

Rainbow SPARX: A Novel Approach to Addressing Depression in Sexual Minority Youth

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CCBT FOR DEPRESSION IN SEXUAL MINORITY YOUTH

**Highlights:**

- Psychotherapies for sexual minority youth should be sensitive to their unique needs.
- Computerised CBT was acceptable and feasible to deliver to this population.
- Preliminary data on the effectiveness of Rainbow SPARX were promising ( $d=1.01$ ).
- Rainbow SPARX can be used as an adjunct to face-to-face therapy.

## Rainbow SPARX: A Novel Approach to Addressing Depression in Sexual Minority Youth

### Abstract

A seven-module computerized cognitive behavioral therapy (CCBT) program (Rainbow SPARX) was developed for adolescents with depressive symptoms who are also sexually attracted to the same sex, both sexes, or who are questioning their sexuality (i.e. sexual minority youth). In this paper a rationale for the use of CCBT amongst sexual minority youth with depression and a brief overview of the intervention are provided. Acceptability, feasibility and preliminary data on Rainbow SPARX's effectiveness, based on a pilot feasibility trial are provided. Twenty-one sexual minority youth (male 52.4%) aged 13-19 years old with significant depressive symptomatology were enrolled in the study. Almost all the participants ( $n = 19$ , 90.5%) completed at least four out of seven modules of Rainbow SPARX and the program received favorable usefulness and likeability ratings. Depressive symptoms decreased significantly post intervention ( $p < 0.0001$ , pre- to post-effect size  $d = 1.01$ ) and this was maintained at three-month follow-up. Rainbow SPARX is an acceptable, feasible and promising intervention, which can be offered as a self-help resource that can be used in privacy and without stigma or can be used as an adjunct to face-to-face therapy.

*Keywords:* homosexuality, bisexuality, depression, psychotherapy, adolescent.

## Rainbow SPARX: A Novel Approach to Addressing Depression in Sexual Minority Youth

Sexual minority youth (i.e. adolescents who are sexually attracted to the same sex, both sexes or are questioning their sexuality) have increased rates of depressive symptoms relative to their heterosexual or exclusively opposite-sex attracted peers (Almeida, Johnson, Corliss, Molnar, & Azrael, 2009; Bezinovic & Tkalcic, 2005; Bos, Sandfort, de Bruyn, & Hakvoort, 2008; Espelage, Aragon, Birkett, & Koenig, 2008; Galliher, Rostosky, & Hughes, 2004; Hatzenbuehler, 2009; Lam et al., 2004; Lucassen et al., 2011; Udry & Chantala, 2002, 2005; Wilkinson & Pearson, 2009; Williams, Connolly, Pepler, & Craig, 2005) and although they demonstrate a willingness to discuss their health and wellbeing (Ciro et al., 2005; Lucassen et al., 2011), young people who are not exclusively opposite-sex attracted report they are more likely to have difficulty accessing health care for emotional worries (Lucassen et al., 2011). These difficulties may be linked to the challenges in finding a therapist skilled at working with sexual minority youth, especially in small towns or rural areas (Hardin & Hall, 2001).

Cognitive behavioral therapy (CBT) is a structured, short-term, psychological therapy (Beck, 1995) and evidence suggests that it is an effective intervention for adolescent depression (Watanabe, Hunot, Omori, Churchill, & Furukawa, 2007). The general principles of CBT are the same for all groups, and CBT can be used effectively with sexual minority youth (Martell, Safren, & Prince, 2004; Safren, Hollander, Hart, & Heimberg, 2001); however, CBT for sexual minority youth requires some adaptation, to take into account the unique socio-political and interpersonal challenges faced by these young people (Almeida et al., 2009; Horn, Kosciw, & Russell, 2009; Purcell, Campos, & Perilla, 1996; Williams et al., 2005). For instance, from a cognitive perspective, sexual minority youth are frequently exposed to negative attitudes about

same-sex sexual attraction and this often leads to the development of harmful core beliefs, which are theoretically linked to the development of psychological dysfunction (Safren et al., 2001). Furthermore, unlike people from various ethnic sub-populations, sexual minority youth do not typically share their minority status with their family, and instead of providing support, the young person's family can contribute to their levels of distress (Safren & Rogers, 2001).

Internationally there is a shortage of trained health professionals in the child and adolescent mental health field (Department of Health, 2004; Gough & Happell, 2007; Mental Health Commission, 2001, 2004; Productivity Commission, 2005; Safren et al., 2001; The Werry Centre, 2011), and despite sexual minority youth having increased rates of depressive symptoms, many CBT clinicians do not have sufficient knowledge, experience or training to work with this population (Safren et al., 2001). It is important to recognize that, in addition to sexual minority youth having particular difficulty obtaining therapy for their depression, young people with depression generally also have difficulty accessing treatment (Mariu, Merry, Robinson, & Watson, 2012; Raviv, Sills, Raviv, & Wilansky, 2000). The challenge then is to make evidence-based interventions like CBT available to those who are under-served. Computerized cognitive behavioral therapy (CCBT) offers an opportunity to address this problem by using technology to deliver evidence-based interventions (Richardson, Stallard, & Velleman, 2010). CCBT consists of any internet or computer-based program used for the delivery of CBT (Andrews, Cuijpers, Craske, McEvoy, & Titov, 2010), and includes interventions that are entirely self-help as well as those that include at least some level of clinician support.

CCBT is increasingly being offered in a stepped care approach as a form of intervention for those seeking treatment for mild to moderate depression (Kaltenthaler et al., 2008). For example, "Beating the Blues" (a form of CCBT) has been recommended by the National Institute

for Health and Clinical Excellence (2006) and it is used throughout the United Kingdom's National Health Service (National Institute for Health and Clinical Excellence, 2006). There are numerous advantages or strengths associated with CCBT: it is acceptable and effective (Calear & Christensen, 2010; Richardson et al., 2010); requires less (if any) therapist time (National Institute for Health and Clinical Excellence, 2005); can be accessed at a time and place that suits the user (Abeles et al., 2009); and can be used to disseminate standardized treatment efficiently (Abeles et al., 2009). Only a handful of CCBT programs have been developed specifically for adolescents with depression, and the programs that have been previously recommended for young people did not have an interface likely to engage with and appeal to this young audience. As a result the authors of this paper (and others in their research group) decided to attempt to develop an appealing, interactive and effective CCBT program (SPARX). Internationally there are only seven other CCBT programs that have been used with adolescents with depression, specifically "Stressbusters", "Master Your Mood Online", "CATCH-IT", "MoodGYM", "Reach Out Central", "Think, Feel, Do" and "The Journey" (Richardson et al., 2010; Shandley, Austin, Klein, & Kyrios, 2010; Stallard, Richardson, Velleman, & Attwood, 2011; Stasiak, Hatcher, Frampton, & Merry, 2012).

SPARX (smart, positive, active, realistic, x-factor thoughts) is a seven-session CCBT program specifically developed for young people with depressive symptoms and has been shown to be appealing to and effective for adolescents seeking help for depression and adolescents excluded from mainstream education who suffer from depression (Fleming, Dixon, Frampton, & Merry, 2012; Fleming, Dixon, & Merry, 2012; Fleming & Merry, 2012; Merry et al., 2012). The majority of CCBT programs for adolescent depression utilize a similar short-term treatment approach to SPARX, with between 5 to 14 sessions/modules typically offered and a mean of 7.9

modules provided (Merry et al., 2011; Richardson et al., 2010; Shandley et al., 2010; Stallard et al., 2011; Stasiak et al., 2012). Most of these CCBT programs are delivered online and two, like SPARX (i.e. “Stressbusters” and “Think, Feel, Do”), have been provided via CD-ROM (Abeles et al., 2009; Stallard et al., 2011). The efficacy of SPARX has been demonstrated in a large randomized controlled non inferiority trial (RCT) (Merry et al., 2012), however SPARX was made for young people generally and did not include content of specific relevance to sexual minority youth. CCBT may be particularly useful in the treatment of sexual minority youth with depression, as it could be made freely available and would be accessible to this often isolated population. Having a computerized version of treatment also allowed for tailoring the content to address some of the challenges that are likely to underpin depression in this population. The current study describes a customized version of SPARX (called SPARX: The Rainbow Version or Rainbow SPARX) developed for sexual minority youth.

Our objectives for the open pilot trial were: 1) to ascertain the acceptability of Rainbow SPARX (using the results of a post-intervention satisfaction questionnaire and by establishing completion rates); 2) to assess feasibility (based on recruitment and uptake rates); and, 3) to collect preliminary data on the program’s effectiveness.

## **Method**

### **Participants**

Participants were sexual minority youth (i.e. young people attracted to the same sex, both sexes, or not sure of their sexual attractions) aged 13 to 19 years old with depressive symptoms (i.e. Child Depression Rating Scale – Revised raw score  $\geq 30$ ) at baseline, living in Auckland (a city and region with over 1.5 million people), New Zealand. Sexual minority youth with severe depressive symptoms, at risk of suicide or self-harm could be included, provided they reported

receiving additional support from a school guidance counselor, therapist and/or general practitioner.

Potential participants who were not receiving the necessary face-to-face support pre-intervention were not excluded from the study, but were referred for support by the researcher (ML). Those receiving antidepressant medication or other relevant therapies (e.g. CBT or interpersonal therapy) were able to take part; these additional treatments were documented at the pre-intervention assessment. Participants were excluded if they were adolescents exclusively sexually attracted to the opposite sex (i.e. they responded that they were attracted to the opposite sex in the sexual attraction question).

The mean age of the open trial participants (n=21) was 16.5 years (range 13-19 years, SD=1.6) and 11 participants (52.4%) identified as male. In terms of ethnicity, 15 (71.4%) were New Zealand European, 2 (9.5%) were Māori, 1 (4.8%) was of a Pacific ethnicity and 3 (14.3%) were Asian. Seven of the 21 participants were receiving professional help for mental health issues at baseline, with one of these participants receiving two forms of assistance: four participants were engaged in weekly (or more frequent) counseling at a high school or a tertiary-level educational institution, and they had all been attending sessions for more than three months; two participants were taking antidepressants and both had been prescribed these for more than three months; and, two of the participants were current clients of a state-funded outpatient child and adolescent mental health service.

## **Procedures**

A youth-led organization for sexual minority youth promoted the study and four high schools supportive of this initiative also encouraged participation. The study was advertised and endorsed by the sexual minority media. Written parental and participant informed consent was

obtained from those under 16 and young people were able to provide written consent for themselves if they were 16 or over. After consent was obtained, the pre-intervention assessments were conducted, and once completed participants were given Rainbow SPARX and instructed to complete one to two levels of the seven-module program per week and to finish treatment within two months. Participants could choose whether to complete the program at home, at the youth-led organization for sexual minority youth, at a selected high school or on a dedicated computer at the Research Centre where the study was based. ML contacted all participants approximately four weeks after their pre-intervention assessment to conduct a brief telephone safety check. The assessments completed pre-intervention were then repeated post-intervention and at three-month follow-up. Each participant received a NZ\$50 (equivalent to US\$40) voucher at the three-month follow-up assessment as a gratuity. The study was approved by the New Zealand Ministry of Health Multi Region Ethics Committee (Ref: MEC/09/01/002). The trial was registered with the Australian New Zealand Clinical Trials Registry (ACTRN12609000814279).

As this was an exploratory study an open pilot trial was conducted. To assess acceptability participants completed a post-intervention satisfaction questionnaire (which included an item on completion rates). All participants were invited to a post-intervention interview at the end of the study (the qualitative results based on these interviews are not reported in this paper). Feasibility of Rainbow SPARX was determined by the number of young people who expressed an interest in participating in the open trial and the number who enrolled in the study. Preliminary effectiveness data on changes in participants' depressive symptoms, anxiety symptoms, quality of life and hopelessness were collected.

## Treatment

**SPARX.** SPARX is a computerized self-help program for the treatment of depressive symptoms and uses the medium of a fantasy world, where the user's avatar is faced with a series of challenges to rid a virtual world of gloom and negativity (Merry et al., 2011). The program uses appealing graphics and interactive exercises to engage users. Each of the seven modules takes approximately 30 minutes to complete and modules have a direct teaching component where skills from the fantasy world are applied to real life (Merry et al., 2011). SPARX is delivered on CD-ROM on personal computers and comes with a paper-based user notebook.

Bicentric (i.e. egocentric and exocentric) frames of reference were used in SPARX (Salzman, Dede, & Loftin, 1999), as this allows users of the program to alternate between the egocentric ("details in the information") and exocentric ("concerning the big picture") frames of reference (Salzman et al., 1999). For instance, every module begins with the guide character (or "virtual therapist") greeting the user, providing information about depression and, after the first module, reviewing the content covered in the last module they completed (i.e. exocentric frames of reference). The user then enters the fantasy world and their avatar completes a mission (i.e. egocentric frames of reference), after which the guide explains the significance of the challenge and how it applies to real life (i.e. exocentric frames of reference). SPARX is based on core CBT skills, and challenges (homework tasks) are set to allow practice and facilitate generalization. The main CBT skills covered in SPARX are physically represented by "the shield against depression". The shield consists of six gems based on particular CBT content, specifically: "Relax" (relaxation training); "Do it" (e.g. behavioral activation); "Sort it" (e.g. social skills training); "Spot it" (recognizing or naming cognitive distortions); "Solve it" (problem solving); and, "Swap it" (e.g. cognitive restructuring) (Friedberg & MacClure, 2002;

Martell et al., 2004). The shield also has a central core, which is hope. The shield against depression is used at key stages throughout the seven modules of the program to highlight the skills used, and the user collects a gem associated with the shield (which they find in the fantasy world in each module) as a reward for completing that level. The seven modules of SPARX contained certain CBT concepts and the physical appearance of each session reflected this as a metaphor for the concepts covered. For example, module four was the “Mountain Province” and users were required to apply problem solving (“Solve it”) skills in order to climb a mountain in that particular level. A trailer of SPARX is available at [www.sparx.org.nz](http://www.sparx.org.nz)

**Rainbow SPARX.** During the development phase of SPARX, researchers and clinicians worked collaboratively with young people to develop the program. The feedback from young people assisted in refining and further improving prototypes of the program. Sexual minority youth were consulted separately, to determine whether a specially adapted version of SPARX for sexual minority youth was warranted. Sexual minority young people requested additional content to that in the original version of the program, with content that was especially relevant to them. Consequently a customized version of the CCBT program (i.e. Rainbow SPARX) was created. The differences between the original version of SPARX and Rainbow SPARX were mostly script-related and accounted for 5.9% of the overall program’s script (i.e. the mini-games, characters and weekly homework tasks remained the same). Additional changes to the appearance of SPARX were also made.

The sexual minority young people consulted during the development phase of the program highlighted key areas that they thought needed to be addressed in a Rainbow Version of SPARX. A summary of the changes are listed below and Table 1 provides a summary of each module’s content.

In Module 1, the guide begins the level by stating that “The rainbow version of SPARX was made to help young people who feel down or depressed including guys attracted to other guys, girls attracted to other girls and young people questioning their sexuality.” A decision was made to refer to sexual attractions (and not sexual identity labels) during this introduction for engagement reasons, because many sexual minority youth are unlikely to classify themselves as lesbian, gay or bisexual (LGB) (Savin-Williams, 2001). After the introductory section, the user is then encouraged to customize their character, and in the Rainbow Version they were not restricted by specific “girl” or “boy” choices. For instance, the customization options (e.g. the haircuts, hair colors and outfit styles) in Rainbow SPARX were the same for the male and female avatar. Prior to this change, users were required to conform to gender-role expectations in relation to their avatars, such that the female avatar had to wear a tunic/dress and the male avatar could only select “masculine-looking” customization options. Allowing the user this flexibility was important, as sexual minority youth are often punished for cross-gender behavior (Martell et al., 2004) and this can result in internalized negative attitudes about behaviors that come naturally to many sexual minority young people (Martell et al., 2004). In this level the guide also challenges the notion that the increased rates of depression amongst sexual minority individuals is to do with deficits associated with people who are not heterosexual, for instance by asking “Some people think that gay, lesbian, bisexual and takataapui [sexual minority Māori] youth are more likely to get depression. Why is this?” With the correct response being b) “Because of the negativity and hassles they get from other people.” Reinforcing this message was important, as it is not sexuality per se that predicts distress or depression in sexual minority individuals, but rather the additional psychosocial stressors that sexual minority youth are exposed to (Safren et al., 2001). Hopeful or positive (strengths-based) views about oneself as a

sexual minority individual were also included, with statements such as: “The other message in the game was about having hope. It’s good to repeat these simple messages: ‘I won’t always feel this way’, ‘things will get better’ or ‘it can be hard not being straight, but I know I can handle the challenges that come my way’. These statements are true and thinking them can make you feel a little better almost instantly, even if you don’t believe them at first.”

In Module 2 the guide character acknowledges how the actions of others can have a negative impact on sexual minority individuals, for example by stating, “Mostly people and beings in the ice province were nice. But in real life we can come across people who are less than likeable or even outright hostile. It can be especially hard if these people hassle you about your sexuality.” This was deemed necessary, as many sexual minority youth are exposed to considerable hostility and bullying (Rivers, 2004; Russell, Ryan, Toomey, Diaz, & Sanchez, 2011). The guide then offers a potential “Sort it” strategy related to the bullying behaviors of others, for instance “Wherever possible try to DO stuff with people who value you just as you are. You’ll probably enjoy yourself more as a result.” This strategy was also suggested as it could also counteract internalized homophobia (the negative attitudes developed by sexual minority individuals about homosexuality), by increasing the young person’s social supports and removing them from overt homophobia (e.g. verbal abuse, harassment and violence due to one’s sexuality).

During a mini-game in Module 3 the user’s avatar must unblock a series of geysers that are about to explode (e.g. heterosexism and homophobia) and the exploding geysers are used as a metaphor for negative emotions having the same potential to explode. Heterosexism (the assumption that everyone is heterosexual or ought to be heterosexual) and homophobia were challenges of particular relevance that sexual minority wanted to have included in Rainbow

SPARX. In this same level the guide asks the user what they do when someone treats them badly “...for example, when you get hassled for being gay, lesbian, bisexual, takataapui or simply for being different?” with various response options. This content is then later linked to “triggers that make me feel angry or hurt”; with one trigger option stating “being told I don’t act like a girl/guy should”. The user chooses from 14 possible response strategies, for example “Talk to someone who understands [with the number of a national free telephone counseling service for sexual minority individuals offered]” or “use slow breathing to relax”.

In Module 4, problems of specific relevance to sexual minority youth are used as examples for problem solving; specifically “I don’t know if I can tell anyone that I’m questioning my sexuality”, “I worry my friends will reject me when I tell them I’m not straight” and “If I come out to my parents they might kick me out”. These responses were examples of problems highlighted by sexual minority youth during the development stage of the program. Furthermore, these challenges have been previously identified as being of special relevance for sexual minority individuals participating in therapy (Martell et al., 2004; Safren et al., 2001).

During Module 5 the guide encourages the user to reflect upon how homophobia might have an impact on a sexual minority individual’s thinking, for example, “Hearing negative comments like ‘that’s so gay’ for when something is lame or stupid implies that there is something wrong with being gay and if we aren’t careful we might start to believe it”. The phrase “that’s so gay” as a form of heterosexist harassment has been in common usage for a number of years (Woodford, Howell, Silverschanz, & Yu, 2012) and expressions or comments that reinforce “the message ‘homosexual is bad’...” (Martell et al., 2004, p. 9) need to be challenged in interventions with sexual minority individuals engaged in therapy.

In Module 6, the guide uses examples of cognitive distortions relevant to sexual minority youth, such as “Your friend walks past a group of students who are laughing. Your friend tells you ‘I bet they were laughing at me, probably because I’m bisexual’ and she feels really lousy. What would be your advice to her?” [Correct answer = “How do you know they were laughing at you? You’re not a mind reader”]. In this level the guide also encourages the user to “Swap it” (i.e. thought challenging) using the acronym RAPA (reality check, another view, perspective and think action) based on the following scenario “Someone gives you grief because you’re different. Here comes the negative thought: ‘I’m a freak and no one will ever love me’ .... Which of these statements is a good REALITY CHECK?” With the answers being a) “I’m not a freak, I might be different, but wouldn’t it be boring if we were all the same?”, b) “It’s not true some people really do care about me and love me too”, c) “Don’t let bullies get you down, one person’s mean comments aren’t fact” [all three responses are correct answers]. In the same manner the guide asks the user to take “ANOTHER VIEW” and to put the same scenario into “PERSPECTIVE”. Finally the guide suggests the user “thinks ACTION” in relation to the scenario, stating “...What can you do or learn from it? Don’t dwell on the negative. Think solutions, not problems. It’s more motivating. What can you do? Which of these do you think are examples of thinking ACTION?” With the correct responses being: a) “I can ask the bully what’s wrong with being different”; c) “I can try spending more time with the people that matter”; and, d) “I now know I will eventually leave this town for somewhere better”. Response d) came about as a result of feedback from sexual minority youth, because despite not being able to leave small towns or rural areas (Snively, 2004), many (if not most) eventually out-migrate (Snively, 2004), for geographical locations that are more positive.

In Module 7 the user is provided a brief review of the content from the previous levels. The guide then gives the users the contact details of services specifically for sexual minority individuals (e.g. youth-based services for sexual minority young people) and the contact details for a national free phone service which “can suggest gay, lesbian, bisexual and takataapui friendly counselors”. Selected images from Rainbow SPARX are available in Figure 1.

## **Measures**

Demographic data were collected at baseline. At post-intervention participants completed a brief satisfaction questionnaire, specifically developed for this study. This questionnaire assessed items on Rainbow SPARX’s appeal, usefulness and likeability using a 5-point Likert response format (5 = very useful or 5 = really liked). This questionnaire also included items on: the time it required for a participant to complete each module; whether participants would recommend Rainbow SPARX to their friends; whether participants thought Rainbow SPARX would appeal to other young people; and, how many modules participants completed.

The primary outcome measure for effectiveness was the Children’s Depression Rating Scale – Revised (CDRS-R) (Poznanski & Mokros, 1995). The CDRS-R is a clinical interview tool which has demonstrated sound reliability, validity, and sensitivity to change (Brooks & Kutcher, 2001; Myers & Winters, 2002). The CDRS-R has also demonstrated good internal consistency with a Cronbach’s alpha of 0.85 (Poznanski & Mokros, 1996) and an acceptable Cronbach’s alpha of 0.77 in the current study. Possible raw scores range from 17 to 113, a raw score of 30 (t-score 55) is indicative of clinically significant depressive symptoms (i.e. over the 70th percentile for depressive symptoms) (Poznanski & Mokros, 1995). Secondary outcome measures included: the Reynolds Adolescent Depression Scale (RADS-2), a 30-item self-report

questionnaire, designed to measure the severity of depressive symptoms in adolescents (Brooks & Kutcher, 2001), this assessment has excellent internal consistency with a Cronbach's alpha of 0.92 (Reynolds, 2002) and 0.93 in the current study; the Mood and Feelings Questionnaire (MFQ), a 33-item self-report questionnaire, designed to detect depression in clinical populations (Kent, Vostanis, & Feehan, 1997), it also has excellent internal consistency with a Cronbach's alpha of 0.94 (Wood, Kroll, Moore, & Harrington, 1995) and 0.93 in the current study; the Pediatric Quality of Life Enjoyment and Satisfaction Questionnaire (PQ-LES-Q), a 15-item self-report questionnaire, addressing satisfaction with life currently (Endicott, Nee, Ruoyong, & Wohlberg, 2006), this assessment has good internal consistency with a Cronbach's alpha of 0.87 (Endicott et al., 2006) and 0.86 in the current study; the Spence Children's Anxiety Scale (SCAS), a 38-item self-report questionnaire, designed to evaluate symptoms of anxiety (Spence, 1998), this assessment has excellent internal consistency with a Cronbach's alpha of 0.92 (Spence, 1998) and good internal consistency in the current study with a Cronbach's alpha of 0.83; and, the Kazdin Hopelessness Scale for Children (Kazdin HPLS), a 17-item self-report questionnaire, assessing hopelessness (Kazdin, French, Unis, Esveldt-Dawson, & Sherick, 1983) and this assessment has acceptable internal consistency with a Cronbach's alpha of 0.75 (Kazdin et al., 1983) and 0.73 in the current study.

The presence of severe depressive symptoms and suicidal ideation were assessed at the face-to-face appointments and during the brief telephone safety check. A participant was categorized as having had an adverse event if their depressive symptoms worsened using pre-defined criteria (specifically a CDRS-R raw score  $\geq 76$ ) and/or if they experienced moderate (or stronger) suicidal ideation in the previous four weeks. Any adverse event resulted in a

participant's general practitioner or school guidance counselor being promptly contacted and additional support arranged.

## **Analyses**

Pre- to post-intervention and post-intervention to three-month follow-up changes in the CDRS-R and functioning on self-report measures (e.g. RADS-2, MFQ, PQ-LES-Q, SCAS and Kazdin HPLS) were tested for statistical significance using paired t-tests. Pre- to post-intervention effect sizes were calculated using Cohen's *d*. Adverse events and the numbers and types of extra interventions at baseline were also summarized. Statistical analyses were performed using PASW (SPSS for Windows Statistical Software package) version 18. The primary analyses were carried out using the intent-to-treat principle, in which the analyses included all study participants with depressive symptoms at baseline. Sensitivity analyses were also carried out for participants that completed  $\geq 4$  modules of Rainbow SPARX and were not receiving additional treatments. Missing responses were replaced using the last observation carried forward method. A two-tailed p-value  $< 0.05$  was taken to indicate statistical significance in all analyses.

## **Results**

### **Acceptability**

In terms of acceptability, 16 (80%) participants indicated that they would recommend Rainbow SPARX to friends and 17 (85%) thought that the intervention would appeal to other young people. The content of the program that received the highest usefulness ratings (i.e. a rating of  $\geq 4$ ) were "learning about depression" and "Relax – Slow breathing and muscle relaxation". The aspects of Rainbow SPARX that received the highest likeability ratings (i.e. a rating of  $\geq 4$ ) were: "You can learn things by yourself at your own pace"; "It is different to

talking to a doctor/counselor”; “I could do it at home”; “It comes with a notebook that I can keep”; and, “It is made especially for young people”. More than 90% of participants reported completing four or more modules of Rainbow SPARX (mean 6.6 modules, range 1-7).

Seventeen participants (81%) reported finishing all seven modules. Fourteen participants (70%) required between 20-30 minutes to complete each level of Rainbow SPARX.

### **Feasibility and Participant Flow**

Of the 44 young people who expressed an interest in the study, 17 did not meet the entry criteria or declined to participate (see Figure 2). Twenty-seven participants were assessed at baseline. Twenty-one participants were sexual minority youth and had depressive symptoms at baseline. All but two participants completed the intervention and post-treatment assessment. Two further participants did not complete the three month follow-up assessment.

### **Preliminary Effectiveness Data**

**Intent-to-treat analyses.** The depressive symptoms of study participants measured with the CDRS-R decreased significantly from pre- to post-intervention (with a large pre- to post-intervention effect size) and this positive change was maintained at three-month follow-up. The depressive symptoms of study participants measured with the RADS-2 and MFQ also decreased significantly pre- to post-intervention. These positive changes in depressive scores were maintained at three-month follow-up (see Table 2).

Significant improvements also occurred pre- to post-intervention for anxiety scores as measured with SCAS (mean change = -7.86, 95% CI -11.62 to -4.10,  $p < 0.0001$ ,  $d = 0.95$ ) and hopelessness scores as measured with Kazdin HPLS (mean change = -1.43, 95% CI -2.43 to -0.43,  $p = 0.008$ ,  $d = 0.65$ ). However, changes in quality of life (as measured on PQ-LES-Q)

although positive from pre- to post-intervention, were not significant (mean change = 2.81, 95% CI -1.18 to 6.80,  $p = 0.16$ ).

**Sensitivity analyses.** The sensitivity analyses for pre- to post-intervention changes as measured using the CDRS-R and RADS-2 were also statistically significant, with comparable effects sizes to the intent-to-treat analyses. Sensitivity analyses results for the MFQ, although non-significant, followed a similar trend to the intent-to-treat analyses (i.e. depressive symptoms decreased).

### **Safety**

In total, eight adverse events were recorded. All adverse events were categorized to be of “moderate severity” (e.g. worsening of mood, running away from home, increased suicidal thinking or deliberate self-harm). If a participant experienced an adverse event, ML and SM ensured appropriate support was put in place.

### **Discussion**

In this pilot feasibility trial we have shown that a specific computerized intervention for depression, designed for sexual minority youth, is an acceptable intervention that can be delivered feasibly. Completion rates of Rainbow SPARX compared very positively with rates reported in other studies. For instance in a systematic review of CCBT for children and adolescents with depression and anxiety 33.3% to 69.6% of participants completed all sessions of CCBT (Richardson et al., 2010), whereas 81% of participants in the current study completed all modules of Rainbow SPARX. Sexual minority participants rated the acceptability of Rainbow SPARX favorably with more than 80% indicating that it would appeal to other young people and that they would recommend it to their friends, suggesting that this intervention was

acceptable to this group of young people. The high satisfaction ratings suggest that Rainbow SPARX is relevant and engaging. The feasibility of delivering Rainbow SPARX to sexual minority youth was less straightforward. In this small study promoting Rainbow SPARX to sexual minority youth as an intervention for depression did not lead to a large uptake of the resource. This was probably due to several factors, including: the low number of sexual minority youth with depressive symptoms willing to participate in a feasibility trial; the ethics committee's requirement of parental co-consent for younger participants; and, the need to have face-to-face assessments (which meant only participants from the Auckland region could take part).

Intent-to-treat and sensitivity analyses demonstrated that the depressive symptoms of sexual minority participants on the CDRS-R decreased significantly post-intervention and this effect was maintained at three-month follow-up. For 12 participants their final scores remained above a CDRS-R raw score of 29 suggesting a degree of depressive symptoms remained; however, this is in line with most depression treatment studies which show remission rates at best in the order of 40% (Hetrick, Merry, McKenzie, Sindahl, & Proctor, 2007). There were significant improvements on all but one secondary outcome measure from pre- to post-intervention. Of note, seven of the study's participants completing Rainbow SPARX were also receiving additional help (predominantly face-to-face therapy) and several of these participants stated that Rainbow SPARX complimented their existing therapy. Two participants that were not receiving any additional support at baseline commented that Rainbow SPARX encouraged them to seek out face-to-face CBT once they completed CCBT.

## **Strengths**

This is the first study to examine the feasibility and acceptability of using a specifically designed computerized resource to treat depression in sexual minority young people. Few exclusion criteria were used to ensure maximal generalizability. Excellent retention and assessment completion rates were achieved. Data on participants' satisfaction of Rainbow SPARX were gathered. This is especially valuable, as there is little research in the field of CCBT and adolescents, and none on sexual minority young people, so these data can help inform further developments in the field. For example, the relaxation content in Rainbow SPARX was very well received and inclusion of this topic is warranted in subsequent CCBT programs.

### **Limitations**

The small sample size of this open pilot trial limits the generalizability of the study. Only 21 sexual minority youth with depressive symptoms over a 14-month period were able to be recruited. Despite intensive efforts to recruit the largest possible sample size, recruitment was challenging. Recruitment challenges were exacerbated by certain consent protocols, in particular the ethics committee's requirement of parental co-consent for younger participants (which explicitly included highlighting to parents that their child was not heterosexual). As a result of this, several potential participants elected not to participate, because they did not want their parents to know about their sexuality. Hence the sample may not have been representative of all sexual minority youth, as all of the participants were sufficiently comfortable with their sexuality to enroll in a formal research project and all of the younger participants were "out" to their parents, at an age when it is thought most sexual minority youth are not out (Rossen, Lucassen, Denny, & Robinson, 2009). Without randomized allocation to wait-list or other control group it is possible that the reductions in depressive symptoms occurred as a result of placebo or temporal effects. However, recent work by Gledhill and Garralda (2011) has indicated that

depressive symptoms in young people presenting to primary care tend to persist without intervention. Furthermore, two randomized controlled trials of SPARX support the efficacy of SPARX amongst young people with depressive symptoms (Fleming, Dixon, Frampton, et al., 2012; Merry et al., 2012). Although depressive symptoms were assessed using standardized tools with sound psychometric properties, formal diagnoses of depression were not made. Treatment completion was determined by participants' self-report. However, based on participants' informal descriptions of their experiences using various sessions of Rainbow SPARX, during the post-intervention interviews, one can be reasonably confident that the self-reported completion rates of participants are accurate.

### **Comparisons to Prior Research**

Only a handful of prior studies addressing the treatment of depression in sexual minority youth have been identified by the authors. All were case reports based on a sample of between one and four participants (Goff, 1990; Hart & Heimberg, 2001; Hussain & Roberts, 1998; Jackson, Telingator, Pleak, & Pollack, 2005). The literature on CCBT programs specifically developed for young people with depression is also sparse (Richardson et al., 2010); therefore this trial adds to the limited number of studies in the field of CCBT for the treatment of adolescent depression. Our findings that CCBT leads to a reduction in depressive symptoms are in line with previous research in both adults and adolescents (Andrews et al., 2010; Richardson et al., 2010). Comparisons of effect sizes between CCBT programs for depression are problematic given the differing populations and study protocols used, however the effect sizes for Rainbow SPARX (ES = 1.01 or 0.98 for the primary outcome measure) compared well to those of other CCBT programs. For instance, in a study where 182 people aged 18 to 52 years old were assigned to MoodGym, a large pre-post effect size of 0.9 was demonstrated amongst

those with clinical depression that completed treatment (Christensen, Griffiths, & Jorm, 2004). Furthermore, a medium effect size of 0.56 was reported in a trial of CATCH-IT when this CCBT program was combined with 1 to 2 minutes of brief advice from a primary care physician amongst 40 adolescents (14 to 21 years old) with persistent sub-threshold depression (Van Voorhees et al., 2008). Very low dropout rates in this study were achieved, in contrast to previous research on CCBT (Richardson et al., 2010). This may have been as a result of the support ML provided to participants (equivalent to 15 minutes per participant over the course of their treatment). A meta-analysis of CCBT in adults indicated that supported CCBT programs result in improved adherence (Andersson & Cuijpers, 2009). The high retention and treatment completion rates may have reflected sexual minority participants' desire to improve therapy and services for sexual minority youth. It may also be because Rainbow SPARX's interactive format was, as it was designed to be, especially engaging and relevant to adolescents.

### **Disadvantages and Advantages of CCBT for Sexual Minority Youth**

There are several limitations or disadvantages associated with CCBT programs like Rainbow SPARX for sexual minority youth with depression. For instance, although CBT clinicians are increasingly endorsing the use of CCBT (MacLeod, Martinez, & Williams, 2009), some are concerned that CCBT is impersonal (Mitchell & Gordon, 2007). The lack of an interpersonal aspect to treatment may be an especially relevant issue for sexual minority young people with depression, as these young people would benefit considerably from an empathic therapist who responds positively and appropriately to the young person's minority sexuality status. CCBT programs are also thought to be less adequate at detecting a young person's worsening clinical state (MacLeod et al., 2009). This limitation of CCBT may be particularly pertinent for sexual minority youth, as these young people are thought to be at an elevated risk of

suicide (Espelage et al., 2008; Fergusson, Horwood, & Beautrais, 1999; Fleming, Merry, Robinson, Denny, & Watson, 2007; Lucassen et al., 2011; Russell & Joyner, 2001). Perhaps as a result of these limitations, some are of the view that CCBT is best delivered as a supplement (e.g. as a homework exercise to reinforce content covered in face-to-face therapy sessions), and not an alternative, to traditional therapist-guided treatment (MacLeod et al., 2009; Whitfield & Williams, 2004). However, this does not take into account the problems of delivering therapy to the high numbers of young people who never receive any treatment for their depression.

CCBT has many strengths or advantages of special relevance to sexual minority youth with depression. For example, CCBT programs can be accessed in private at a time and place that is best suited to the young person using the program. Furthermore, the young person using the program need not worry that a computerized intervention will “out them”. CCBT programs like Rainbow SPARX have the added advantage of being designed in collaboration with sexual minority youth together with sexual minority clinicians, and as such constitutes a culturally appropriate “gay affirmative therapy” (Liddle, 1997; Mayer et al., 2008). Finally, sexual minority youth often report geographical and social isolation (Walls, Kane, & Wisneski, 2010) and CCBT programs, like Rainbow SPARX, can potentially be accessed by sexual minority youth in locations far from large urban centers with established services for sexual minority individuals.

### **Conclusions**

In this open trial, a CCBT intervention for sexual minority youth with depression was found to be a feasible and acceptable intervention for these youth. Depression ratings improved post intervention and these positive effects were maintained at three-month follow-up. Rainbow SPARX could be used as an adjunct to face-to-face therapy, where it is offered as an additional

treatment option, or as a self-help intervention to those sexual minority youth unable to access CBT. The next step in terms of evaluating the program is a definitive RCT comparing Rainbow SPARX to an active control condition.

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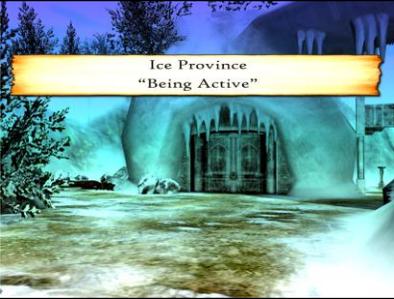
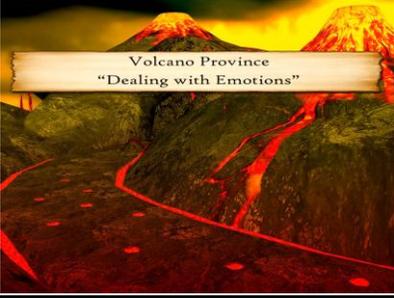
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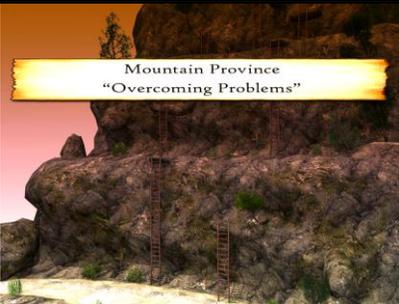
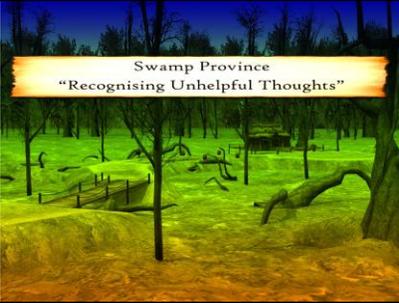
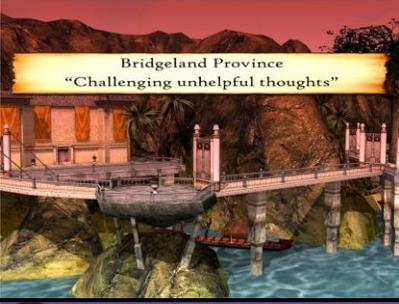
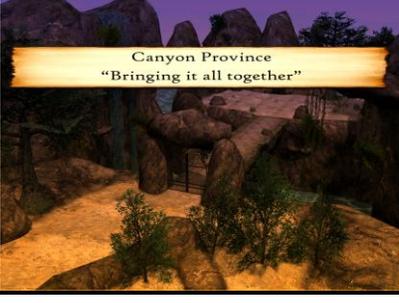
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Table 1

*Overview of SPARX and Rainbow SPARX*

Module/ Session	Title	Main Content Covered	Challenge/ Homework
1	 <p>Cave Province "Finding Hope"</p>	<ul style="list-style-type: none"> <li>• Introduce Gnats (gloomy negative automatic thoughts or unhelpful thoughts)</li> <li>• Introduce the character and concept of Hope (i.e. people recover from depression)</li> <li>• Controlled breathing ("Relax")</li> <li>• Psycho-education about depression and overview of the CBT model</li> </ul>	<ul style="list-style-type: none"> <li>• User to identify things they want to change e.g. feeling sad, lonely or angry or experiencing problems related to sleeping or eating</li> </ul>
2	 <p>Ice Province "Being Active"</p>	<ul style="list-style-type: none"> <li>• Basic communication and interpersonal skills ("Sort it")</li> <li>• Progressive muscle relaxation ("Relax")</li> <li>• Activity scheduling and behavioral activation ("Do it")</li> </ul>	<ul style="list-style-type: none"> <li>• User to select things they are going to do e.g. play sport, do something totally relaxing or go to the beach</li> </ul>
3	 <p>Volcano Province "Dealing with Emotions"</p>	<ul style="list-style-type: none"> <li>• Good listening skills ("Sort it") introduced using BLINC (bite your tongue, look at the speaker, be interested, no interruptions and check you understand)</li> <li>• Dealing with strong emotions (e.g. "Spot it" – spot angry or hurt feelings)</li> </ul>	<ul style="list-style-type: none"> <li>• User to pick a skill from the module that they will try out e.g. "Sort it" using BLINC</li> </ul>

4	 <p>Mountain Province "Overcoming Problems"</p>	<ul style="list-style-type: none"> <li>• Introduce problem solving ("Solve it") using STEPS (say what the problem is, think of solutions, examine these ideas, pick one and try it, see what happens)</li> <li>• Recognize sparks (i.e. positive or helpful thoughts about you/your future) ("Spot it")</li> </ul>	<ul style="list-style-type: none"> <li>• User to identify a problem and use STEPS to overcome this problem</li> <li>• User to find the Sparks in their life (e.g. think of something that you are good at or something positive in your life)</li> </ul>
5	 <p>Swamp Province "Recognising Unhelpful Thoughts"</p>	<ul style="list-style-type: none"> <li>• Recognizing various Gnats ("Spot it")</li> </ul>	<ul style="list-style-type: none"> <li>• User to spot the Gnats (negative thoughts) that they experience and to write these down in their SPARX notebook</li> </ul>
6	 <p>Bridgeland Province "Challenging unhelpful thoughts"</p>	<ul style="list-style-type: none"> <li>• Learning to challenge Gnats using RAPA (reality check, another view, perspective and think action) ("Swap it")</li> <li>• Negotiating a deal ("Sort it")</li> </ul>	<ul style="list-style-type: none"> <li>• User to spot negative thoughts and swap these for "something better" using RAPA</li> </ul>
7	 <p>Canyon Province "Bringing it all together"</p>	<ul style="list-style-type: none"> <li>• Putting the skills together (recap of all skills)</li> <li>• Mindfulness – tolerating distress</li> <li>• Knowing when to ask for help</li> </ul>	<ul style="list-style-type: none"> <li>• User to utilize the "shield against depression"</li> </ul>

## CCBT FOR DEPRESSION IN SEXUAL MINORITY YOUTH

Table 2

*Depressive symptoms across three time points*

<b>Outcome</b>	<b>n</b>	<b>M (SD)</b>	<b>Mean change (95% CI) pre- to post- &amp; post- to follow-up</b>	<b>p-value</b>	<b>Effect size<sup>a</sup></b>
<i>Intent to treat analyses</i>					
<b>CDRS-R</b>					
Pre-intervention	21	41.48 (10.35)			
Post-intervention	21	34.05 (10.24)	-7.43 (-10.79 to -4.07)	<0.0001	1.01
Follow-up	21	33.43 (12.04)	-0.62 (-5.82 to 4.58)	0.81	-
<b>RADS-2</b>					
Pre-intervention	21	71.33 (15.03)			
Post-intervention	21	63.43 (14.84)	-7.90 (-12.17 to -3.64)	0.001	0.84
Follow-up	21	62.57 (17.60)	-0.86 (-5.41 to 3.70)	0.70	-
<b>MFQ</b>					
Pre-intervention	21	25.10 (12.97)			
Post-intervention	21	18.90 (13.71)	-6.19 (-11.13 to -1.25)	0.02	0.57
Follow-up	21	19.57 (14.68)	0.67 (-5.58 to 6.92)	0.83	-
<i>Sensitivity analyses</i>					
<b>CDRS-R</b>					
Pre-intervention	12	39.75 (8.10)			
Post-intervention	12	31.58 (7.29)	-8.17 (-13.45 to -2.88)	0.006	0.98
Follow-up	12	33.08 (12.84)	1.50 (-5.97 to 8.97)	0.67	-
<b>RADS-2</b>					
Pre-intervention	12	70.50 (12.14)			
Post-intervention	12	61.42 (10.67)	-9.08 (-15.64 to -2.52)	0.01	0.88
Follow-up	12	62.33 (16.02)	0.92 (-7.24 to 9.07)	0.81	-
<b>MFQ</b>					
Pre-intervention	12	23.08 (9.34)			
Post-intervention	12	16.67 (9.77)	-6.42 (-14.64 to 1.80)	0.11	-
Follow-up	12	19.50 (15.32)	2.83 (-7.23 to 12.90)	0.55	-

<sup>a</sup>All effect sizes were Cohen's *d*: 0.5-0.8 medium effect; and >0.8 large effect (Cohen, 1992).

Figure 1. Screenshots from Rainbow SPARX

Female avatar in Rainbow SPARX (with full customization options available).



The Guide character in Rainbow SPARX

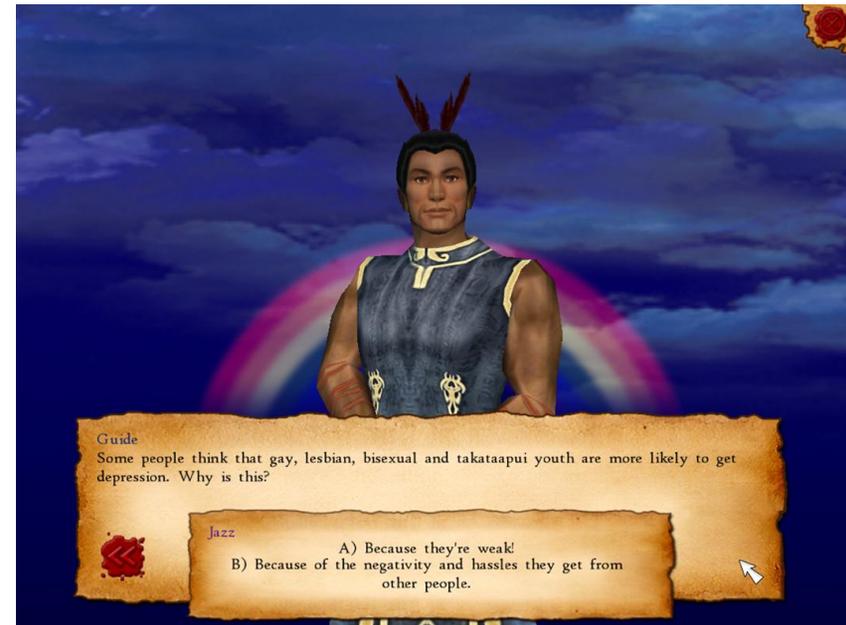


Figure 2. Participant Flow Chart

