Title: Can an Internet-based intervention reduce suicidal ideation, depression and hopelessness among secondary school students: results from a pilot study.

Authors and affiliations: Jo Robinson¹, Sarah Hetrick¹, Georgina Cox¹, Sarah Bendall¹, Hok Pan Yuen¹, Alison Yung^{1,2}, Jane Pirkis³.

¹ Orygen Youth Health Research Centre, Centre for Youth Mental Health, University of Melbourne, Locked Bag 10, Parkville, Vic 3052, Australia

² Institute of Brain, Behaviour and Mental Health, University of Manchester, Oxford Road, Manchester M13 9PL, UK

³ Melbourne School of Population and Global Health, University of Melbourne, Level 4, 207 Bouverie Street, Victoria 3010, Australia

Corresponding author:

Jo Robinson

Orygen Youth Health Research Centre,

Centre for Youth Mental Health, University of Melbourne

Locked Bag 10, Parkville

Vic 3052, Australia

Tel: +61 3 9342 2866

Fax: +61 3 9342 2941

Email: jr@unimelb.edu.au

Abstract

Background

Little evidence exists regarding the efficacy of suicide prevention programs among youth. This pilot study aims to test the effects of a specifically designed, 8-module Internet-based program on suicidal ideation among secondary school students.

Methods

The study employed a pre-test / post-test design. Outcomes of interest were suicidal ideation, depression and hopelessness. Participants, recruited via the school wellbeing team, were assessed at baseline and immediately post-intervention. The intervention was delivered weekly at the young persons' school.

Results

Twenty-one students completed all eight modules and a post-intervention assessment, and constitute the observed case sample used for the analysis. Overall levels of suicidal ideation, depressive symptoms and hopelessness decreased significantly over the course of the study.

Conclusions

This was a small pilot study with no control group. However significant reductions were seen in suicidal ideation, depressive symptoms and hopelessness, indicating that Internet-based interventions may hold promise when it comes to reducing suicide risk among youth. Further investigation is warranted.

Key words: Suicidal ideation, adolescents, Internet, cognitive-behavioural therapy, school.

Background

Suicide is a major public health problem and the most frequent cause of death among Australian youth (1). Suicide-related behaviours, including suicide attempts and suicidal ideation are more common than completed suicide. Up to 24% of 12–17 year-olds have reported suicidal ideation, and 7-11% have reported a 12-month prevalence of suicide attempt (2). These behaviours are one of the greatest concerns for Australian young people (3) and are associated with a range of negative outcomes including completed suicide and premature mortality via other causes (4, 5). The prevention of suicide, and the development of a strategic research agenda targeting interventions for suicidal youth have both been cited as national priorities (6, 7), yet there remains a lack of intervention research among suicidal individuals (8), including youth (9).

Depression is also common and is the most common risk factor for suicide-related behaviour. Suicidal youth are six times more likely to have a psychiatric disorder compared with non-suicidal youth (10-12), most commonly depressive disorders, with between 60 and 80% of young people having a diagnosis of depression at the time of a suicide attempt (13). Hopelessness has long been linked to increased suicide risk and is believed to mediate the relationship between depression and suicide-related behaviour (14-17).

Not all suicidal young people experience symptoms of depression therefore interventions that specifically target suicidal young people are required. Good evidence exists regarding the treatment of youth depression (18), but there is limited knowledge regarding effective interventions for suicide-related behaviour (8, 9). However, a range of psychological approaches has been tested, including dialectical behavioural therapy, group therapy, problem-solving therapy, attachment-based family therapy and cognitive-

behavioural therapy (CBT). Of these, CBT appears to be the most promising in terms of its ability to reduce suicidal ideation among adolescents and young adults, according to a recent review (9).

CBT is used extensively in the treatment of adolescent depression (19) and the most commonly used components include basic psycho-education, pleasant activity scheduling, cognitive restructuring, problem-solving and relaxation training (19).

In response to the growing popularity of electronic means of communication, in particular among youth, CBT interventions are now routinely delivered via the Internet. Internet-based CBT has been shown to be an effective and cost-effective form of treatment for depression and anxiety among adults (20-26), and has the potential to be more accessible and less stigmatising than traditional, face-to-face models of therapy (27, 28). It has also been shown to have the potential both to prevent and reduce symptoms of depression and anxiety in adolescents (29, 30). Programs that are password protected, practitioner prescribed and supported, tend to have higher rates of adherence, lower rates of attrition and better treatment outcomes than open access sites (25, 31).

Despite the potential benefits of Internet-based CBT, there is virtually no research into the impact of Internet-based CBT on suicide-related behaviour. Only one study has tested the effects of an Internet-based program among suicidal adults, and reported a reduction in suicidal ideation (32), and no studies have targeted suicidal youth.

Given that schools are an obvious and accepted environment for implementing suicide prevention initiatives with young people (12, 33-35), and that school wellbeing staff are considered helpful by students when it comes to mental health-related difficulties (36),

the development of an Internet-based CBT program that can be delivered in school settings may be a logical next step.

Methods

Aims and hypotheses

The aims of this pilot study were to develop and test the impact of an Internet-based program (*Reframe IT*) among secondary school students at risk of suicide. Hypotheses were that the *Reframe IT* program would lead to reductions in: 1) suicidal ideation; 2) depressive symptoms; and 3) hopelessness.

Study design

This was a small pilot study that employed a pre-test/post-test design with an 8-week intervention phase. Participants were assessed immediately before beginning the intervention (baseline), and immediately after the intervention was complete (post-intervention).

Setting

The study was conducted by researchers at Orygen Youth Health Research Centre (OYHRC). The research team comprised two researchers who conducted the assessments and delivered each module (JR and GC) and two researchers who provided clinical supervision and moderated the website (SH and SB).

Sample

Secondary schools from the OYHRC catchment area, and the area serviced by the **headspace** centre in Geelong (a regional city close to Melbourne) were invited to participate. In total 11 schools agreed to participate in the study.

Students were eligible for the study if they were between 14 and 18 years old and if they had presented to a member of their school wellbeing team and reported experiencing suicidal ideation during the past month. Exclusion criteria were any intellectual disability, the presence of psychotic symptoms and/or an inability to speak English.

Students who met the inclusion criteria were asked by the school wellbeing team if they were interested in participating in the study. If they said ‘yes’, a plain language statement and consent form was given to them to be signed by both the student and their parent/guardian. Once the consent form was returned to the school, the school wellbeing staff member contacted the study team and an appointment was made for the baseline assessment to be conducted.

Intervention

The *Reframe IT* intervention was developed by the research team and comprises eight modules, designed to be administered once a week. Each participant had access to his or her own personalized webpage accessed via a secure login. Only the participant and the research team could access the page. There was no social networking function.

The site comprised an adult ‘host’ character who delivered the therapy verbally, and a series of video diaries made by young people (actors), that told a different ‘story’ each week. There were also two activities to be completed per week that related to the issues raised in the module. The site also included a message board, a series of factsheets covering a range of related topics, downloadable MP3s and a list of local and national

helplines and services that participants could access if they wished. As the weeks progressed, additional items were added to the site, (e.g., an activity diary).

The eight modules incorporated standard CBT approaches commonly used with young people (19). These were: engagement and agenda setting; emotional recognition and distress tolerance; identification of negative automatic thinking; behavioural activation - help-seeking and activity scheduling (including relaxation techniques); problem solving, with a specific focus on managing suicidal ideation; detecting and challenging problematic thinking, and cognitive restructuring.

Researcher involvement was two-fold. Firstly, two researchers (JR and GC) facilitated delivery of the program, this included setting up appointments; managing Internet issues; and remaining in the vicinity while the participant viewed the program. Secondly, there was involvement from a researcher-therapist (SH) who checked the responses to a weekly 'distress-check' which was completed online at the end of each module. If scores on this were high, this information was fed-back to the school staff. She also checked completed activities and responded with personalised but standardised messages and checked the message board daily responding as appropriate.

The intervention as administered weekly in a quiet room in the school.

Outcomes

The primary outcome was reduced suicidal ideation at post-intervention. This was measured by the Suicidal Ideation Questionnaire-Junior version (SIQ-JR) for year 8 and 9 students. This is a 15-item self-report measure designed to assess suicidal ideation in adolescents. Scores are ranked 0-6 with higher scores indicating greater severity of suicidal ideation. The maximum score is 90 and a cut-off score of 31 indicates a

clinically meaningful level of suicidal ideation. It has been validated with clinical and non-clinical populations and shown to have high levels of internal consistency and test-retest reliability, and high levels of construct and criterion validity (37, 38). Older students (i.e., those in years 10-12) completed the adult version of the same measure, the Adult Suicidal Ideation Questionnaire (ASIQ). This is also a self-report measure, with 25 items scored on a scale of 0-6 and a total score of 150. A cut-of score of 31 has been suggested (39). It has also been shown to have high internal consistency and good test-retest reliability (40).

Other outcomes measured included depressive symptoms, measured by the Children's Depression Rating Scale-Revised (CDRSR) (41), which is a clinician-administered measure that rates depressive symptoms across 17 domains. The instrument has a range of 17-113. Raw scores can be converted to a *T*-score, with 65 or above indicating that a depressive disorder is likely to be confirmed. This equates to a raw score of 40 or above. Raw scores are reported here. We also administered the Reynolds Adolescent Depression Scale Version 2 (RADS) (42) which is a 10-item self-report measure. Responses are rated from 1-4, giving a possible total score range of 10-40 points, with higher scores indicating greater symptom severity. A cut-off score of 26 on this measure indicates clinically significant symptomatology.

Finally, hopelessness was measured using the Beck Hopelessness Scale (BHS) (14). This is a 20-item self-report measure with a possible range of scores from 0 to 20. A higher score indicates a greater degree of hopelessness (43).

To allow for possible confounding effects on the outcome, at the end of the study we also assessed whether or not participants had received help from a mental health professional (namely a psychiatrist, a psychologist, a psychiatric nurse, an occupational therapist, or

clinicians from Orygen Youth Health, **headspace** or CASA (the Centre Against Sexual Assault)), and whether or not they had been prescribed medication, during the study period.

Demographic information was collected at baseline using a specifically designed questionnaire.

All assessments were conducted face-to-face, by a trained researcher (JR and GC), at the participant's school. Following the baseline assessment a safety plan was also completed and a copy uploaded onto the *Reframe IT* website.

Statistical methods

Firstly, because two different suicide measures were used (the SIQ-JR and the ASIQ), with different total scores, mean scores for each individual were calculated. A paired samples t-test was conducted to evaluate the impact of the *Reframe IT* intervention on suicidal ideation using the calculated mean scores.

Paired samples t-tests were also carried out to examine the impact of the intervention on depression (measured by the CDRSR and the RADS) and hopelessness (measured by the BHS).

Type I error was set at 0.05 for all analyses. No intention-to-treat analysis was conducted.

Because of the small sample size and relatively high rate of attrition, a sensitivity analysis was conducted using the SIQ mean scores, whereby a best-case/worst-case scenario was examined. In order to do this, we calculated the interquartile range for the post-intervention scores for those who had completed the intervention and completed

post-intervention assessments. In the best-case scenario all missing data post intervention were imputed as the 25th percentile and in the worst-case scenario all missing data were imputed as the 75th percentile.

Preliminary checks identified no multi-variate outliers or any violations of the assumptions of normality or multicollinearity.

Hierarchical regression analysis was conducted, in order to determine whether or not SIQ at post-intervention was predicted by suicidal ideation at baseline or treatment received during the study. SIQ at baseline was entered into the first step and treatment during the course of the study (defined as either contact with a mental health professional and/or receipt of medication) entered into the second step.

Safety and supervision

Several safety measures were in place. Firstly, as noted above immediately following the baseline assessment a detailed safety plan was conducted with each participant. This included a number of strategies that the participant could use if they felt suicidal. It also contained contact details for informal and formal sources of help, nominated by the participant.

Secondly, all assessments and modules were completed at school. Psychological distress was measured weekly immediately following the module, using the ten-item version of the Kessler Psychological Distress Scale (K10) (44, 45) and a specifically designed questionnaire assessing feelings of distress and suicidal ideation. The outcomes of both of these measures was fed back immediately to the school wellbeing staff member who responded appropriately.

Fortnightly clinical supervision meetings were held, attended by the researchers responsible for participant assessments (JR and GC) and two additional members of the research team (SH and SB), both of whom are registered clinical psychologists and provided the supervision. Any concerns regarding the wellbeing of participants were discussed, and where necessary referrals were made to specialist services.

Ethical approval was obtained from the University of Melbourne Human Research Ethics Committee and the Victorian Department of Education and Early Childhood Development Ethics Committee. Written consent was required from all students and their parents/guardian.

Results

Over the recruitment period 34 students were referred to the study, from nine schools (the remaining two schools did not refer any students to the program). Of these 34 students, baseline assessments were conducted with 32, and 27 students began the intervention. Twenty-one students completed all eight modules and a post-intervention assessment, and constitute the observed case sample used for the analysis.

Demographic and baseline characteristics of the sample

The demographic characteristics of those students for whom baseline data are available, including both those who did (n=21) and did not complete the program (n=11), are presented in Table 1. Reasons given for dropping out of the program were not always given, however when they were provided they included feeling better, changing school, and having too much schoolwork. One participant reported feeling too unwell to

continue. As can be seen in Table 1, the majority of participants were female, ages ranged from 14-18 (mean age 15.6), lived with a family member and identified as Australian. No participants identified as Aboriginal or Torres Strait Islander.

= Insert Table 1 about here =

Baseline characteristics

Levels of suicidal ideation were high at baseline. SIQ-JR raw scores ranged from 5-80 with a mean of 53.1 (SD 24.6) and ASIQ raw scores ranged from 9-148 with a mean score of 80.0 (SD 42.1). As can be seen in Table 2, levels of clinician-rated depressive symptoms (mean 58.8, SD 14.5) and self-rated depressive symptoms (mean 32.5, SD 4.8) were high at baseline. However hopelessness was less so with a mean score of 12.0 (SD 5.1).

Changes in suicidal ideation, depressive symptoms and hopelessness following Reframe-IT

A series of paired samples t-tests were conducted to examine the changes in suicidal ideation, depressive symptoms and hopelessness following the *Reframe IT* intervention. A statistically significant result was seen on all measures (see Table 2), with a moderate effect size for suicidal ideation and clinician-rated depressive symptoms (0.66 and 0.60 respectively) and a small effect size for self-rated depressive symptoms and hopelessness (0.48 and 0.46 respectively). A sensitivity analysis was also conducted for changes in suicidal ideation, which revealed that the changes from pre to post intervention remained significant for the best-case scenario ($t(31)=7.5$, $p<.0005$) and the worst-case scenario ($t(31)=6.330$, $p<.0005$).

= Please insert Table 2 here =

Predicting SIQ scores at post-intervention

When SIQ at baseline entered the first step of the analysis it was found to be significant and predicted 37% of the variance $F(1,19)=12.79, p<.002$. Suicidal ideation post-intervention was predicted by pre-intervention suicidal ideation scores (see Table 3). Entering the main effects of treatment with a mental health professional or treatment with medication during the study on the second step did not account for any additional variance $\Delta R^2=.006, F_{\text{chn.}}(2,17)=.91, p=.913$. Therefore knowing whether or not young people received any additional treatment over and above the intervention does not help predict final suicidal ideation scores.

=Insert Table 3 about here=

Discussion

Key findings

This was a small pilot study that examined the effects of an Internet-based intervention among a sample of secondary school students at risk of suicide. Unsurprisingly levels of suicidal ideation were high at baseline with the mean scores of 53.1 and 80.0, for the SIQ-JR and ASIQ respectively, being well above the clinical cut-off scores. The scores on both the CDRSR and RADS were also well above the cut-off for clinical significance, indicating high levels of depressive symptoms at baseline.

Overall levels of suicidal ideation, depressive symptoms and hopelessness decreased significantly over the course of the study. Although levels of suicidal ideation were still relatively high at post-intervention, the medium effect size shown by the study indicates

a clinically meaningful change. Similarly clinician-rated depression reduced from the category of “a depressive disorder is *very likely* to be confirmed” to “it is *possible* that a depressive disorder will be confirmed”, again with a medium effect size, indicating clinically meaningful change.

Limitations

Before we consider the implication of this study it is important to note some limitations. Firstly, this was a small pilot study with no control group, as such we cannot be certain that any changes seen between baseline and post-intervention can be attributed to the intervention. However, we did undertake regression analysis to examine whether concomitant treatment was associated with final suicidal ideation scores and showed that it was not. From this we can hypothesise that the *Reframe IT* intervention may have had an impact on suicidal ideation scores, although this does need to be tested in a controlled study.

Due to a lack of resources, and because this was just a pilot study with a small sample size, it was not considered feasible to assess inter-rater reliability on the clinician rated depression measure (CDRSR). However, both researchers (JR and GC) were trained together in the use of the instrument. Additionally, each assessment was presented in supervision and any uncertainty regarding how any of the items should be scored was discussed until a consensus was reached.

It must also be noted that rates of attrition were relatively high with 13 students dropping out of the study. Whilst this is not unusual in studies testing Internet-based interventions (46), it did reduce our sample size by approximately one third and introduced the potential for a degree of bias in the sample. Further, as this was a small pilot study no

intention-to-treat analysis was conducted. However the sensitivity analysis conducted may provide some reassurance as to the robustness of our findings.

Finally, we were unable to collect reliable data from school staff regarding the precise number of students approached for participation in the study. Therefore we were unable to report an overall consent rate.

Implications

Notwithstanding the above limitations, this study does provide some encouraging evidence regarding the potential for the use of Internet-based interventions with suicidal young people. As noted above, to date there is relatively little evidence regarding the effectiveness of interventions for suicide prevention in general, and specifically among young people (8, 9, 47), and this includes Internet-based interventions. We found only one published study examining the effects of an Internet-based intervention on suicidal ideation, and this was conducted among adults and not youth; in addition participants who were assessed as being severely suicidal were excluded from the study (32).

This is perhaps unsurprising as suicidal youth are frequently excluded from intervention studies that examine both face-to-face treatment (48) and Internet-based interventions (49). However, it is disappointing, as by employing such exclusion criteria, young people who are most at risk of suicide are not only deprived of access to potentially effective treatment, but researchers miss the opportunity to develop effective interventions for this population. In addition, suicidal young people can be hard to engage in traditional forms of treatment (50, 51), and young people in general are frequent users of the Internet, therefore they arguably have the greatest potential to benefit from interventions of this nature.

Whilst it is acknowledged that there are concerns that the Internet can have harmful effects upon vulnerable young people when it comes to the subject of suicide, for example in terms of the potential for contagion or causing distress among participants (52), to our knowledge there are to date no empirical data to suggest that this is the case. We did assess both the safety and acceptability of the *Reframe IT* intervention in the current study. These data will be reported elsewhere, but preliminary analysis indicates no adverse effects of the intervention.

Conclusions

To date there is no evidence to indicate whether or not Internet-based interventions are effective in reducing suicide-related behaviours among young people. However, given the prevalence of suicide-related behaviours among young people, and the growing popularity of Internet use, and Internet-based treatment interventions, it seems that examining the safety and effectiveness of these types of program in reducing suicide-related behaviours in young people at risk, should be a focus of future research. Despite the limitations described above, the findings from this pilot study suggest that Internet-based interventions may be effective in treating suicidal ideation, as well as depression among this population. As noted, this was a small and uncontrolled study, however funding has now been obtained to test the *Reframe IT* intervention in a randomised controlled trial, which we hope will provide more conclusive evidence as to the potential efficacy of Internet-based treatment for young people at risk of suicide.

Acknowledgements

This study received funding from the American Foundation for Suicide Prevention and from an NHMRC Program Grant. JP is on a National Health and Medical Research Council Senior Research Fellowship. SH and SB are both on a National Health and Medical Research Council Early Career Fellowship. OYHRC is affiliated with Melbourne Health and the University of Melbourne and receives funding from the Colonial Foundation.

Conflict of interest

The authors report no conflict of interest.

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Author/s:

Robinson, J;Hetrick, S;Cox, G;Bendall, S;Yuen, HP;Yung, A;Pirkis, J

Title:

Can an Internet-based intervention reduce suicidal ideation, depression and hopelessness among secondary school students: results from a pilot study

Date:

2016-02-01

Citation:

Robinson, J., Hetrick, S., Cox, G., Bendall, S., Yuen, H. P., Yung, A. & Pirkis, J. (2016). Can an Internet-based intervention reduce suicidal ideation, depression and hopelessness among secondary school students: results from a pilot study. *EARLY INTERVENTION IN PSYCHIATRY*, 10 (1), pp.28-35. <https://doi.org/10.1111/eip.12137>.

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