no longer met the criteria for their primary anxiety diagnosis post-treatment compared to 14% of the wait-list. This increased to 74% at the 12-month follow-up for the intervention participants. The March et al. (2009) study showed that 30% of intervention participants no longer met the criteria for their primary anxiety diagnosis post-treatment. This increased to 75% at the 6-month follow-up. The Spence et al. (2011) study showed that 35% of intervention participants no longer met the criteria for their primary anxiety diagnosis post-treatment. This increased to 58% at the 6-month follow-up and 72% at the 12-month follow-up.

The Wuthrich et al. (2012) study achieved the least successful outcomes in relation to the reduction of anxiety symptoms for the intervention participants. Post-treatment 41% of the intervention participants no longer met the criteria for their primary anxiety diagnosis. This decreased to 26% at the 3-month follow-up.

Three of the studies included a traditional, clinic-based CBT comparison condition in addition to a non-CBT control condition. The Spence et al. (2006) study showed that 65% of the traditional CBT participants no longer met the criteria for their primary anxiety diagnosis post-treatment, compared with 56% for the cCBT participants. The Spence et al. (2011) study showed that 31% of the traditional CBT participants no longer met the criteria for their primary anxiety diagnosis post-treatment, compared with 35% for the cCBT participants. The Khanna and Kendall (2010) study showed that 70% of the traditional CBT participants no longer met the criteria for their primary anxiety diagnosis post-treatment compared with 81% for the cCBT participants.

Feasibility

In addition to the outcomes of the cCBT treatment in relation to the participants' primary anxiety symptoms, the studies reported on a range of other outcomes that affect the feasibility of cCBT as an effective treatment for child and adolescent anxiety.

Three studies (Khanna & Kendall, 2010; March et al., 2009; Spence et al., 2011) utilised the Children's global assessment scale (CGAS; Shaffer et al., 1983) as a means of assessing the effect of cCBT on children's and adolescents' general functioning. All three studies showed significantly improved functioning as measured by the CGAS for the cCBT participants. Where applicable, the gains made were equivalent to those experienced by the traditional, clinic-based CBT comparison condition.

The five indicated studies also used author prepared questionnaires to assess the level of satisfaction or usefulness perceived by the participants of the cCBT intervention. All of these studies showed that there were moderate to high levels of satisfaction for the cCBT treatment method. Where applicable, it was rated equally as highly as the traditional, clinic-based CBT comparison condition.

All six studies collected data on attrition and treatment completion rates. Khanna and Kendall (2010) had a 0% attrition rate and a 100% completion rate for the cCBT group in their study. The four other indicated studies experienced between 8% and 28% attrition from the cCBT intervention condition. All the modules were completed for the Wuthrich et al. (2012) study, while the BRAVE studies had an average of 52% of children/adolescents and 55% of parents who completed the entire cCBT intervention. The universal study found that 62% of the participants completed three or more modules, while 33% completed all five.

DISCUSSION

This review supports cCBT as a promising treatment for children and adolescents with anxiety disorders. The cCBT trials all showed effective treatment outcomes when compared to no-treatment controls. However, this support is limited by the small number of studies and the small sample sizes in each study. In comparison, research into the use of cCBT for adults is significantly more advanced. A recent meta-analysis (Cuijpers et al., 2009) of computer aided psychotherapy for anxiety disorders in adults accessed 23 randomised controlled studies dating back to 1988. As a whole they found that cCBT was as effective for adults as face-to-face therapy.

A limitation of the trials also raises an ethical dilemma. The only data available for the no-treatment sample are immediately post-treatment. These data regularly support superior treatment outcomes for the cCBT sample, but as it would be unethical to refuse treatment to the no-treatment sample for any length of time, no follow-up comparative data are possible.

However, these trials also demonstrate the unresolved questions that remain in the field with regard to the efficacy of CBT as a therapy for children and adolescents with anxiety. Although CBT is one of the most researched and currently efficacious treatments for child and adolescent anxiety, much still remains to be determined about the factors that influence treatment outcomes.

The same is true for cCBT and none of the trials in this review achieved further clarity in this respect.

Unresolved issues with regard to CBT treatment include the individualisation of treatment for the different variety of anxiety disorders. The type and severity of the anxiety disorders in the cCBT trials diagnosed pre-treatment varied considerably but all of the treatments dealt with the varied anxiety disorders as a unitary type of disorder. There was no attempt to provide specific data to individualise treatment outcomes in relation to pre-treatment diagnosis. This absence of analysis results in an inability to ascertain which of the pre-treatment diagnoses – generalised anxiety disorder; separation anxiety disorder; specific phobia; social phobia; panic disorder or obsessive compulsive disorder – responded more positively to treatment against those that were more resistant to it. This is an important issue as it is acknowledged in adult anxiety treatment that different anxiety disorders require different treatment approaches to achieve optimum outcomes (Cartwright-Hatton, Roberts, Chitsabesan, Fothergill, & Harrington, 2004).

Another issue is the influence of comorbid disorders. A study by Berman, Weems, Silverman, and Kurtines (2000) showed that there are links between treatment outcomes for children and adolescents with anxiety and comorbid diagnosis. Although the sample size was small, this study demonstrated that less favourable treatment outcomes are obtained for children and adolescents with anxiety and comorbid diagnosis of depression. Only one cCBT trial from this review specifically measured depression in addition to anxiety, but the reported results did not allow for an analysis of comorbid depression and treatment outcomes for anxiety from the treatment programme. Future trials would benefit from increased analysis to help detect the children and adolescents that the programme would most benefit. cCBT trials with larger samples and more extensive pre- and post-treatment diagnosis and analysis are needed to unpack this issue further.

The influencing condition of parental involvement in treatment is another area of uncertainty with regard to the efficacy of CBT generally and these cCBT trials specifically. Reviews such as James, Soler, and Weatherall (2005) and Ishikawa et al. (2007) have mixed conclusions about the influence of parental involvement due to differences in the parental components of treatment and diagnostic assessments. These difficulties are duplicated in the cCBT trials leaving the field no closer to understanding which factors of parental involvement are critical in achieving successful treatment outcomes.

Another issue that potentially influenced treatment outcomes and differed considerably between trials in this review was therapist time and mode of communication. Interestingly, the two studies with the highest amount of therapist delivery time (Khanna & Kendall, 2010; Spence et al. 2006) had the lowest attrition rates and reasonable treatment completion rates. Assuming the length and type of therapist contact aids in the creation of a therapeutic alliance, this would support one traditionally held view that therapeutic alliance is a critical factor in successful treatment outcomes, as posited by Horvath and Symonds (1991) in their meta-analysis of the relationship between working alliance and outcome in psychotherapy. This view was echoed in a survey conducted by Stallard et al. (2010) where mental health professionals had apprehensions about the potential for a lack of therapeutic alliance in cCBT

even though they were generally in favour of its use. However, the premise that successful outcomes in CBT require extensive face-to-face clinic contact and high therapeutic alliance is not completely supported by these studies. The two BRAVE studies (March et al., 2009; Spence et al., 2011) both factored in limited, telephone delivered therapist contact, yet achieved similarly successful outcomes as the initial BRAVE trial (Spence et al., 2006) that evenly distributed therapist contact and computer use.

The expertise of the therapist delivering the cCBT treatment is another factor that varies throughout these studies. Although they divided therapist and computer time evenly, Khanna and Kendall's (2010) study employed a 'coach' to undertake the face-to-face sessions. The 'coach' was not required to have training or previous experience in CBT delivery. The treatment outcomes of Khanna and Kendall's study suggest that success in terms of a reduction in the primary diagnosis of anxiety does not depend on participants accessing only trained and experienced CBT therapists. However, firm conclusions will require further trials specifically addressing this factor.

Another issue that contributes to the uncertainty around treatment outcomes of CBT generally and cCBT specifically is the potential for differentiated outcomes across samples of different ages. The participants in the trials were widely spaced in age and the samples were not large enough to ascertain whether cCBT achieved more or less favourable outcomes across a specific age group. It is of interest to note that the study with the least successful outcomes, being the reduction of anxiety diagnosis post-treatment, was the study involving the oldest participants. This group also had a zero per cent reduction in anxiety diagnosis for the wait-list, which differed from all of the other trials that experienced between a 10% and 19% reduction in anxiety diagnosis for the wait-list. There could be several explanations for this; the anxiety disorders of the older adolescents may have differed in their severity or prevalence which may have affected their response to cCBT treatment, for example. However, it is not possible to draw any conclusions about this without significant research aimed specifically at different age cohorts.

Another issue for further research is the effectiveness of cCBT for children younger than 7. Even though anxiety is a disorder that is present in this age group (Office of National Statistics, 2000), none of the trial's participants were younger than 7, possibly intentionally as there is very little evidence of the effectiveness of traditional face-to-face CBT for very young children (Cartwright-Hatton et al., 2004).

Another unresolved question in this field is the efficacy of CBT compared with other treatment types (Cartwright-Hatton et al., 2004; Rapee et al., 2009). In this review, none of the trials analysed cCBT for children and adolescents in comparison to treatment conditions other than traditional face-to-face CBT. In those small samples there was no indication that cCBT was more or less effective than face-to-face CBT. Unfortunately, despite the successes of CBT and cCBT treatments, there is still a large percentage of children and adolescents who receive no benefit from treatment and continue to suffer the life interference caused by anxiety symptoms. Further research is needed to improve our knowledge about essential factors for treatment in an attempt to achieve a greater percentage of successful treatment outcomes for children and adolescents suffering from anxiety.

Notwithstanding the above commentary, if the focus is returned to the reviews purpose, there is a clear answer to the primary question: Can CBT provide successful treatment outcomes for school-aged children and adolescents with anxiety if delivered using a technology-based platform, as opposed to traditional face-to-face CBT? The answer is yes. The trials have shown that treatment outcomes from cCBT are similar to those achieved by face-to-face therapy. In addition, there are advantages in the availability of cCBT treatment compared with traditional face-to-face CBT delivery methods. If, as a number of reviews would argue (Cuijpers et al., 2009; Elkins, McHugh, Santucci, & Barlow, 2011; Marks & Cavanagh, 2009), CBT is unable to be delivered to the majority of anxiety disordered child and adolescent populations due to problems of dissemination and implementation, cCBT could provide welcome relief.

IMPLICATIONS FOR TEACHERS

There are several ways that cCBT programmes have been used by schools:

- Publicising the availability of programmes within the school and parent community, for example via newsletters;
- Providing links to online programmes from student and staff health and wellbeing webpages;
- Introduction of the programmes into the health curricula;
- Selected students working with counsellors or special needs teachers through programmes at school.

Further information about the evidence-based programmes referred to in this review is as follows:

- The BRAVE programme, run by the University of Queensland is currently (to the end of 2013) taking registrations for participants aged from 8 to 12 years suffering from social anxiety. Registration for an adolescent programme, for children aged 13 to 17 years, is coming. https://exp.psy.uq.edu.au/socialanxiety/index.html?page=home
- CAMP-COPE-A-LOT is a software programme with workbooks available on CDRom. It requires a coach to guide the child through the programme, but the coach does not need to have any formal training in CBT. http://www.cope-a-lot.com/
- MOODGYM is aimed at adolescents and is run by the Australian National University. It is a free resource. https://moodgym.anu.edu.au/welcome
- COOL TEENS is currently only available to adolescents who are part of the research study in Australia.

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