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RUNNING HEAD C-CBT for Depressed Adolescents

TITLE Computerised CBT for Depressed Adolescents: Randomised Controlled Trial

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## **Abstract**

### *Background*

Depression in adolescents is a common and impairing problem. Effective psychological therapies for depression are not accessed by most adolescents. Computerised therapy offers huge potential for improving access to treatment.

### *Aims*

To test the efficacy of Stressbusters, a Computerised-CBT (C-CBT) programme for depression in young people.

### *Method*

Multi-site, schools-based, RCT of C-CBT compared to Waiting List, for young people (N=112; aged 12–16) with significant symptoms of depression, using multiple-informants (adolescents, parents, teachers), with follow-up at 3 and 6 months.

### *Results*

Relative to being on a Waiting List, C-CBT was associated with statistically significant and clinically meaningful improvements in symptoms of depression and anxiety according to adolescent self-report; and with a trend towards improvements in depression and anxiety according to parent-report. Improvements were maintained at follow-up. Treatment gains were similar for boys and girls across the participating age range. Treatment effect was partially mediated by changes in ruminative thinking. Teachers rated adolescents as having few emotional or behavioural problems, both before and after intervention. C-CBT had no detectable effect on academic attainment. In the month after intervention, young people who received C-CBT had significantly fewer absences from school than those on the Waiting List.

### *Conclusions*

C-CBT shows considerable promise for the treatment of mild-moderate depression in adolescents.

**Key words**

Computerised-CBT

Depression

Adolescents

RCT

## **Introduction**

Depression in children and adolescents is a common and impairing problem. Point prevalence in community samples of adolescents is estimated at 3-8%; and around 20% of young people will have experienced a depressive disorder by the end of adolescence (Merikangas et al 2010). Young people with depression show increased rates of social dysfunction, academic failure, substance abuse, obesity, and suicide, and are more likely to have future adjustment problems in relation to marriage and employment. There is specific continuity into adulthood, with around a third of young people with untreated depression likely to experience a relapsing and remitting course beyond adolescence. Effective treatments exist, and Cognitive Behavioural Therapy (CBT) is recommended as a first line treatment for adolescents with mild-moderate depression (NICE, 2015).

However, most young people with depression are not offered any treatment at all; and few are offered an evidence-based treatment such as CBT (Andrews et al 2002; Coyle et al 2003). This longstanding under-provision of evidence-based treatment is probably due to a combination of factors including: under detection of depression; lack of clinicians with requisite training; and inaccessible or stigmatising service provision (Stallard et al 2007).

One response to this problem has been to develop software which can deliver evidence based interventions via computer. The structured format of CBT lends itself to delivery via computer. Computerised CBT (C-CBT) offers several potential advantages including consistent delivery of therapy components; increased accessibility; non-stigmatizing provision at home or school; cost-efficiencies; and automatic data capture. C-CBT is especially suited to adolescents because they are in general familiar and comfortable with online environments and technology.

## C-CBT for Depressed Adolescents

Five C-CBT programmes for the treatment of depression in young people have been evaluated so far: an online programme, Mood Gym (Calear 2009); Stressbusters (Abeles et al 2009); Think-Feel-Do (Stallard et al 2011); SPARX (Fleming, 2012; Merry et al 2012); and The Journey (Stasiak et al 2014).

A recent systematic review and meta-analysis (Pennant et al, 2015) concluded that C-CBT has potential for treating depression in young people. For example, in a large (N=187) randomised controlled trial in New Zealand, SPARX was found to be at least as effective as face to face counselling for 12-19 year olds seeking help for mild-moderate depression (Merry et al 2012). Two C-CBT programmes have been developed in the UK. Both have shown promising results in a case series design (Stressbusters, Abeles et al 2009), and in a quasi-experimental design (Think-Feel-Do; Stallard et al 2011). No RCTs have yet been carried out in the UK.

Outcomes of C-CBT for depression are therefore promising, but the field is in its infancy, and further development and evaluation is needed (Clarke et al, 2014; National Collaborating Centre, 2014). To date, evaluations of C-CBT in the UK have been based in Child and Adolescent Mental Health Services (CAMHS). However, C-CBT may be particularly suited for delivery in schools, as part of the stepped care approach to treating depression that is recommended by NICE (2015). This is because most young people with mild-moderate depression are not in contact with CAMHS, but they do attend school. It is in principle possible for C-CBT to be provided in schools by non-specialists, in a way which is convenient and easily accessible for young people.

We report here on the first UK-based RCT of C-CBT for depression in young people. Our primary question is whether a C-CBT programme (Stressbusters) shows efficacy for the treatment of mild-moderate depression symptoms, relative to a Waiting List (WL) condition, when delivered in a schools-based setting. In addition, we examined secondary outcomes (child-reported anxiety; parent-reported depression and anxiety; teacher-reported emotional-behavioural problems; and functioning at school). We also tested whether age or gender moderated the effect of treatment,

and whether treatment effects were mediated by changes in ruminative thinking style, as predicted by cognitive models of depression.

## **Method**

### *Design*

A two-stage project was implemented. In Stage 1, young people (12-16 years old) were screened for symptoms of depression. In Stage 2, young people who were experiencing significant symptoms of depression were included in a randomised controlled trial of Stressbusters vs Waiting List (Trial registration number: ISRCTN 83507297). The treatment or waiting period lasted eight weeks. Follow-up assessments were carried out at 3 and 6 months.

### *Setting, participants and ethical issues*

The project was approved by King's College London Research Ethics Committee (ref PNM/09/10-123), and implemented in three large non-selective state-sector secondary schools in South London. Young people were invited to take part in the Stage 1 screening if they were: on-roll at school between 2011-2013; aged 12 to 16 years old (Years 7 to 11); and were able to read and comprehend the screening questionnaire (the Mood and Feelings Questionnaire-Child Report, MFQ-C; Angold et al 2002). Young people were invited to take part in the Stage 2 RCT if they scored  $\geq 20$  on the MFQ-C. Young people were excluded from Stage 2 if severe symptoms and/or significant risk requiring immediate intervention were present. For the Stage 1 screening, carers were informed about the project and given an opportunity to opt out; for the Stage 2 RCT, carers provided opt-in consent. Young people provided opt-in consent for both stages.

### *Procedure*

After obtaining consent, screening was carried out in classrooms. MFQ-C screening questionnaires were administered, collected, and scored on the same day in order to manage potential risk issues. Young people who scored above cut-off on the screen were invited for an individual interview with a clinical psychologist. The purpose of the meeting was to check on the validity of the screen, to assess face-to-face potential risk, and to provide information about the project. Young people were shown a short clip of the Stressbusters programme, so that they could make a better informed choice about whether to take part. After obtaining informed consent from young people and carers to take part in Stage 2, additional questionnaire measures (see below) were completed by young people, parents, and their teachers. Young people were individually randomised to receive Stressbusters for 8 weeks, or to be on a Waiting List (WL) for 8 weeks. The questionnaire battery was re-administered to young people, parents, and teachers post-treatment/WL, and at 3- and 6- months follow-up. All young people who were allocated initially to WL were offered Stressbusters at the end of the waiting period.

### *Treatment conditions*

Stressbusters is a C-CBT programme designed specifically for adolescents with mild to moderate depression. Details of its development (Robinson et al 2011) and initial evaluation in a case-series (Abeles 2009) are available. The programme is based on an effective face-to-face CBT protocol for young people with depression (Wood et al 1996; Verduyn, Rogers, and Wood 2009). Treatment components include: psycho education about depression and its treatment; behavioural activation; identifying and changing negative automatic thoughts; improving problem solving; improving social skills; relapse prevention. Treatment components are individually delivered via computer in an age-appropriate and appealing way, through the use of secure, interactive multimedia (animation and videos). In each session, the user: securely logs on; reports on their homework and current mood; is introduced to the topic of the session; chooses a video to watch of a depressed teenager (young

## C-CBT for Depressed Adolescents

actor) implementing the treatment technique; applies the technique to themselves through the use of interactivity; designs their own individualised homework based on that technique; and finally logs out. Customised hand-outs (eg mood monitoring sheets, activity diaries) and fact sheets (eg bullying, drug use) are printed out at the end of the session. Young people took part in their Stressbusters sessions either during the lunch hour at school, after school, or during lesson time. Stressbusters sessions were carried out individually using a laptop and headphones, in an assigned room at school, with a maximum of five students completing a session at one time. There was no proscription on seeking any additional non-study intervention while completing Stressbusters.

Waiting List Young people allocated to this condition were free to seek any non-study intervention during the eight-week period (for example, school counsellor, GP, referral to child and adolescent mental health services).

### *Randomisation*

Young people were individually randomised, using a computer programme (MINIM, Evans et al 1990). Randomisation was carried out using a minimisation procedure (Pocock 1983) with stratification according to school (three schools), symptom severity (MFQ-C <29 vs MFQ-C score >=29), age (younger than 14 years old vs 14 years or older), and gender. The minimisation procedure is especially suited to relatively small sample sizes, and resulted in balanced cells.

### *Measures*

Young people

The primary outcome was severity of self-reported depression symptoms, measured by the Mood and Feelings Questionnaire – Child report (MFQ-C, Angold et al 2002). This 33-item questionnaire is suitable for use with 8-17 year olds and covers a broad range of depression symptoms, rated on a 3-

## C-CBT for Depressed Adolescents

point scale. It has been used extensively in community and clinical studies. Reliability and validity indicators are excellent. A score of  $\geq 29$  indicates a likely current major depressive episode; a score of  $\geq 20$  indicates the presence of "any mood disorder" (eg dysthymia, depressive disorder NOS, major depression in partial remission) (Daviss et al 2006). Internal reliability for the MFQ-C in the current study was Cronbach's alpha = .90. Screen for Child Anxiety Related Disorders (SCARED, Birmaher, 1997). This 25-item questionnaire measures symptoms of a broad range of anxiety problems among 9-18 year olds. Reliability and validity indicators are good. Internal reliability in the current study was Cronbach's alpha = .92. Child Response Styles Questionnaire (CRSQ, Abela et al., 2000). This 25-item questionnaire of ruminative thinking style has been shown to predict the severity and persistence of depression in adolescents. Internal reliability in the current study was Cronbach's alpha = .86

## Parents and carers

Parent-completed parallel versions of the Mood and Feelings Questionnaire (MFQ-P, Angold et al 2002), and Screen for Child Anxiety Related Disorders (SCARED-P, Birmaher et al 1997). Internal reliability of the MFQ-P in the current study was Cronbach's alpha = .93; and of the SCARED-P was Cronbach's alpha =.93

## Teachers

Strengths and Difficulties Questionnaire (SDQ, Goodman, 2001). The SDQ measures emotional and behavioural problems in young people, and their impact and burden. It is very widely used in CAMHS. Psychometric properties are excellent. Internal reliability in the current study was low, Cronbach's alpha = .59

## School functioning data

Attendance. The number of days that school was attended in the month preceding randomisation, and the month after the post-treatment/WL assessment was gathered from school attendance records. Attainment. The number of pupils attaining grades A-C in standardised school-wide assessments in three core subjects – English, Maths, and Science – before and after intervention/WL was gathered from school academic records. Attainment at this level is commonly used in national benchmarking across secondary schools in the UK.

### *Data analytic plan*

Linear mixed models were fitted using maximum likelihood, which allows for models to be estimated in the presence of some missing data on the outcome. Maximum likelihood assumes data is missing at random. A linear mixed model was fitted in both the C-CBT and WL groups, including a random effect for school. A model with main effects for both Time and Group, in addition to a Time x Group interaction, was fitted to each outcome measure. To test whether the treatment effects of C-CBT persist at follow-up, a linear mixed model was fitted in the C-CBT group only, with time as a categorical predictor, and with baseline scores as a control variable. Controlled and uncontrolled effect sizes were calculated for the main outcome measures. Regression models were used to test moderating effects of gender, age, and school on changes in depression symptoms. Mediation analysis used bootstrapping procedures to test the magnitude of indirect effects. Sample size was determined by power calculations based on previous estimates of effect sizes for Stressbusters on MFQ-C scores (Abeles et al 2009). A sample size of 51 per group gives 85% power ( $p < .05$ ) to detect an effect size of 0.6.

## **Results**

### 1. Screening, participant flow, and treatment adherence

Figure 1 illustrates participant flow. Of N=2036 students on roll in the 3 schools, 76% were screened. Of those screened, 21% scored above cut-off of 20 on the MFQ-C. Of those scoring above cut-off, 8% were receiving face-to-face treatment for severe depression in Child and Adolescent Mental Health Services, and 5% presented with risk that required face-to-face management: these young people met our exclusion criteria and so took no further part. Of those remaining young people (who reported elevated symptoms but who did not require face-to-face treatment), consent to take part in the RCT was received from 43%. N=112 young people were randomised to Stressbusters (N=55) or Waiting List (N=57). N=110 young people were assessed immediately post treatment/WL. Most young people who were allocated to Stressbusters were followed up at 3 months (N=51) and 6 months (N=49). Of young people allocated to Stressbusters, 86% completed all 8 sessions, and 93% completed at least 4 of 8 sessions. One young person allocated to Stressbusters also received a concurrent non-study intervention with a school counsellor. Of young people allocated to the Waiting List, N=1 (2%) took up a non-study intervention with a school counsellor. No young people allocated to either Stressbusters or Waiting List received a non-school mental health intervention prior to their post-treatment assessment.

Figure 1 about here

## 2. Randomised controlled trial

### *Pre-treatment/wait list comparisons*

The C-CBT and the WL groups did not differ significantly on any of the variables assessed at trial entry (see Table 1).

*Effect of C-CBT versus WL*

Adolescent reported symptoms

Model fitting using maximum likelihood estimation (MLE) showed that the C-CBT group scored significantly lower than WL on the MFQ-C (self-reported depression) at post-treatment (see Table 1 and Figure 2). MFQ-C scores in the C-CBT group showed significant pre-post treatment improvement ( $B= 12.21$ ,  $p<0.001$ ), reflecting a clinically important mean reduction on the MFQ-C of 11.8 (SD 14.4) points. In the WL group, there was no significant pre-post change on MFQ scores ( $B=0.76$ ,  $p=0.60$ ). The C-CBT group also scored significantly lower than WL on the SCARED (self-reported anxiety) at post-treatment (see Table 1). SCARED scores in the C-CBT group showed significant pre-post treatment improvement ( $B=8.19$ ,  $p<0.001$ ). In the WL group, there was no significant pre-post change on SCARED scores ( $B=-0.059$ ,  $p=0.98$ ).

Table 1 and Figure 2 about here

Parent reported symptoms

Model fitting using MLE revealed a non-significant trend for an estimated difference post-treatment/WL between the C-CBT group and the WL group, in favour of C-CBT, for both MFQ-P scores ( $p=.09$ ) and SCARED-P scores ( $p=.09$ ) (see Table 1). MFQ-P scores in the C-CBT group showed significant pre-post treatment improvement ( $B=6.11$ ,  $p=0.02$ ). In the WL group, there was no significant pre-post change on MFQ-P scores ( $B=0.83$ ,  $p=0.68$ ). SCARED-P scores in the C-CBT group showed significant pre-post treatment improvement ( $B=7.05$ ,  $p<0.001$ ). In the WL group, there was no significant pre-post change on SCARED-P scores ( $B=-0.70$ ,  $p=0.85$ ).

## C-CBT for Depressed Adolescents

### Teacher reported problems

On teacher-rated SDQ scores, there were no significant group effects post-treatment, and no significant within-group changes over time (see Table 1).

### School functioning

To test for possible group differences in school attendance, the number of days attended in the 4 weeks prior to randomisation, and the number of days attended in the 4 weeks after the post treatment/WL assessment, was compared between the groups. Modelled as a Poisson distribution, there was a significant Group x Time interaction in favour of C-CBT (see Table 1), showing that pupils in the C-CBT group spent significantly more time at school than those in WL. To test for possible group differences in school attainment, the number of pupils achieving top grades (A-C) in English, Maths, and Science in internal standardised school assessments was compared between groups pre and post intervention. There were no significant differences between the C-CBT and WL in any of these three core subjects either pre (all  $\chi^2(1) < 2.92$ , all  $p > .05$ ) or post (all  $\chi^2(1) < 1.65$ , all  $p > .10$ ) intervention.

### Treatment effect sizes

Controlled (between-group) and uncontrolled (within-group) effect sizes were calculated for the main outcome measures of adolescent-rated depression (MFQ-C) and anxiety (SCARED) symptoms. A small effect is in the range 0.2–0.5; a medium effect is 0.5–0.8; and a large effect is  $>0.8$  (Cohen, 1988). On complete data, for MFQ-C, the uncontrolled effect size for C-CBT was 1.02, the uncontrolled effect size for WL was 0.04, and the controlled effect size for C-CBT (vs WL) was 0.82. For SCARED-C, the uncontrolled effect size for C-CBT was 0.50, the uncontrolled effect size for WL was -0.02, and the controlled effect size for C-CBT (vs WL) was 0.41. Effect sizes were also derived

## C-CBT for Depressed Adolescents

from the mixed models reported above, to take account of missing data. The controlled effect size for C-CBT (vs WL) on MFQ-C was Beta = 0.87 (standardised coefficient). The controlled effect size for C-CBT (vs WL) on SCARED-C was Beta = 0.46.

## Follow-up

On adolescent-reported measures of depression and anxiety, all treatment gains in the C-CBT group were well maintained at 3-and 6-month follow up. For MFQ-C, there is continued significant improvement in the outcome from post-treatment to 3 months ( $p=.04$ ). The difference in MFQ-C outcomes at 3 and 6 months is not statistically significant different ( $p=.62$ ), implying that treatment gains on depression are maintained to 6 months. For the SCARED-C, there is a significant improvement from post-treatment to 3 months ( $p<.001$ ), and no significant change from 3 to 6 months ( $p=.37$ ) implying that treatment gains on anxiety are maintained to 6 months. For parent-reported MFQ, parent-reported SCARED, and teacher-rated SDQ, there is no statistically significant change from post-treatment to 3 months or 3 months to 6 months.

## Moderators of treatment response

To test the moderating effect of gender, age and school on changes in depression symptoms, three separate linear regression models were run. The dependent variable was change in MFQ-C scores (from pre-treatment to post-treatment/WL). The independent variables were group (C-CBT or WL); the potential moderator (gender (coded 0,1), or age (school year group coded 0,1,2,3,4), or school attended (coded 0,1,2); and an interaction term (group x moderator). None of the interaction terms was significant (all  $p>.08$ ).

### Mediator of treatment effect

To test the potential mediating role of ruminative thinking style on changes on depressive symptoms, a series of regression models was run (Baron and Kenny, 1986), followed by a formal test of the significance of the magnitude of the indirect effect (Preacher and Hayes 2004). First, there was a significant total effect of C-CBT (vs WL) on changes in depression symptoms ( $B=11.44$ ,  $SE=2.40$ ,  $p<.0001$ ). Second, there was significant effect of C-CBT on changes in rumination ( $B=4.87$ ,  $SE=1.92$ ,  $p<.05$ ). Third, there was a significant effect of changes in rumination on changes in depression ( $B=.76$ ,  $SE=.09$ ,  $p<.0001$ ). After controlling for the effect of changes in rumination, the direct effect of C-CBT on changes in depression symptoms was reduced (from  $B=11.4$  to  $B=7.75$ ,  $SE=1.97$ ,  $p<.0005$ ). This attenuation in the magnitude of the direct effect of C-CBT on changes in depression symptoms when changes in ruminative thinking are taken into account indicates a significant mediating role for ruminative thinking. A bootstrapping procedure was used (Hayes 2013) to test formally the hypothesis that the effect of C-CBT on depression symptoms was mediated by changes in ruminative thinking style. The magnitude of the indirect effect, estimated using 1000 bootstrap resamples, was  $B=3.69$  ( $SE=1.57$ ), with a bias-corrected 95% confidence interval of 1.04 to 7.31 (significance is indicated by the 95% confidence interval not crossing zero).

### Discussion

In this schools-based randomised controlled trial, a computerised CBT programme, Stressbusters, was efficacious in treating symptoms of depression and anxiety among young people with mild to moderate depression. Effect sizes for the primary outcome measure of self-rated symptoms of depression were large. The magnitude of the change in MFQ-C scores was clinically meaningful and important. Effect sizes for the secondary outcome measure of self-rated symptoms of anxiety were small to medium. These beneficial effects of C-CBT were maintained at 3 and 6 month follow-up.

## C-CBT for Depressed Adolescents

The programme was equally effective for girls and boys, for young people across the participating age range (12 to 16 years old), and for young people in each of the three participating schools. As predicted, the effect of the programme was partially mediated by a reduction in ruminative thinking. Parents of young people who received C-CBT also reported a trend towards improvements in depression and anxiety symptoms. Teachers did not report any improvements in young people who received C-CBT. However, these results should be interpreted with caution because few teachers provided data, and the internal reliability coefficient for the teacher-completed measure was low. There was no difference between groups on academic attainment in English, Maths, or Science. Attendance data from school records showed that pupils who participated in C-CBT had significantly fewer absences from school than those in WL, reflecting a drop in attendance among those who were allocated to WL but not among those who received C-CBT.

As far as we are aware, this is the first randomised controlled trial in the UK of C-CBT for young people with symptoms of mild to moderate depression. The positive outcome for Stressbusters is very encouraging for C-CBT, and is in line with previous evaluations of other C-CBT programmes. Comparison of effect sizes between studies is hazardous because of differences in measurement instruments, participant characteristics, and comparison conditions. However, the current effect size for Stressbusters is broadly comparable to that found in the recent RCT of another C-CBT programme for adolescent depression, SPARX (Merry et al 2012), and is in line with effect sizes reported for C-CBT programmes for adults with depression and anxiety, in a recent meta-analysis (Andrews, et al 2010). Further development of the Stressbusters software is in progress, and further evaluation of the updated programme, compared to an active comparison condition, is warranted.

Take-up of treatment was lower than expected. Roughly one in five young people scored above cut-off on the MFQ-C, as anticipated. Just over half (51%) of screen-positive young people consented to take part in the RCT, but parents and young people *both* provided consent for only 43% of those

eligible. We do not know what the take-up rate would be for Stressbusters if it were offered as part of regular provision rather than as part of a clinical trial. Future work would benefit from focusing on engagement with school staff and parents to increase take-up of schools-based interventions. Future research that examines long term (6 month) naturalistic outcomes for young people who screen positive but who choose not to take up any intervention would be informative.

Adherence to Stressbusters for those who chose to take part was excellent, with 86% of young people completing all 8 sessions, and 93% completing at least half of the sessions offered. These rates compare favourably with those of 37% from the Youth Mood project (Calear et al 2009) and are comparable to adherence rates of 86% in the SPARX project (Merry et al 2012). The implication is that young people will engage with a variety of formats of C-CBT interventions, including “game-fied” interventions such as SPARX, and more traditional translations of CBT sessions such as Stressbusters.

In line with best practice and in an attempt to gain a rounded view of adolescents’ difficulties, we sought information from parents and teachers, as well as adolescents themselves. Firstly, it is striking that few parents, and even fewer teachers, provided data. Data from this relatively small, self-selecting, sub-sample of parents and teachers should therefore be treated cautiously. Secondly, parent ratings of depression and anxiety are significantly lower than adolescent ratings, and the mean scores of parent-rated MFQ-P and SCARED-P questionnaires were below the commonly accepted clinical cut-offs on these measures. This suggests that many parents in the current project were unaware of the extent of emotional difficulties in their offspring. Thirdly, notwithstanding the low alpha coefficients for the SDQ, teacher ratings of broad emotional and behavioural difficulties were also very low, and were well below scores that would indicate significant emotional problems. Again, this suggests that teachers are often unaware of pupils’ internalising difficulties. Most (92%) of the young people in this study who screened positive had never had any contact with Child and

Adolescent Mental Health Services (CAMHS); most were not viewed by their parents or teachers as having emotional difficulties; and yet all of them reported significant depressive symptoms in the clinical range, when asked directly via screening questionnaire. Under-detection of depression in the adolescent community is well known. Current findings are encouraging in terms of the feasibility of screening for depression in young people in schools, but also speak to the need to provide further information to parents and teachers about depression in young people, so that problems can be better recognised.

This study has a number of limitations. We did not conduct diagnostic clinical interviews with young people, and so we are unable to comment on either the efficiency of the MFQ-C as a screener for depressive disorder, or on the effect of C-CBT on diagnoses. The small number of participating parents and teachers limits the extent to which we can generalise from these data. The study also has a number of strengths. These include broad inclusion criteria, large sample size, use of standardised measures and multiple informants, and good retention to follow up at 3 and 6 months.

In summary, Stressbusters showed initial efficacy for the treatment of symptoms of mild-moderate depression and anxiety in young people. This is highly encouraging for the field of C-CBT in general, and for this software in particular, and further work is needed. Future work might focus on the development of online programmes coupled with the inclusion of common technologies such as smartphones and tablets in order to enhance engagement and clinical effect. This project demonstrates that C-CBT can be safely delivered in schools while maintaining clinical effect: this has improved accessibility of evidence-based interventions for a subset of the population, but further work is needed in order to engage fully with educators and parents so that uptake is increased.

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## References

Abela, J. R. Z., Rochon, A., & Vanderbilt, E. (2000). The Children's Response Style Questionnaire. (Unpublished questionnaire). Montreal, Canada: McGill University.

Abeles, P., Verduyn, C., Robinson, A., Smith, P., Proudfoot, J., & Yule, W. (2009) Computerised CBT for adolescent depression (Stressbusters) initial evaluation in an extended case series. *Behavioural and Cognitive Psychotherapy*, 37, 151 -165

Andrews G, Cuijpers P, Craske MG, McEvoy P, Titov N. (2010) Computer therapy for the anxiety and depressive disorders is effective, acceptable and practical health care: a meta-analysis. *PLoS One*; 5, 1-6.

Andrews, G., Saxbo, M. & Burns, J. (2002). Preventing major depression in young people. *British Journal of Psychiatry*, 181, 460-62

Angold, A., Erkanli, A., Silberg, J., Eaves, L. and Costello, E. J. (2002). Depression scale scores in 8–17-year-olds: effects of age and gender. *Journal of Child Psychology and Psychiatry*, 43, 1052–1063.

Baron RM, Kenny DA (1986), The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *Journal of Personality & Social Psychology* 5, 1173-1182

Birmaher, B., Khetarpal, S., Brent, D., et al (1997). The screen for child anxiety and related emotional disorders: scale construction and psychometric characteristics. *Journal of the American Academy of Child and Adolescent Psychiatry*, 36, 4, 545-553

Calear AL, Christensen H, Mackinnon A, Griffiths KM, O'Kearney R. (2009) The Youth Mood project: a cluster randomized controlled trial of an online cognitive behavioral program with adolescents. *Journal of Consulting and Clinical Psychology*, 77, 1021-32.

Clarke, A.M., Kuosmanen, T., & Barry, M. (2014). Systematic review of online youth mental health

promotion and prevention interventions. *Journal of Youth and Adolescence*, DOI 10.1007/s10964-014-0165-0

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*, 2nd ed. Hillsdale, NJ: Erlbaum

Coyle, J.T., Pine, D., Charney, D., Lewis, L., Nemeroff, C., Carlson, G., Joshi, P., Reiss, D., Todd, R., Hellender, M. (2003). Depression and bipolar support alliance consensus statement on the unmet needs in diagnosis and treatment of mood disorders in children and adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry*, 42, 12, 1494-503

Daviss, W.B., Birmaher, B., Melhem, N., Alexson, D., Michaels, S., & Brent, D. (2006). Criterion validity of the mood and feelings questionnaire for depressive episodes in clinic and non clinic subjects. *Journal of Child Psychology and Psychiatry*. 47, 9, 927-934

Evans S, Day S, Royston P (1990), *A program for randomising patients to treatment groups in clinical trials by the method of minimisation*. Version 1.5, University of York, UK. Available at: <http://www-users.york.ac.uk/~mb55/guide/minim.htm> Accessed August 2014

Fleming T, Dixon R, Frampton C, Merry S. (2012). A pragmatic randomized controlled trial of computerized CBT (SPARX) for symptoms of depression among adolescents excluded from mainstream education. *Behavioural and Cognitive Psychotherapy*, 40, 529-541

Goodman R (2001) Psychometric properties of the Strengths and Difficulties Questionnaire (SDQ). *Journal of the American Academy of Child and Adolescent Psychiatry*, 40, 1337-1345.

Merikangas K, He J-P, Burstein M, et al. (2010). Lifetime prevalence of mental disorders in US adolescents: results from the national co-morbidity survey replication adolescent supplement (NCS-A). *Journal of the American Academy of Child and Adolescent Psychiatry*; 49, 980–989. Merry, S.N., Stasiak, K., Shepherd, M., Frampton, C., Fleming, T., & Lucassen, M. (2012). The effectiveness of SPARX, a computerized self help intervention for adolescents seeking help for depression:

## C-CBT for Depressed Adolescents

randomized non-inferiority trial. *British Medical Journal*, 344, 1-16.

National Collaborating Centre for Mental Health (2014). E-therapies systematic review for children and young people with mental health problems. NCCMH, [www.minded.org.uk](http://www.minded.org.uk) March 2014

National Institute for Health and Clinical Excellence (2015). *Depression in children and young people: identification and management in primary, community and secondary care*. NICE, 2015.

Pennant, M., Loucas, C., Whittington, C., Creswell, C., Fonagy, P., Fuggle, P., Kelvin, R., Naqvi, S., Stockton, S., & Kendall, T. (2015). Computerised therapies for anxiety and depression in children and young people: a systematic review and meta-analysis. *Behaviour Research and Therapy*, 67, 1-18

Pocock SL (1983), *Clinical Trials - A Practical Approach*. Chichester, UK: Wiley

Preacher KJ, Hayes AF (2004), SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behaviour Research Methods* 36, 717-731

Robinson, A., Yule, W., Verduyn, C., Smith, P., Proudfoot, J., & Abeles, P. (2011). Stressbusters: the development of a computerised CBT programme for adolescent depression. ACAMH Occasional Papers, Eds: W Yule & O Udwin, *Increasing Access to CAMHS*, July 2011, London

Stallard, P., Udwin, O., Goddard, M. and Hibbert, S. (2007). Availability of cognitive behaviour therapy within specialist child and adolescent mental health services (CAMHS): A national survey. *Behavioural and Cognitive Psychotherapy*, 35, 4, 501-505.

Stallard, P., Richardson, T., Velleman, S., & Attwood M. (2009) Computerized CBT (Think, Feel, Do) for depression and anxiety in children and adolescents: outcomes and feedback from a pilot randomized controlled trial. *Behavioural and Cognitive Psychotherapy*, 39, 273-84.

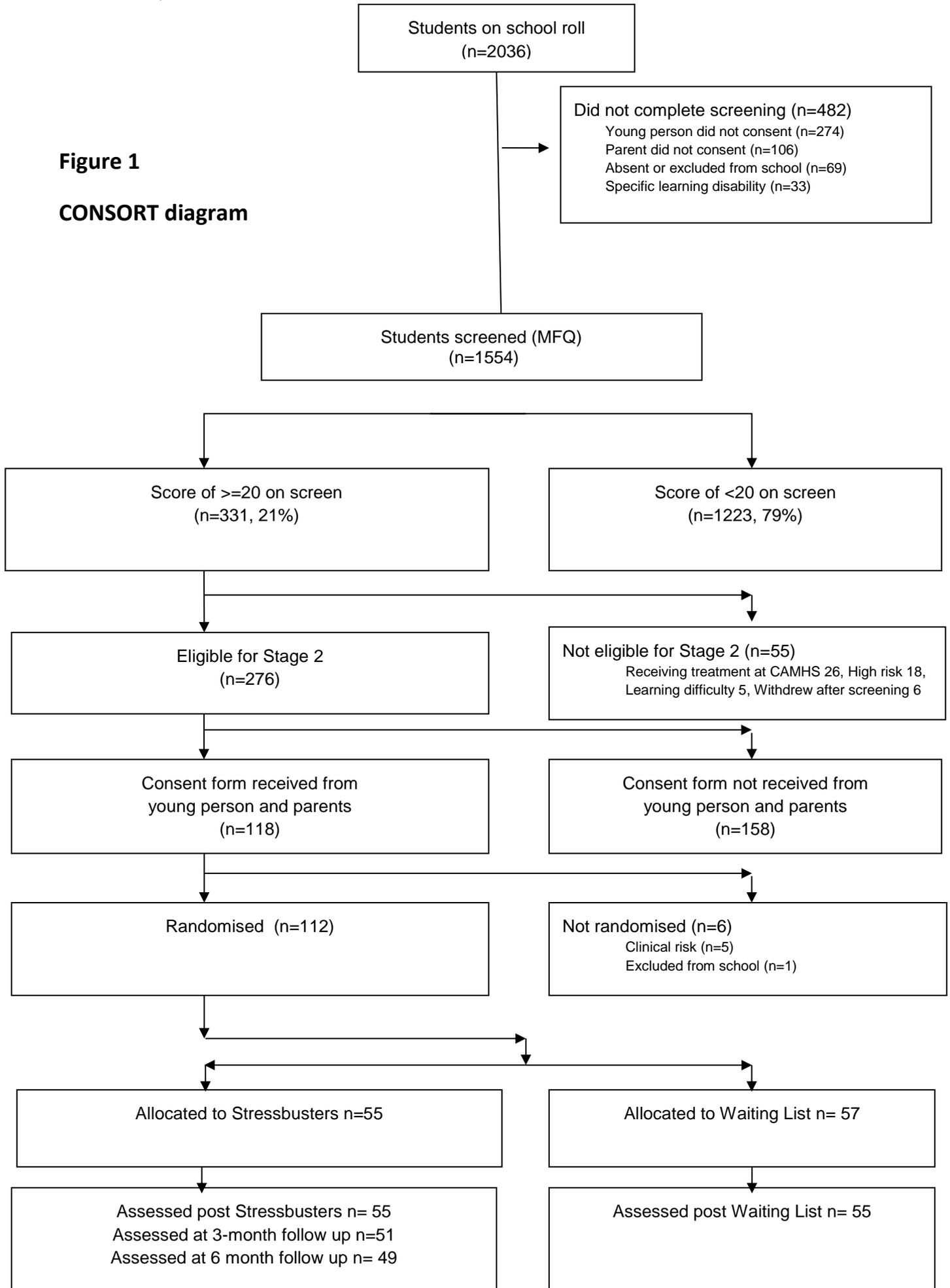
Stasiak, K., Hatcher, S., Frampton, C., and Merry, S.N. (2014). A pilot double blind randomised placebo controlled trial of a prototype computer-based cognitive behavioural therapy program for adolescents with symptoms of depression. *Behavioural and Cognitive Psychotherapy*, 42, 385-401.

## C-CBT for Depressed Adolescents

Verduyn, C., , Rogers, J., and Wood, A. (2009). *Depression: Cognitive Behaviour Therapy with Children and Young People*. Routledge, London

Wood, A., Harrington, R. C. and Moore, A. (1996). Controlled trial of a brief cognitive-behavioural intervention in adolescent patients with depressive disorders. *Journal of Child Psychology and Psychiatry*, 37, 737–746.

**Figure 1**  
**CONSORT diagram**



Assessment	Stressbusters (N=55)		Waiting List (N=57)		Group Effect <sup>a</sup>
	Mean	SD	Mean	SD	
<b>MFQ-Child</b>					
Pre	25.6	11.1	24.8	11.8	B= -.73, p=.75
Post	13.4	12.9	24.3 (N=55)	13.6	B= 11.48, p<.001
3m Follow up	10.5 (N=51)	11.0			
6m Follow up	9.6 (N=49)	10.9			
<b>SCARED-Child</b>					
Pre	32.1 (N=54)	14.6	30.9	14.1	B= -1.01, p=.74
Post	23.8 (N=53)	18.4	31.2 (N=55)	17.5	B= 8.26, p<.01
3m Follow up	15.3 (N=51)	13.9			
6m Follow up	13.4 (N=49)	14.4			
<b>MFQ-Parent</b>					
Pre	12.0 (N=31)	11.9	11.6 (N=28)	7.7	B= .21, p=.93
Post	6.3 (N=17)	7.2	12.1 (N=16)	10.8	B= 6.05, p=.09
3m Follow up	7.5 (N=13)	7.1			
6m Follow up	7.7 (N=12)	8.2			
<b>SCARED-Parent</b>					
Pre	17.9 (N=32)	13.6	15.2 (N=28)	9.7	B= -2.24, p=.50
Post	10.9 (N=18)	9.1	16.0 (N=16)	17.9	B= 7.48, p=.09
3m Follow up	13.5 (N=13)	11.1			
6m Follow up	13.3 (N=13)	8.9			
<b>SDQ-Teacher</b>					
Pre	7.0 (N=24)	6.7	5.9 (N=29)	6.4	B= -.85, p=.59
Post	5.1 (N=27)	5.6	5.9 (N=29)	5.5	B= .69, p=.60
3m Follow up	4.1 (N=23)	5.4			
6m Follow up	4.6 (N=20)	6.5			
<b>Attendance <sup>b</sup></b>					
Pre	17.5 (N=54)	2.3	17.7 (N=55)	2.4	B= 0.08, p=.64
Post	16.8 (N=54)	3.5	12.9 (N=56)	5.3	B= .79, p<.001
3m Follow up	17.6 (N=54)	3.9			
6m Follow up	17.7 (N=54)	2.7			

Table 1. Descriptive data and between group effects for Stressbusters vs Waiting List

## C-CBT for Depressed Adolescents

Figure 2

MFQ-C mean scores: Stressbusters vs Waiting List

