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Linköping University Post Print

N.B.: When citing this work, cite the original article.

Original Publication:

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Postprint available at: Linköping University Electronic Press http://urn.kb.se/resolve?urn=urn:nbn:se:liu:diva-125320
Internet-delivered cognitive behavioural therapy for children with anxiety disorders: A randomised controlled trial

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A R T I C L E   I N F O

Article history:
Received 11 March 2015
Accepted 11 November 2015
Available online 19 November 2015

Keywords:
Internet-delivered treatment
CBT
Children
Anxiety disorders

A B S T R A C T

Background: Cognitive behaviour therapy (CBT) has been shown to be an effective treatment for anxiety disorders in children, but few affected seek or receive treatment. Internet-delivered CBT (ICBT) could be a way to increase the availability of empirically supported treatments.

Aims: A randomised controlled trial was conducted to evaluate ICBT for children with anxiety disorders.

Method: Families (N = 93) with a child aged 8–12 years with a principal diagnosis of generalised anxiety disorder, panic disorder, separation anxiety, social phobia or specific phobia were recruited through media advertisement. Participants were randomised to 10 weeks of ICBT with therapist support, or to a waitlist control condition. The primary outcome measure was the Clinician Severity Rating (CSR) and secondary measures included child- and parent-reported anxiety. Assessments were made at pre-treatment, post-treatment and at three-month follow-up.

Results: At post-treatment, there were significant reductions on CSR in the treatment group, with a large between-group effect size (Cohen’s d = 1.66). Twenty per cent of children in the treatment group no longer met criteria for their principal diagnosis at post-treatment and at follow-up this number had increased to 50%. Parent-reported child anxiety was significantly lower in the treatment group than in the waitlist group at post-treatment, with a small between-group effect size (Cohen’s d = 0.45). There were no significant differences between the groups regarding child-ratings of anxiety at post-treatment. Improvements were maintained at three-month follow-up, although this should be interpreted cautiously due to missing data.

Conclusions: Within the limitations of this study, results suggest that ICBT with therapist support for children with anxiety disorders can reduce clinician- and parent-rated anxiety symptoms.

Trial registration: Clinicaltrials.gov: NCT01533402.

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1. Introduction

Epidemiological studies show that 5–10% of children and adolescents suffer from an anxiety disorder, which means that it is one of the most common mental disorders for this age group (Pine & Klein, 2008). Anxiety disorders are associated with suffering and impairments in everyday life of the affected individual as well as in the family and among relatives, and increase the risk for depression, substance abuse and impairment in social and emotional functioning during adolescence and early adulthood (Costello, Angold, & Keeler, 1999; Fichter, Quadflieg, Fischer, & Kohlboeck, 2009; Ginsburg, La Greca, & Silverman, 1998; Pine & Klein, 2008). Thus, childhood anxiety disorders should be identified and treated as early as possible.

There is strong support for cognitive behaviour therapy (CBT) as an effective treatment for anxiety disorders in children (James, James, Cowdrey, Soler, & Choke, 2013), and CBT is regarded to be the treatment of choice for this group (Dadds & Barrett, 2001).
However, the vast majority of children and adolescents with anxiety disorders do not receive evidence-based psychological treatment (Chavira, Stein, Bailey, & Stein, 2005; Costello, He, Sampson, Kessler, & Merikangas, 2014). It is therefore important to find means to increase the availability of CBT for this population.

Computers and the Internet enable us to offer less therapist-intensive but effective interventions over long distances, which can increase the availability of evidence-based treatments. Internet-delivered CBT (ICBT) has proven to be an effective method in the treatment of adults with depression and anxiety disorders (Andersson, 2014; Hedman, Ljotsson, & Lindefors, 2012). Studies have not only shown efficacy of ICBT compared to no-treatment control conditions, but have also demonstrated results comparable to face-to-face treatment (Andersson, Cuijpers, Carlbring, Riper, & Hedman, 2014).

To date, there are several trials evaluating computerised or internet delivered CBT-interventions for children and adolescents with anxious or depressive symptoms (Pennant et al., 2015; Reyes-Portillo et al., 2014; Richardson, Stallard, & Velleman, 2010). ICBT has some potential advantages compared to computerised CBT, the most important being the possibility of non-synchronous therapist support independent of geographical distances, as computerised approaches are often able to involve face-to-face therapist support (Khanna & Kendall, 2010; Stallard, Richardson, Velleman, & Attwood, 2011). Wuthrich et al. (2012) conducted a RCT comparing a CD-ROM delivered treatment with telephone-delivered therapist support to a waitlist control for adolescents with anxiety disorders, making it more comparable to ICBT.

A majority of the evaluated ICBT programs are prevention programs that target children and adolescents who are “at risk” or have elevated symptom levels (Reyes-Portillo et al., 2014). The BRAVE-ONLINE programs, however, have been evaluated for children and adolescents with diagnosed anxiety disorders and have shown promising results (Donovan & March, 2014; March, Spence, & Donovan, 2009; Spence et al., 2011). For example, March et al. (2009) compared an internet-delivered program for children (8–12 years) with anxiety disorders to a waitlist control and found a significantly larger decrease of clinician rated anxiety severity in the ICBT group. Results on child- and parent-rated anxiety symptoms were mixed at post-treatment. Reyes-Portillo et al. (2014) considered BRAVE ONLINE to be “probably efficacious” but pointed out that the results need to be replicated by other research groups to further increase the evidence-base level.

We have previously evaluated ICBT for children with specific phobia in an open trial with promising results (Vigerland et al., 2013). Although there are a few studies with promising results, more studies are needed to establish the efficacy of ICBT for children with anxiety disorders. The aim of the present study was to evaluate the efficacy of ICBT for children with anxiety disorders compared to a waitlist control.

2. Method

2.1. Participants

Participants were self-referral and recruited nationally in Sweden during 2012 through media advertisement. One parent in each family was required to be responsible for participation and to be the primary contact with the research team when needed. Inclusion criteria for the study were: a) children had to be 8–12 years of age, b) have a principal diagnosis of either generalised anxiety disorder, panic disorder, separation anxiety, social phobia or specific phobia (except for blood-injury, or injection phobia) according to DSM-IV criteria, c) any psychotropic medications had to be stable for 3 months prior the treatment, and d) the family had to have access to a computer and internet and speak Swedish.

Participants were excluded if the child a) had a diagnosed neurodevelopmental disorder (e.g. autism or attention-deficit/hyperactivity disorder (ADHD)) b), was severely depressed (defined as ≥20 on the Child Depression Inventory), or had another acute psychiatric disorder (e.g. psychosis, suicidal ideation), or c) was currently involved in psychological treatment. Participants were also excluded if d) a parent had an on-going substance abuse or c) there was an on-going child custody dispute or abuse in the family, or other family problems that made ICBT unsuitable. Finally, families were excluded if f) the parent responsible for the treatment and study participation suffered from serious psychiatric disorder.

The regional ethics committee in Stockholm approved the study. Written informed consent was obtained from the parents and the children gave their verbal consent to participate.

2.2. Assessments

2.2.1. Primary outcome measure

The primary outcome measure was the Clinician Severity Rating (CSR) derived from the Anxiety Disorder Interview Schedule Child and Parent version (ADIS C/P; Albano & Silverman, 1996). ADIS is a semi-structured interview conducted with the child and parent separately to assess diagnostic criteria according to DSM-IV (American Psychiatric Association, 2000). The severity of each diagnosis is assessed with the CSR on a 9-point scale (0–8). A score of 3 or lower is considered as subclinical symptoms whereas a score of 4 or higher means that the criteria for diagnosis, with regard to severity, are fulfilled. The interviewing clinicians initially rate CSR based on child and parent interviews separately and then agree on a set of final composite CSR-scores. The ADIS C/P has shown good to excellent kappa coefficients and excellent test-retest reliability (Silverman, Saavedra, & Pina, 2001), and the concurrent validity of the ADIS C/P has been established (Wood, Piccintini, Bergman, McCracken, & Barrios, 2002). The telephone administration of ADIS, conducted with one parent, has yielded good to excellent agreement with the face-to-face administered interview (Lyneham & Rapee, 2005).

2.2.2. Secondary outcome measures

2.2.2.1. Children’s Global Assessment Scale (CGAS). CGAS (Shaffer et al., 1983) is used by clinicians to assess global functioning in children (scale 0–100) and adolescents, with higher scores indicating higher functioning. It has shown moderate to excellent inter-rater reliability, good stability over time and good concurrent as well as discriminant validity (Bird, Canino, & Rubio-Stipec, 1987; Lundh, Kowalski, Sundberg, Gumpert, & Landén, 2010; Shaffer et al., 1983).

2.2.2.2. The Spence Children’s Anxiety Scale (SCAS-C/P). SCAS-C (Spence, 1998) measures six domains of anxiety: fear of physical injury, generalised anxiety, obsessive-compulsive disorder, panic/agoraphobia, separation anxiety and social anxiety. The questionnaire consists of 44 items that are rated on a 4-point scale. Higher scores indicate high levels of anxiety. Six positive filler items are included in the children’s scale. The internal consistency is high (Cronbach’s alpha = 0.93; Spence, Barrett, & Turner, 2003). The parent version (SCAS-P; Nauta et al., 2004) consists of 38 items, formulated to correspond to the child version without filler items, and has shown high internal consistency. Cronbach’s alpha in the current study was 0.87 for SCAS-C and 0.81 for the parent scale.

2.2.2.3. Fear Survey schedule for children –Revised (FSSC-R C/P). FSSC-R (Ollendick, 1983) consists of 80 items regarding fear of specific things or situations. Each item is rated on a 3-point scale
with higher scores indicating higher levels of fear. The scale has high internal consistency and moderate test-retest reliability over a 3-month period. When administered to parents, the wording of the questions was adjusted. Cronbach’s alpha in the current study was 0.93 for FSSCR-C and 0.90 for the parent scale.

2.2.2.4. Penn State worry questionnaire for children (PSWQ-C). The PSWQ-C/P (Chorpita, Tracey, Brown, Colllica, & Barlow, 1997) is an adaptation of the PSWQ for adults, consisting of 14 items regarding worry that are rated on a 4-point scale, which has shown good validity and reliability. When administered to parents, the wording of the questions was adjusted. Cronbach’s alpha in the current study was 0.99 for PSWQ-C and 0.98 for the parent scale.

2.2.2.5. Separation anxiety inventory for children (SAI-C). The SAI-C (In-Albon, Meyer, & Schneider, 2013) consists of 12 items that investigate to what extent the child avoids different relevant situations. It has shown good validity and reliability. When administered to parents, the wording of the questions was adjusted. Cronbach’s alpha in the current study was 0.99 for SAI-C and 0.93 for the parent scale.

2.2.2.6. Social phobia and anxiety inventory (SPAI-C/P). SPAI-C(P) (Beidel, Turner, & Morris, 1995) is a scale with 26 items that measures cognitive, somatic and behavioural aspects of social anxiety, and it has shown good validity and reliability. The parent version (Higa, Fernandez, Nakamura, Chorpita, & Daleiden, 2006) is identical to the child version, formulated to correspond to the child version of, and has shown good internal consistency. Cronbach’s alpha in the current study was 0.97 for SPAI-C and 0.96 for the parent scale.

2.2.2.7. Quality of Life Inventory: Child version (QOLI-C). The original QOLI for adults (Frisch, Cornell, Villanueva, & Retzlaff, 1992) covers importance and satisfaction in 16 different life domains, e.g. family, friends, occupation and society and has shown good reliability and validity when administered in Swedish samples (Lindner, Andersson, Ost, & Carlbring, 2013; Paunovic & Ost, 2004). The Swedish child version contains fewer life domains (n = 10) and child adjusted life domains. The 10 domains are rated on how important they are (0–2) and how satisfied the participant is with them (−3 to 3), generating a possible total score of −6 to 6. Cronbach’s alpha in the current study was 0.89.

2.2.2.8. Treatment satisfaction. Participant satisfaction was measured in children and parents at post-treatment using the Client Satisfaction Scale (CSS; Ollendick, 2010). It consists of 10 questions, answered on a 5 point rating scale, regarding satisfaction of treatment outcome; e.g. change in fear, avoidance and whether or not the participant would recommend the treatment to others. Higher scores indicate higher satisfaction. Cronbach’s alpha in the current study was 0.75 for the child scale and 0.85 for the parent scale.

2.2.3. Screening measures

2.2.3.1. Development and well-being assessment (DAWBA). DAWBA (Goodman, Ford, Richards, Gatward, & Meltzer, 2000) is a screening instrument containing an interview and questionnaires for children and adolescents in the ages 5–17 for common mental health disorders such as anxiety disorders, depression, ADHD, autism and bipolar disorder. It has shown excellent discriminant validity and acceptable concurrent validity (Goodman et al., 2000). In the present study the internet-based version of DAWBA directed to parents was used, containing both open ended and closed questions.

2.2.3.2. Child Depression Inventory (CDI). The CDI (Kovacs, 1985) assesses the severity of depressive symptoms in children and adolescents. It consists of 27 items graded from 0 (no symptoms) to 2 (severe symptoms). The questions cover depressed mood, self-blame, loss of appetite, insomnia, interpersonal relationships and school adjustment. Internal consistency in a psychiatric sample was good (Kovacs, 1985) and validity was found to be equivocal although CDI scores were related to diagnoses in a psychiatric sample. The CDI has shown good reliability in a Swedish sample (Ivarsson, Svander, & Littler, 2006) and Cronbach’s alpha in the current study was 0.79.

2.2.3.3. Primary care evaluation of mental disorders (Prime-MD). Parents’ symptoms of anxiety, depression and other psychiatric problems were assessed with Prime-MD (Spitzer et al., 1994) at pre-treatment. The self-report form of the Prime-MD used in this study screens for depression, anxiety, alcohol problems, somatiform disorders and eating disorders. It consists of 29 items answered with yes/no. Two items were removed from the self-report form (item 4 “Pains or problems during menstruation” and item 5 “Pain or problems during sexual intercourse”) as their content was judged as irrelevant for the purpose of the questionnaire in the current study. The self-report form has shown good overall sensitivity when compared to a structured assessment by a mental health professional (Spitzer et al., 1994).

2.3. Procedure

After responding to advertisement in newspapers, one parent first underwent a brief telephone interview to establish if basic inclusion criteria were fulfilled (criteria a, c–e) and no exclusion criteria were met (criteria a, c, e). Thereafter at least one parent completed an internet-based screening instrument, DAWBA (to screen for psychiatric comorbidity). The child and both parents (except the cases where there only was one parent) then completed CDI, SCAS, Prime-MD, and QOLI online. All questionnaires and self-report measures were in Swedish. For those not meeting exclusion criteria (b, d, f), the child and at least one parent underwent a face-to-face assessment using the Swedish translation of the Anxiety Disorders Interview Schedule (child and parent version; ADIS C/P) with a research assistant or clinical psychologist. Global functioning using CGAS was rated after the interview was completed. The research assistants were last-year students in the Swedish five-year clinical psychology program, with completed one-year training in CBT. The other assessors were experienced psychologists with CBT-training. If a principal diagnosis of generalised anxiety disorder, panic disorder, separation anxiety, social phobia or specific phobia was confirmed (criterion b) and the family had given informed consent, participants were included in the study and asked to complete an additional self-report measure corresponding to their principal diagnoses (FSSCR-C, PSWQ, SAI or SPAI; no additional measure was administered to those with a principal diagnosis of panic disorder). Included participants were instructed to keep any psychotropic medication constant throughout the treatment period. Participants were then randomised to the intervention or a waitlist control.

At post-treatment the relevant parts of the ADIS interview (diagnoses that had been scored ≥4 on CSR at pre-treatment) were administered over the telephone. We did not consider it feasible to interview the younger children over the telephone, and therefore all post-and follow-up interviews were conducted with only a parent. The interviewing research assistant or clinical psychologist, who was not blind to treatment condition or baseline diagnoses, then completed a CSR and CGAS for each participant. Parents and children also completed CSS C/P, SCAS C/P, QOLI-C and the self-
2.4. Treatment

The intervention was developed by the research group and has been evaluated for specific phobia with promising results (Vigerland et al., 2013). The program focused mainly on exposure but also included psychoeducation, coping strategies and problem solving skills (see Table 1 for an overview of the treatment content). For this study, the psychoeducation and examples in the program was adapted into five slightly different versions to fit each principal anxiety disorder (generalised anxiety disorder, panic disorder, separation anxiety, social phobia and specific phobia). Furthermore, rationale and instruction for worry-time were included in the GAD-version included and brief psychoeducation on social skills training was added to the social phobia version.

Participants had access to the treatment platform for ten weeks and treatment content was presented in 11 chapters or modules (see Table 1). The content was presented in a varied manner with reading material, films, animations, illustrations, and exercises (see Figs. 1 and 2 for an example). The treatment can be described as a combined parent-child intervention with seven of the modules aimed at the parent(s), containing information and instructions on how to help their child, and four modules addressed to the child. Parents were to work with their modules first so that they would be prepared to assist their child on the child directed modules. Child directed content was a shorter version of the parent directed information, adapted to an appropriate level and including less text and more animations. Throughout the treatment participants had online contact with an assigned psychologist/ CBT-therapist through written messages and written feedback on worksheets. Families received individually tailored replies from their therapist within 48 h after submitting exercises and/or questions. Three telephone calls were scheduled during treatment (at the beginning, middle and end of treatment), and additional telephone calls were conducted if it was deemed necessary in order to increase motivation or problem solve during the exposure focused weeks. The role of the psychologist was to answer questions and clarify treatment content, increase motivation and to help solve problems if necessary.

Parents and children worked through the modules at their own pace. They were encouraged to cover psychoeducation and rationale for exposure for both parents and children during the first two weeks, and then to engage in exposure for the main part of the treatment. No new modules were presented during the weeks focussing on exposure but families were instructed to log in to the platform and report their progress. Participants were then instructed to complete the last modules covering maintenance of treatment progress, continued improvement, and relapse prevention during the final treatment week.

2.4.1. Statistical analyses

The power calculation was originally conducted based on an estimated between group effect size of 0.5 (based on March et al. (2009), $d = 0.56$). Allowing for approximately 15% dropout, it was estimated that 120 participants were needed (Kazdin, 2010). However, only 93 participants were included in the trial, which led to 80% power to detect an effect size of 0.60, with an alpha-level of 0.05 (Kazdin, 2010).

All statistics were calculated using SPSS version 22. The difference in change between the treatment group and waitlist group from pre-to post-treatment (i.e., the group * time interaction effect) were analysed with hierarchical linear mixed-models (HLMM), that used all available data without excluding cases with missing data (Gueorguieva & Krystal, 2004). The inclusion of random intercept, random slopes and covariance structures for repeated measures were determined analytically using log likelihood ratio test. Maintenance of improvement from post-treatment to follow-up for the intervention group was tested with paired t-tests based on observed data (i.e., no imputations of missing values were made). Between-group effect sizes (Cohen’s $d$) at post-treatment were calculated based on the estimates obtained in the HLMM by dividing the difference in slope (i.e. coefficient of time * group interaction effect) by the observed pre-treatment standard deviation for the whole group (Feingold, 2009). Within-group effect sizes were based on observed values and calculated by dividing the difference between the first and second assessment with the pooled within-group standard deviation (calculated using Equations (4.15) and (4.27) in Borenstein, Hedges, Higgins, & Rothstein, 2009).

Self-report measures were collected from both parents when possible. When data from two parents were available the mean of the parent ratings was used. Only the ICBT condition was assessed at three-month follow-up, as participants in the waitlist condition had been offered ICBT after completing the post-treatment assessment.

Kappa coefficients (Cohen, 1960) and intraclass correlation coefficients (ICC; two-way random, average measure) was used to calculate inter-rater reliability for composite ratings of anxiety disorders at pre-treatment assessment, and for investigation of agreement between child, parent and composite ratings on anxiety disorders. The k values are evaluated as having poor reliability.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Overview of treatment content.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week</td>
<td>Module Content</td>
</tr>
<tr>
<td>1–2</td>
<td>1 Psychoeducation on emotions, fear and anxiety</td>
</tr>
<tr>
<td></td>
<td>2 Psychoeducation on anxiety disorders and CBT</td>
</tr>
<tr>
<td></td>
<td>3 Psychoeducation on goals and exposure hierarchies</td>
</tr>
<tr>
<td></td>
<td>4 An introduction to exposure, coping techniques (e.g. breathing and relaxation) and worry time/social skills training (only for GAD/Social phobia programs)</td>
</tr>
<tr>
<td></td>
<td>5 An introduction to using a reward system</td>
</tr>
<tr>
<td></td>
<td>6 Preparation for managing obstacles</td>
</tr>
<tr>
<td>2–3</td>
<td>7 Psychoeducation on fear and anxiety</td>
</tr>
<tr>
<td></td>
<td>8 Psychoeducation on exposure, setting goals and creating exposure hierarchies</td>
</tr>
<tr>
<td></td>
<td>9 Planning exposures and coping techniques (e.g. breathing and relaxation)</td>
</tr>
<tr>
<td>4–9</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>10 Problem solving, maintenance plan</td>
</tr>
<tr>
<td></td>
<td>11 Summary, follow-up on goals, maintenance plan</td>
</tr>
</tbody>
</table>
when $k < 0.40$; fair when $k$ is $0.40 – 0.59$; good when $k$ is $0.60 – 0.74$; and excellent when $k$ is $> 0.74$ (Mannuzza et al. 1989).

3. Results

3.1. Descriptives

Participants were 93 children, aged 8 – 12 years, and 182 parents. Ninety per cent of participants lived in Stockholm County. Demographic variables are presented in Table 2. In general, parents were well educated with the majority having completed a university degree. About a third of the children had a principal diagnosis of separation anxiety or specific phobia, respectively and approximately 20% had a principal GAD diagnosis. Seventy per cent of the children had more than one diagnosis, the average number of diagnoses being 2.3 ($SD = 1.3$, $Md = 2$). At pre-treatment, child ratings of depression and parent ratings of their own anxiety and depression symptoms were low (CDI; $M = 6.6$, $SD = 4.9$ and PRIME-MD; $M = 5.5$, $SD = 2.5$, respectively).

Inter-rater reliability at pre-treatment was good ($k = 0.65$, $p < 0.01$) for anxiety disorders (i.e., presence “yes” or “no”) and excellent for CSR scores of anxiety disorders (ICC = 0.77). Overall, CSR-scores on anxiety disorders from the child and parent interview showed moderate correlations ($r(91) = 0.43 – 0.49$, $p < 0.01$), while there was a stronger correlation between anxiety disorder CSR-scores from the parent interview and the composite scores ($r(91) = 0.77 – 0.83$, $p < 0.01$). Agreement on presence of anxiety disorders between parent interview and composite scores were good to very good ($k = 0.72 – 0.82$, $p < 0.01$). Agreement on presence of anxiety disorders was lower between child- and parent-based interviews ($k = 0.37 – 0.46$, $p < 0.01$), and child and composite interviews ($k = 0.56 – 0.68$, $p < 0.01$).

3.2. Missing data

CSR ratings were missing for three participants (3%) at post-treatment and seven participants (15%) at three-month follow-up. Self-assessments were completed by 73 children (78%) and 76 parents (82%) at post-treatment and 35 (76%) parents and children in the treatment group at three-month follow-up (see Fig. 3). No
significant differences were found on pre- or post-treatment scores on CSR or SCAS (child and parent reported), age, gender, CDI, principal diagnosis or number of diagnoses between children who did and children who did not complete self-report measures at post-treatment. Between families where at least one parent completed measures at post-treatment and families where none of the parents completed measures at post-treatment there were significant differences on the number of completed modules (with families where at least one parent completed measures at post-treatment completing more modules on average) ($t$ (44) = 2.04, $p = 0.048$). Furthermore, there was a significant difference between families who did and did not participate in the ADIS interview at three-month follow-up, with parents not participating having higher post scores on the CSR and the SCAS-P.

### 3.3. Treatment outcomes

Pre- and post-treatment assessments for both groups including interaction effects and between-group effects are presented in Table 3 together with the follow-up assessments for the treatment group. Within-group effects sizes are presented for both groups in Table 4.

The pre-to post-treatment change on the CSR, the primary outcome, was significantly larger in the treatment group than in the waitlist group at post-treatment, with a large between-group effect size of $d = 1.66$. CSR in the treatment group showed additional increase in ratings of functioning was seen between post-treatment and three-month follow-up in the treatment group ($t$ (38) = 5.14, $p < 0.001$) and the within-group effect size between pre-treatment and three-month follow-up was large ($d = 1.24$).

Parent-reported child anxiety, measured with SCAS-P, showed a significantly greater pre-to post-treatment change in the treatment group compared to the waitlist group, with a small between-group effect size ($d = 0.45$). At three-month follow-up, the within-group effect size, compared to pre-treatment had increased from $d = 0.66$ to $d = 0.91$ and there was a significant decrease in ratings ($t$ (27) = 2.18, $p < 0.038$). There were no significant differences on pre-to post-treatment changes in SCAS-C between treatment and waitlist group, although ratings dropped in both groups (within-group effect size $d = 0.51$ and $d = 0.56$ in the treatment and waitlist group, respectively). At three-month follow-up ratings had dropped, compared to post-treatment, in the treatment group. However, the change was not statistically significant ($t$ (24) = 1.93, $p < 0.065$). No significant group differences were found on pre-to post-treatment changes on QOLI and no significant difference was seen between post-treatment and follow-up ($t$ (24) = 0.56, $p < 0.582$) in the treatment group.

Diagnosis specific measures (child and parent versions of FSSC-R, PSWQ, SAI or SPAI) did not reveal any significant group differences on pre-to post-treatment changes. Due to a large amount of missing data on these measures, test of maintenance of improvement between post-treatment and FU was not conducted for the specific measures. Detailed results are presented in Table S1 (available online).

### 3.4. Treatment satisfaction

Of the 46 families randomised to ICBT, 32 children and 62 parents completed the CSS. Overall, children and parents were moderately satisfied with the treatment with a mean rating of 3.67 and 3.78 respectively. Parents rated item “I would recommend this treatment” highest, with 86% indicating “Agree” or “Very much agree” and item “My child is not more scared than other children his/her age” the lowest, with only 31% indicating “Agree” or “Very much agree”. Children rated item “This treatment was effective” the highest with 82% responding “Agree” or “Very much agree”, and
item “After the treatment my fears don’t affect my life at all” the lowest, with only 44% responding “Agree” or “Very much agree”. Results are presented in detail in Table S2 (available online).

3.5. Treatment compliance and further treatment seeking

Not all families completed all modules in the recommended pace. The mean number of completed modules was 9.7 (SD = 1.8; range 4–11) and 83% completed the first nine modules. Twenty-nine participants (63%) completed at least one of the two maintenance modules. Four families (9%) did not reach the modules that were intended for both children and parents (starting with module 7). Number of characters written in the platform ranged from 1440 to 24,408 (M = 9666, SD = 5663, Mdn = 9084), which corresponds to approximately 0.5–11 pages (M = 4.4, SD = 2.6, Mdn = 4.13). Linear regression showed that post-treatment CSR scores were not significantly predicted by number of completed modules (Beta = 0.169, t = 1.12, p = 0.268) or number of characters entered in the platform (Beta = 0.04, t = 0.262, p = 0.795). Although families were instructed to log in to the platform and report completed exposure tasks, no families followed this recommendation in a systematic way. No participants in the treatment group that participated in follow-up assessment had sought help for the child’s anxiety problems elsewhere.

4. Discussion

The aim of the present study was to evaluate the efficacy of ICBT for children with anxiety disorders. On the primary outcome measure, we found a large effect size in favour of the treatment group at post-treatment and effects were maintained at three-month follow-up. There was a small but significant interaction effect of time and treatment on parent-rated anxiety at post-treatment, but no significant effects were observed on child-ratings of anxiety.

CSR ratings showed a significantly larger decrease in the treatment group compared to the waitlist group at post-treatment, but the mean CSR rating did not fall below four, which is the cut off for clinical level of impairment and severity, until three-month follow-up. The large between-groups effect on CSR was comparable to March et al. (2009) although they reported a larger decrease of absolute CSR scores at post-treatment and follow-up. March et al. (2009) had a longer follow-up time and also included booster sessions after one and three months, which could account for the greater improvement (although only 41% of children completed the booster sessions).

The proportion of participants no longer meeting criteria for their principal diagnosis did not significantly differ between groups at post-treatment, the proportions being 20% and 7% in the treatment and waitlist group, respectively. This was somewhat lower than what was seen in March et al. (2009) where the corresponding proportions were 30% and 10%. March et al. also reported that 75% no longer met criteria for their primary diagnosis at 6-month follow-up. A review by James et al. (2013) found average remission rates for anxiety disorders after CBT to be 56%. Consistent with findings in Vigerland et al. (2013), the treatment in the present study seems to have a delay in treatment effect, reaching comparable levels of remission (50%) at three-month follow-up. As this effect was uncontrolled, it needs to be interpreted cautiously. Also, there was a larger proportion of missing data at three-month follow-up (15%), and analyses showed that participants with missing follow-up data had significantly higher CSR and SCAS-P scores at post treatment than those who completed the follow-up interview. This suggests that results on the CSR and on diagnostic status in the observed sample may be a slight overestimation.

On the CGAS-ratings of global functioning, the small effect size found in this study at post-treatment is considerably lower than in March et al. (2009) and the absolute difference between pre- and post-treatment scores was small.

No significant treatment effect on child ratings of anxiety, SCAS-C, was found in the present study. This is in line with March et al. (2009), who reported no significant treatment effects for levels of child rated anxiety symptoms. Furthermore, other studies of CBT for children with anxiety disorders have not found any significant between group treatment effect on the SCAS-C, and it may be that the properties of the measure are not optimal for treatment evaluation (Spence et al., 2011; Spence, Holmes, March, & Lipp, 2006; Wergeland et al., 2014). On SCAS-P, a small significant treatment
Table 3
Treatment outcomes - Observed means and standard deviations for treatment- and waitlist group at pre-treatment, post-treatment and follow-up (for the treatment group). Between-groups effect sizes based on the estimates obtained in the hierarchical linear mixed models are presented together with the coefficient (Δslope) for the interaction effect between time and study group.

<table>
<thead>
<tr>
<th>Pre</th>
<th>Post</th>
<th>FU</th>
<th>Between-group differences</th>
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<tr>
<td></td>
<td>Pre</td>
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<td>n</td>
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<tr>
<td>CSR</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>ICBT</td>
<td>46</td>
<td>5.7</td>
<td>0.7</td>
</tr>
<tr>
<td>WL</td>
<td>47</td>
<td>5.6</td>
<td>0.7</td>
</tr>
</tbody>
</table>
| CGAS
| ICBT | 46  | 55.2| 4.7 | 45 | 58.1| 4.4 | 39 | 60.1 | 5.1 | Δslope: 2.31 [1.43, 3.19] |
| WL  | 47  | 57.5| 5.4 | 45 | 57.9| 5.6 | 39 | 25.5 | 16.3 | Effect size: 0.45 [0.03, 0.87] |
| SCAS-C
| ICBT | 46  | 35.9| 13.7| 31 | 29.0| 13.6| 35 | 22.7 | 12.0| Δslope: -0.42 [-0.78, -0.07] |
| WL  | 47  | 34.4| 13.3| 42 | 27.1| 12.9| 35 | 22.7 | 10.2| Effect size: 0.45 [-0.02, 0.91] |
| QOLI
| ICBT | 46  | 4.1 | 1.1 | 31 | 3.7 | 1.4 | 35 | 3.9 | 1.1 | Δslope: -0.29 [-0.75, 0.17] |
| WL  | 47  | 4.0 | 1.1 | 42 | 4.0 | 1.1 | 35 | 22.7 | 12.0| Effect size: -0.26 [-0.72, 0.27] |

Note: CDI = Children’s Depression Inventory; CGAS = Children’s Global Assessment Scale; CSR = Clinician Severity Rating; GAD = Generalised anxiety disorder; ICBT = Internet-delivered cognitive behavioural therapy; SCAS C/P = Spence Children’s Anxiety Scale; QOLI = Quality of Life Inventory; WL = waitlist control.

Table 4
Within-group effect sizes.

<table>
<thead>
<tr>
<th>Pre</th>
<th>Pre-FU</th>
<th>Post-FU</th>
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<tr>
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</tr>
<tr>
<td>CSR</td>
<td></td>
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</tr>
<tr>
<td>ICBT</td>
<td>1.32 [0.88, 1.76]</td>
<td>1.84 [1.19, 2.49]</td>
</tr>
<tr>
<td>WL</td>
<td>0.19 [-0.03, 0.42]</td>
<td></td>
</tr>
</tbody>
</table>
| CGAS
| ICBT | 0.63 [0.43, 0.83] | 1.24 [0.84, 1.65] | 0.67 [0.42, 0.91] |
| WL  | 0.06 [0.00, 0.12] | | |
| SCAS-C
| ICBT | 0.51 [0.18, 0.84] | 0.63 [0.13, 1.14] | 0.18 [0.05, 0.40] |
| WL  | 0.56 [0.35, 0.77] | | |
| SCAS-P
| ICBT | 0.66 [0.27, 1.05] | 0.91 [0.39, 1.43] | 0.26 [0.02, 0.50] |
| WL  | 0.29 [0.11, 0.47] | | |
| QOLI
| ICBT | 0.30 [0.03, 0.57] | 0.21 [-0.15, 0.56] | -0.12 [-0.42, 0.17] |
| WL  | 0.02 [-0.28, 0.33] | | |

Note: CDI = Children’s Depression Inventory; CGAS = Children’s Global Assessment Scale; CSR = Clinician Severity Rating; ICBT = Internet-delivered cognitive behavioural therapy; SCAS C/P = Spence Children’s Anxiety Scale; QOLI = Quality of Life Inventory; WL = waitlist control.

Higher scores indicate higher functioning. Sign of effect sizes have been changed so that positive scores indicate improvement.

effect \((d = 0.44)\) was found at post-treatment, which is comparable to March et al. (2009) where the corresponding effect size was \(d = 0.31\).

Diagnosis specific measures showed no significant effects at post-treatment. This could partly be explained by a lack of power, as there were few patients (9–29) in each diagnostic group and quite a large number of missing data on these measures (11%–43%) at post-treatment. On the child versions of the FSSC-R there was an increase in the scores (indicating more fear) in the treatment group.

Questions on treatment satisfaction focused largely on perceived treatment outcome and a majority of participants in the treatment group rated the treatment as helpful. Indeed, 86 per cent of parents indicated they would recommend the treatment to a friend with similar problems. Overall, parents and children were neutral or positive, which is in accordance with the moderate treatment effects found at post-treatment.

While Spence et al. (2011) and Wuthrich et al. (2012) are similar to the present study, with regard to the inclusion of children with diagnosed anxiety disorders and the use of a CBT-program with non face-to-face therapist support, they were aimed at adolescents and are therefore not completely comparable. Even so, results are largely similar. Spence et al. (2011) and Wuthrich et al. (2012) both showed a significant between-group effect in favour of the treatment group, compared to waitlist, and a large within-group effect size on CSR ratings in the treatment group. Proportion of participants free of their principal anxiety disorder at post-treatment was 34% and 41% for Spence et al. and Wuthrich et al., respectively. Spence et al. did not find significantly larger improvements for ICBT on SCAS-C or SCAS-P compared to waitlist control, while Wuthrich et al. found significantly larger decreases in the treatment group from pre-to post-treatment on SCAS-C and SCAS-P, with large within-group effect sizes. Khanna and Kendall’s (2010) evaluation of computer-assisted CBT, including several therapist-led exposure sessions, also showed results in favour of computer-assisted CBT on CSR ratings compared to a computerised control intervention, but no significant differences on child ratings of anxiety.

In summary, treatment outcomes in the present study were not substantially different from those in other, similar studies. The somewhat weaker treatment outcomes seen in this study could be associated with poor treatment engagement. Although a majority of families completed all the psychoeducation there are no available data on number of exposures or amount of time that families worked with the treatment outside of the computer. The experience of the psychologists in the study was that families understood the concept of exposure, but did not practice exposure tasks to the extent that was necessary.

Although the sample was relatively high-functioning with baseline CSR- and CGAS-scores indicating less severity than seen in for instance March et al. (2009) and Kendall et al. (2010), parent ratings on SCAS-P showed levels of anxiety symptom consistent with a clinical sample (Nauta et al., 2004). Moreover, a majority of included children fulfilled criteria for at least two anxiety disorders, indicating a clinical, if not a highly severe, sample.

4.1. Limitations

The study has a number of limitations, which should be taken into consideration when interpreting the results. First of all, the
primary outcome measure was not rated by blind assessors, but by assessors that were aware of treatment allocation, and involved in the project. It cannot be ruled out that this can have affected the results. Also, CSR scores at post-treatment and follow-up were based solely on parent information whereas they were based on child- and parent report at pre-treatment. Limited resources necessitated telephone interviews at post-treatment and follow-up, and only parents were interviewed as some children were considered too young to participate in a telephone interview. At pre-treatment, diagnoses based only on parent interviews showed good to excellent agreement with composite diagnoses, while agreement between child based diagnoses and composite diagnoses was lower. This is in line with previous research that has shown that clinicians are more influenced by parent report when assigning diagnoses (Grills & Ollendick, 2003, Rapee, Barrett, Dadds, & Evans, 1994). Together with results from Lynenham and Rapee (2005), suggesting that relying only on information from the parent can be sufficient in determining presence or absence of diagnoses, it suggests that results in this study might not have been substantially different if child-report had been included in post-treatment assessment. However, the results should be interpreted cautiously. Secondly, we used a waitlist-control and not an active control group, and thus we did not control for effects of expectancy of improvement or attention from a caregiver. In addition, there was no control group at three-month follow-up and it cannot be ruled out that the further improvement that was found in the treatment group was due to passage of time or natural recovery rather than an effect of treatment.

Furthermore, there are no valid data on treatment compliance. The data that are available on number of completed stages might not provide a fair description of participants’ activity. Unfortunately, we have no data on amount of exposure, which we believe to be the component that contributes mostly to positive treatment outcome. Also, we believe that some participants would have benefited from a more regular contact with a supportive therapist. Future trials should include a more regular interaction with the treatment platform and contact with the therapist as a way of increasing amount of exposure exercises, improving measurement of treatment compliance and possibly improving effects.

Finally, this study does not include data on therapist time, number of additional phone calls, length of phone calls or other therapist variables. This should be addressed in future studies as it could be important with regard to generalisability and cost-effectiveness.

5. Conclusions

Although this study has some limitations, it supports previous findings that ICBT with therapist support can reduce clinician- and parent-rated symptoms of anxiety. However, there is still need to better understand secondary outcomes, including child-ratings of anxiety and quality of life, and to get more reliable estimates of follow-up outcomes. Future studies should include blind assessors, a larger sample and an active control group. If ICBT for children with anxiety disorders can prove its efficacy and effectiveness in future studies, it could be a way of making CBT more available for this population.

Acknowledgements

We are indebted to the families that took part in the study, and to Mari Jungenström, Jenny Meyer, Sara Rosén, Kristina Loftsson and Ola Enström who helped us with the assessments. Financial support was provided from the Stockholm County Council (HNS 9576) and the regional agreement on medical training and clinical research between Stockholm County Council and the Karolinska Institutet (ALF 20110278 and 20120070), the Claes Groschinsky foundation (SF11 147). These results were reported in part at the annual conferences of the Anxiety and Depression Association of America, European Society for Child and Adolescent Psychiatry and World Congress of Behavioural and Cognitive Therapies in 2013.

Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.brat.2015.11.006.

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