Building on the empirical data supporting the efficacy of cognitive–behavioral therapy (CBT) for child anxiety, researchers are working on the development and evaluation of cost-effective and transportable CBT approaches. Related to this, a widely endorsed goal is to disseminate evidence-based treatments from research settings to community settings. Computer-assisted treatments have emerged as a means to provide cost-effective and efficient service to an increased number of anxious youth for whom a CBT treatment would be otherwise unavailable. We offer a rationale for the development and evaluation of computer-assisted psychosocial treatments for anxiety in youth, offer illustrative advances made in this area, and describe our efforts in using computers to enhance dissemination of CBT for child anxiety. Specifically, our illustrations include a description of (a) Camp-Cope-A-Lot (CCAL), a computer-assisted CBT for the treatment of anxiety disorders in youth ages 7–12, and (b) CBT4CBT: Computer-based training in CBT for anxious youth. Findings from evaluations of these programs are summarized, and further advances are proposed and discussed. Depression and Anxiety 28:58–66, 2011.

Key words: anxiety; computer-assisted treatment; child and adolescent anxiety; cognitive–behavioral therapy

INTRODUCTION

Anxiety disorders are highly prevalent in youth and cause substantial impairment in school, family relationships, and social functioning. Left untreated, these disorders predict future anxiety disorders, depression, and other mental health disorders in adulthood.[1] Evidence supports the efficacy of cognitive–behavioral therapy (CBT) for anxiety in youth,[2–9] but, due to the limited number of trained CBT providers, CBT remains rarely implemented in the settings where children with anxiety disorders are identified and treated.[10]

There continues to be a disjunction between empirically supported treatments and those that are typically available in the community.[10–12] For youth who receive community services, their treatment outcomes are typically more modest and less efficient than for the relatively few who receive treatment in research clinics.[13–15] A barrier is the lack of CBT-trained workforce[16–18] and the supply of practitioners adequately trained in empirically supported treatments is

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unlikely to catch up to the need for services in the near future. According to Greist, problems also include “inevitable and uncontrollable therapist deviations” (p 793) from the empirically supported treatments as developed and implemented in the research settings.

Given the high prevalence (10–20%) and substantial morbidity associated with anxiety disorders in childhood, the dissemination of CBT from clinical research to clinical practice should be a priority. A widely endorsed goal is to broaden the range of treatment delivery models to bridge the gap between research–clinic treatments and service–clinics. Computer-based (stand-alone; self-help) and computer-assisted (in combination with face-to-face therapy; therapist guided) programs facilitate the delivery of CBT, and could play an important role in broadening the availability of empirically supported treatment and improving the integrity of the treatment provided in the community.

COMPUTER-BASED COGNITIVE–BEHAVIORAL TREATMENTS

Globally, interest in internet- and computer-administered assessments and treatments for mental health problems are blossoming, as evidenced by more than 200 studies of computer-based mental health interventions. Computer-based and computer-assisted CBT treatments not only hold the potential to enhance dissemination, but also have potential practical advantages. First, costs of services provided via computer may be reduced by as much as one-third relative to the cost of conventional treatment. Second, computers are available in multiple settings (e.g. schools, community agencies, homes). As a therapeutic tool, the computer may offer anonymity and privacy for those seeking information or who may be reluctant to initiate treatment. Accessing information from a private location reduces barriers that may otherwise deter a patient from pursuing treatment. Computers offer the potential to improve standardization and enhance adherence, and can include standardized materials (e.g. practice role-plays, exposure tasks), homework assignments, and built-in knowledge checks. While maintaining protocols in the preferred sequence, programs can allow customization for each patient (e.g. modify instructions based on client responses) and can facilitate review of material as needed (e.g. Cefai et al., 2010). Also, because CBT is structured and sequentially implemented, it lends itself to interactive computer software. Ease of record keeping and data collection are other advantages of computer-assisted programs. Using internet-based programs, user input can be automatically recorded, stored in secured private databases, and monitored regularly—a function that can reduce time and cost for researchers and clinicians alike.

In general, as well as anxiety in particular, manual-based treatments were initially developed to improve treatment integrity and transportability; however, manuals do not automatically result in good practice uptake. Other continuing professional education methods, such as workshops or seminars, which are notable for being expensive and time consuming, are less successful than preferred in achieving competent and faithful transfer of skills. For example, in a meta-analysis of studies of various approaches to implementation, traditional efforts, such as discussing theory and knowledge, demonstrating treatment techniques, and role-playing resulted in very limited implementation of the new skills in actual practice. Computer-assisted delivery of treatments for anxiety offers the potential to improve standardization, and enhance treatment adherence, and increasing the consistency of CBT content than is available in most settings. An effective computer-assisted treatment could ease the delivery of CBT (while maintaining fidelity) and reduce therapist training costs and clinical hours, two features that might make it more likely to be adopted by practicing professionals. As J. March predicted, “more often than not, interventions will be streamed over the internet for reasons of uniformity and standardization, ease of delivery, and cost-effectiveness”.

Although there are advantages, there are potential disadvantages associated with computer-based and computer-assisted interventions. For instance, a concern has been voiced regarding the loss of the therapist–client relationship or lack of a “therapeutic alliance” and the negative impact this could have on client engagement and compliance. In addition, computerization has been criticized as potentially limiting the individualization of treatment. Last, depending on the design of the computer program, it might be criticized for lacking important therapeutic components (e.g. opportunities for live exposure tasks). The possibility of privacy and security breaches is another concern.

When one turns to the research literature, the preliminary evidence supports the use of computer-based and computer-assisted interventions in the treatment of a number of psychological disorders in adults, including depression, anxiety, obsessive–compulsive disorder, panic symptoms, and eating disorders. In addition to demonstrating symptom reduction, preliminary data from Proudfoot et al. suggest that computer-based CBT programs are an acceptable format for psychological treatment. In this study, patient satisfaction with a computer-based treatment was significantly higher than satisfaction with treatment-as-usual. These findings are preliminary, however, as the studies vary widely in setting, patient populations, comparison groups, and outcome measures, and are in many cases...
limited to small sample sizes. A recent meta-analysis of internet- and computer-based cognitive–behavioral treatments for anxiety confirmed that there are currently not enough large, well designed, and randomized controlled trials available to draw strong conclusions about the generalizability of these findings.\textsuperscript{[64]} Nevertheless, in 2006, the UK National Institute for Clinical Effectiveness deemed computerized CBT an acceptable option “for the management of depression in primary and secondary care and for the management of anxiety (panic disorder, with or without agoraphobia, and GAD) in adults in primary, secondary and community care”\textsuperscript{[43]} (p 9). Fewer evaluations exist of computer-based programs for children and adolescents; however, the literature is expanding. A number of studies exist evaluating the efficacy of computer-based treatments for child anxiety\textsuperscript{[65–67]} selective mutism,\textsuperscript{[68]} specific phobia,\textsuperscript{[69]} disordered eating,\textsuperscript{[70]} and depression\textsuperscript{[67,71–73]} among youth.

**COMPUTER-BASED CBT FOR CHILD ANXIETY**

Spence et al.\textsuperscript{[74]} reported on the feasibility of the partial delivery of CBT via the internet for anxious youth aged 7–14. The internet-assisted program (CLIN-NET) was compared to group CBT (CLINIC) and a waitlist (WL). In the CLIN-NET condition, 8 of 16 therapy sessions were delivered via the internet and the remaining sessions were in a clinic-based group format. Both treatments resulted in significantly greater reductions in anxiety symptoms compared to WL. In addition, the rates of improvement in the two treatment conditions were comparable with response rates reported in previous investigations of group CBT for childhood anxiety. The internet-assisted treatment content was found to be acceptable to families, with minimal dropout and a high level of compliance. The Spence et al. results are promising and supportive of the use of computers, yet it is worth noting that therapists in both CLINIC and CLIN-NET conditions were psychologists from a university research clinic trained in CBT for child anxiety; thus, these results did not address matters of dissemination to naïve therapists.

March et al.\textsuperscript{[75]} evaluated the \textit{BRAVE} program, an internet-based (minimal therapist contact via phone/email) treatment for 7–12 year old children with anxiety disorders. Participants were randomly assigned to either the \textit{BRAVE} program or WL. At posttreatment, compared to WL participants, children receiving \textit{BRAVE} showed small reductions in anxiety symptoms and increases in functioning, but the outcomes at posttreatment were not as good as previous studies involving clinic-based CBT for child anxiety. Given that the treatment was largely internet based, questions remain regarding treatment compliance. For example, at posttreatment, only 33% of children and 60% of parents had completed all treatment sessions (not including booster sessions). At 6-month follow-up, the improvements were enhanced, with 75% of the \textit{BRAVE} children no longer meeting criteria for their principal diagnosis, a finding that is consistent with clinic-based outcomes. However, note that the absence of a control group at 6 months can reduce the confidence in the follow-up findings.

Cunningham et al.\textsuperscript{[66]} reported on the Cool Teens Program, a pilot project with five adolescents. The Cool Teens Program, a multimedia, self-help CD-ROM intended for anxious adolescents, was supplemented with biweekly telephone calls by a clinical psychologist to monitor progress and troubleshoot difficulties. After 12 weeks, two of the participants (40%) reported anxiety severity ratings that were reduced to subclinical levels for at least one anxiety disorder. At 3-month follow-up, these two participants no longer met criteria for an anxiety disorder. The authors noted that it was the participants with the more severe/complicated presentations that made the fewest gains. Adherence may be an issue, given that only two of the five participants completed all eight modules.

**CAMP COPE-A-LOT**

Taking a somewhat different approach to the use of computers in treatment provision, Camp Cope-A-Lot (CCAL) is a computer-assisted intervention for children (ages 7–12 years) with anxiety (Separation Anxiety, Social Phobia, Generalized Anxiety Disorder, Specific Phobia, Panic Disorder). The program\textsuperscript{[76,77]} is based on the \textit{Coping Cat} treatment,\textsuperscript{[78,79]} an empirically supported CBT for anxiety in youth.\textsuperscript{[1,6,80,81]} Unlike the computer-based programs, CCAL is a “computer-assisted” treatment program, employing minimal but necessary involvement of a mental health professional—the coach. With an eye toward dissemination, CCAL was designed to be implemented by practitioners who are not yet trained or experienced in CBT for anxious youth and require fewer therapist hours.

CCAL uses a diversity of characters (see Fig. 1), computer flash animation, audio, 2D animations and interactivities (see Fig. 2), videos, schematics, a built-in reward system, self-check system, written text, and a fun cartoon character, “Charlie,” to guide the user through the program. CCAL users are assigned a “coach” (therapist), and the child user completes one 30–40 min “level” (session) of the CCCD each week for 12 weeks. The first 6 weeks are completed independently by the child and the remaining six sessions [primarily exposure sessions] are completed with the assistance of a coach. The coach follows a “Coach’s Manual” for implementation, and accordingly the coach ensures monitoring of patient symptoms, facilitates completion of the exposure tasks, and provides reinforcement and support as needed.

The feasibility, acceptability, and effects of CCAL were recently evaluated in an RCT\textsuperscript{[82]} that compared CCAL to traditional individual CBT (ICBT) and a
computer-assisted education, support, and attention condition (CESA). CESA consisted of 12 sessions, each including 30 min of education and support and 20 min of computer activities (age-appropriate games). Participants were 49 children (33 males) between the ages of 7–12 (Mean = 10.1 ± 1.6) who met DSM-IV criteria for a principal anxiety disorder. Children were randomly assigned to CCAL, ICBT, or CESA, and randomly assigned to a therapist. Because many cases were seen in the community, therapist random assignment was restricted by geographic location: children were randomly assigned to one of two providers in their area. Therapists (N = 16) were volunteers from school districts, and from Ph.D. and Psy.D. training programs with no previous training or experience in CBT for child anxiety.

Data were gathered from participants, parents, therapists, and independent evaluators (IEs). Regarding acceptability, assessed from children and parents, the findings indicated that the computer-assisted approach was acceptable. In addition, the approach was found to be feasible for implementation by treatment providers with no specialty CBT training. With regard to symptom reduction, the results were encouraging: children reached significantly greater gains following participation in ICBT or CCAL treatments than in the CESA comparison condition. At posttreatment, based on IE diagnostic interviews, 75, 88, and 23% of principal anxiety diagnoses for participants in ICBT, CCBT, and CESA, respectively, were no longer principal diagnoses at posttreatment. The children in ICBT and CCAL also showed significantly greater (a) reduction in anxiety severity and (b) improved global functioning than those who received CESA. Although follow-up was only 3 months, gains were maintained. It is worth noting that the response rate and degree of improvement reported for the computer-assisted CBT was consistent with that found in evaluations of noncomputer-assisted delivery of CBT.[2,6,8]

Treatment sessions were audio taped, and later coded and rated. Based on these data, therapist adherence to the treatment protocol, interestingly, was significantly greater in the CCAL and CESA conditions than in ICBT. In other words, the two computer-assisted conditions had higher adherence than the noncomputer-assisted implementation. Apparently, having a proportion of the treatment content delivered via the computer program contributed to greater treatment adherence among novice therapists.

Ratings of treatment sessions included ratings of therapist “flexibility within fidelity.”[81,83] That is, within protocol fidelity, were therapists flexible in personalizing the program to the needs and characteristics of the participants? The data indicated that therapist flexibility was greater in the ICBT than in CCAL and CESA. One possibility is that a proportion of the content was delivered via computer in the CCAL and CESA conditions.

Given questions regarding computer-assisted treatments and the therapeutic alliance, alliance ratings were also gathered and analyzed. In contrast to potential concerns, therapeutic alliance did not suffer in conditions with delivery of partial treatment content via computer. No significant therapeutic alliance differences were found across conditions. In both computer-assisted treatments (CCAL, CESA), therapist involvement guided at least 50% of the treatment, and this seemed to have established/maintained an alliance. Although speculative at this time, it may have been the therapist contact and alliance associated with computer-assisted treatment that contributed to the high rate of compliance (100%) in CCAL compared to compliance rates reported for computer-based treatments with minimal therapist contact (e.g.[75,84]).
Parents and children, separately, reported on their satisfaction with the treatment that was provided. Children in the CCAL condition reported significantly higher rates of satisfaction than those in CESA, as did children in the ICBT condition. Parents, in contrast, did not report significant differences in ratings of satisfaction among treatments. It may be that the children—participants who had access to the treatment content method of delivery—had greater variability in their ratings, whereas parents’ generally high ratings of satisfaction may be indicative of a generally positive experience with the therapists in all three treatments.

Implementation studies need to address the social context of the dissemination effort, but that was not done in the initial evaluation of computer-assisted CBT. Nevertheless, given that recruiting volunteer therapists was accomplished with ease, they were successful in finding referrals for the study, and that there were no reported difficulties with program implementation, CCAL holds promise for the dissemination of evidence-based treatment of child anxiety. Further investigation of therapist features and child client outcomes, as well as social context variables, are needed given the importance of these factors in long-term implementation utilization.

**COMPUTER-BASED TRAINING IN COGNITIVE–BEHAVIORAL THERAPY**

The magnitude of beneficial gains found in community clinics is less than that found in research evaluations of specific treatments. To address this outcome gap, federal funding agencies are prioritizing research efforts to disseminate EBTs to real-world clinical settings. Arguably, one of the most important components of these efforts concerns the training of therapists who will deliver the interventions effectively. Computer-based training programs may facilitate dissemination. Advantages of the computer-based training, in general, include (a) self-paced learning, (b) increased accessibility, (c) cost-efficiency, (d) standardization of training, and (e) consistency in quality. In comparison to books and manuals, computer-based training may be particularly effective for training therapists. Computer-based training permits (a) audio and visual examples of and prompts for implementing specific therapeutic strategies, (b) increased maneuverability allowing the referencing of specific resources to match individual needs of clients (cited to be a major concern with manualized treatments), (c) increased standardization and transportability of treatment materials, and (d) the potential for built-in therapist competency checks and a patient reward system. Internet and computer-based training programs could increase the accessibility of CBT procedures to service providers, accelerate the learning of the new strategies and techniques, and facilitate instruction to therapists of different theoretical orientations. Although further study is needed, the therapist’s experience with the computer-based training programs combined with the use of computer-assisted treatments may enhance overall treatment effectiveness.

Computer-based training has been in place in other disciplines. For example, studies have evaluated computer-based training programs in medicine,
nursing, and applied sciences. The approach used in most of these studies has been randomized controlled trials comparing computer-based training to traditional class instruction with tests of knowledge and ratings of student satisfaction as outcome measures. The results of a meta-analysis of studies of computer-based training found that there was a medium effect size favoring computer-based training over traditional instruction, with students learning more in less time with the computer-based training.

There is a small but growing literature regarding computer-based training for therapists. Williams et al. developed and evaluated Calipso, a training package designed to teach CBT to mental health workers for the assessment and management of several disorders (anxiety, depression, schizophrenia). Williams et al. reported that computer-based training enhanced skill acquisition in comparison to lectures, though students may perceive lectures to be more effective than computer-based training. We agree with Berger, who suggested in his review of computer-based training for therapists that, along with additional data on the effectiveness of the training method, there is a need to examine the impact of computer-based training on the quality of therapy outcomes.

COMPUTER-BASED TRAINING FOR THERAPISTS WORKING WITH ANXIOUS YOUTH

Training CBT therapists to provide services for anxious youth can be a time-demanding process. For example, graduate student trainees complete diagnostic training to reliability criteria and perform diagnostic services for more than a year before being trained in CBT. Such training involves attending a workshop, completing readings, having a training case with supervision, and participating in group supervision within the climate of a clinic that provides CBT. Trainees have access to multiple experienced therapists as well as DVD’s of past cases, exposure tasks, and treatment materials. Once trained, they initially carry a light caseload. Although this training experience is not easily replicated in other settings, computers can add meaningfully to training that is otherwise limited to reading a treatment manual.

One effort, Computer-Based Training in Cognitive–Behavioral Therapy for anxious youth (CBT4CBT), is a DVD-based program to train therapists in CBT for anxious youth. The basic content is consistent with the therapist manual that was followed in the published reports of CBT with anxious youth, updated by input from experienced therapists (e.g. from Columbia, Duke, Hopkins, PCOM, UCLA, U Rhode Island, WPIC) who offered suggestions for “therapist notes” to go with each session. Given that manuals have been criticized for a limited amount of “personalization” of the treatment, the “tips” from experienced therapists offer specific resources to match individual needs of clients: within the program the tips can be accessed for older and younger patients, different diagnostic presentations, and a variety of fear situations. The program provides the rationale for the treatment components and step-by-step instructions to guide the therapist through each session. But, the DVD format permits other features as well. CBT4CBT allows the user to pause and reverse for self-paced learning. The user can print treatment materials to be used in session: for example, pictures for use in the affective education session, a map for locating physiological symptoms, and a form for developing the fear hierarchy. The computer program provides audio-visual prompts and stimuli for the child/patient, videos of exposure tasks done by other youth that can be viewed by the child, and a set of computer games that can be used within a reward system. The availability of these materials helps the standardization of treatment and eases the transportability of treatment.

What is the level of new knowledge that follows the reading of a treatment manual? One could argue that, in the absence of a structured program with monitoring, the answer is unknown, though likely to be less than preferred. Importantly, CBT4CBT, as is characteristic of computer-based training, includes built-in trainee competency checks. After each training module, the trainee must answer four of six questions correctly before the program will allow them to proceed. A user cannot jump ahead, or pick and choose modules, until after first completing the full sequence of modules and answering the required percentage of questions correctly along the way.

In a preliminary evaluation of CBT4CBT, novice therapists (N = 76) were randomly assigned to receive training via (a) CBT4CBT, (b) manual-based training (MBT) or to (c) a waitlist control (WLC). Following training, participants were compared on measures of (a) competency in CBT for childhood anxiety and (b) therapist satisfaction with the training. Trainee therapists were given 4 weeks to fulfill the training (or WL period), and completed assessments before and after training. WL participants were given the option to receive either training method.

Participants were volunteer clinicians (58 females [76%]; 66 Caucasian [87%], 5 African-American [6.6%], 3 Hispanic [2%], 1 Asian [1.3%], 1 Other [1.3%]) with no prior training in CBT for child anxiety, from across the country, recruited via professional association listserv emails and mailings. Thirteen states were represented (e.g. NY [16%], IL [12.7%], and PA [9.3%]). Twenty-two were M.S./M.Ed./MSW (29%), 18 were Ph.D./Psy.D./Ed.D. Trainees (24%), 12 Ph.D. (16%), 10 Ed.S. (13%), 9 Psy.D. (7%), 5 Ed.D. (6%), and 4 of “Other” degrees (5.1%). Of the 76 enrolled, 68 participants completed pre- and posttraining assessments. Thirty-seven reported (55%) having <3 years of clinical experience, 13 (17%) had >15 years, 9 (14.4%) had 4–7 years, 5 (8%) had 8–11 years, and 4 (7%) had 12–14 years of clinical experience.
Following training, trainee knowledge was significantly improved for both CBT4CBT and MBT participants, with CBT4CBT participants scoring higher at posttraining than MBT participants. Not surprisingly, trainees reported higher rates of satisfaction with CBT4CBT and MBT compared to WLC, with similar rates of satisfaction reported for CBT4CBT and MBT. With specific reference to the computer-based training, the majority of trainees (95%) agreed or strongly agreed that the program was easy to navigate, the computer at their place of work was able to run the program without difficulty (95%). These findings suggest feasibility and acceptability for the CBT4CBT training program. However, the initial work did not assess the effects of the training program on therapist behavior (competence, treatment integrity) and child outcomes, and such efforts will be needed in future work. In addition, cost analyses are needed, as are analyses of long-term utility and sustainability following training.

SUMMARY

Few individuals could have foreseen the truly widespread and deep impact that computers have had and will continue to have on the world’s access to and use of information. The provision of psychological treatment and the training of psychological therapists will not be outside this continuing impact. Rather, computers will increasingly be central to access information, individual education, and the provision of mental health services. Although not a focus of this study, diagnostics and assessments are also going to be impacted by computers. For example, it is not futuristic to consider a bioharness that, attached to an iPod-sized computer, can record and track physiological reactivity, and couple these data with behavioral actions and self-reported thoughts. Although the present discussion illustrated a computer-assisted program for anxious youth and a computer-based training for therapists, these are but two of the many areas requiring attention. We need to also be concerned about checking and maintaining the accuracy of information available on the web, disseminating empirically supported treatments, facilitating patient access to services, and evaluating the emerging methods of social communication and networking.

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REFERENCES


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