Do worry and its associated cognitive variables alter following CBT treatment in a youth population with Social Anxiety Disorder? Results from a randomized controlled trial

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1. Introduction

Social Anxiety Disorder (SAD) affects between 1 and 10% of children (Anderson, Williams, McGee, & Silva, 1989; Kashani & Orvaschel, 1990; Schneier, 2006), and in adolescents, has a lifetime prevalence ranging from 3.9%–13.7% (Fehm, Pelissolo, Furmark, & Wittchen, 2005; Kessler et al., 2005; Kessler et al., 2012; Ruscio et al., 2008). SAD confers significant deleterious consequences (Beesdo et al., 2007; Wittchen, Fuetsch et al., 1999; Wittchen, Stein, & Kessler, 1999), and if left untreated, tends to persist (Beesdo-Baum et al., 2012; Burstein et al., 2011; Kessler et al., 2012). It commonly co-occurs with other mood and anxiety disorders and is particularly comorbid with Generalized Anxiety Disorder (GAD), with research demonstrating that pure forms of either GAD or SAD are relatively rare (Walkup et al., 2008). Not only is SAD in youth prevalent, detrimental and persistent, but there are also less positive outcomes following CBT for those suffering with SAD compared to those afflicted with other anxiety disorders (Ginsburg et al., 2011; Hudson et al., 2015).

Anxiety disorders may not be fully differentiated in children and adolescents due to the presence of common pathological processes that underlie them (Lahey et al., 2004; Sterba et al., 2010). Worry and a number of cognitive variables found to be associated with worry (i.e., intolerance of uncertainty, positive and negative beliefs about worry, negative problem orientation and cognitive avoidance) have been shown to underpin GAD in adults and are also present in children and adolescents with GAD (Holmes, Donovan, Farrell, & March, 2014; Laugesen, Dugas, & Bukowski, 2003). It is our contention, that worry and the cognitive variables with which it is associated, may also be important to the development and maintenance of SAD in youth, and may explain the high comorbidity rates between the two disorders.

Worry refers to the persistent presence of uncontrollable, often upsetting, intrusive thoughts and images that focus on solving problems or exploring feared, future oriented outcomes (Borkovec, Robinson, Pruzinsky, & DePree, 1983). Although commonly recognised as the defining feature of GAD, individuals with SAD also engage in worry,

demonstrating anticipatory anxiety prior to social interactions (Clark & Wells, 1995), and post-event processing (PEP) following social interactions (Clark & Wells, 1995; Rachman et al., 2000). Indeed, it has been found that adults with GAD and SAD cannot be differentiated in terms of worry, and that worry scores independently predict diagnoses of SAD and GAD, but not other diagnoses (Starcevic et al., 2007). Similarly, research has demonstrated that worry is a feature of GAD and SAD in youth (Hearn, Donovan, Spence, March, & Holmes, 2016; Whitmore, Kim-Spoon, & Ollendick, 2013) and in fact, that levels of worry cannot differentiate children with GAD from children with SAD (Hearn, Donovan, Spence, & March, 2017). Thus, there is evidence that worry is common to both SAD and GAD in youth.

A number of cognitive variables have been found to be associated with worry, and are featured in the leading conceptual models of GAD put forward by Dugas and colleagues (Dugas, Gagnon, Ladouceur, & Freeston, 1998; Dugas & Robichaud, 2007; Ladouceur et al., 1998) and Wells (1995). Among them is intolerance of uncertainty (IU), a construct central to the Dugas model of GAD. IU refers to a mindset in which uncertainty is construed as being so disconcerting and aversive that significant measures must be taken to avoid it (Boelen, Vrinssen, & van Tulder, 2010; Comer et al., 2009). Studies have suggested that IU is the most important unique predictor of worry in adults (Boelen et al., 2010; Buhr & Dugas, 2006; Dugas et al., 2001; Laugesen, 2007; Laugesen et al., 2003) and a robust predictor of worry frequency in a community sample of children (Fialko, Bolton, & Perrin, 2012), and children with GAD (Holmes et al., 2014; Read et al., 2013). IU has also been shown to predict SAD severity and symptoms in adults (Boelen & Reijntjes, 2009; Carleton et al., 2010; Mahoney & McEvoy, 2012), as well as children and adolescents (Boelen et al., 2010; Hearn et al., 2017). Furthermore, it has been found that children with SAD report equivalent levels of IU as those with GAD (Hearn et al., 2016). Thus, it would appear that both youth with SAD and youth with GAD have difficulties with IU.

Positive and negative beliefs about worry (PBW and NBW) are two other cognitive variables that have been found to be associated with

worry. PBW are central to the models put forward by both Dugas (Dugas et al., 1998; Dugas & Robichaud, 2007) and Wells (1995), whereas NBW are central only to Wells' model. PBW include beliefs that worry helps to facilitate problem solving and prepares the individual for any eventuality (Borkovec et al., 1983; Gosselin et al., 2007). In contrast, NBW include beliefs that worrying is detrimental, difficult to control and dangerous for well-being (Wells, 1995). Both PBW and NBW have been shown to be related to pathological worry in adults and adolescents (Cartwright-Hatton and Wells, 1997; Freeston, Rhéaume, Letarte, Dugas, & Ladouceur, 1994). While some evidence indicates that PBW are linked to elevated worry in younger children (Kertz & Woodruff-Borden, 2013; Muris et al., 1998; Smith & Hudson, 2013), other evidence indicates that they are not (Fialko et al., 2012; Hearn et al., 2017; Holmes et al., 2014; White & Hudson, 2016; Wilson & Hughes, 2011). In contrast, NBW have been found to be associated with worry in clinical populations of adolescents (Ellis & Hudson, 2010; Fisak et al., 2013) and children (Holmes et al., 2014; Smith & Hudson, 2013; White & Hudson, 2016). To date, PBW and NBW have received no empirical attention with respect to SAD in adults. However, children with SAD have been shown to hold equivalent levels of NBW (but not PBW) to children with GAD (Hearn et al., 2016) and NBW (but not PBW) have been shown to be related to SAD symptoms (Hearn et al., 2017). Thus, there is emerging evidence that NBW at least, may be related to both SAD and GAD in youth populations.

Negative Problem Orientation (NPO) is another cognitive variable associated with worry that is central to the Dugas model of GAD (Dugas et al., 1998; Dugas et al., 2007). NPO describes the cognitive and emotional beliefs that result when personal and social problems are viewed as threatening. The individual with a NPO doubts their ability to solve problems and feels pessimistic about the likely outcomes (D'Zurilla, Nezu, & Maydeu-Olivares, 2001). NPO is well established as an important contributor to adult and adolescent worry (Dugas & Robichaud, 2007; Dugas et al., 2007; Laugesen et al., 2003), and high levels of NPO have been found in 8–12 year olds with GAD (Holmes et al., 2014). NPO has recently been considered as having a more transdiagnostic role in the maintenance of psychopathology and has been linked to a number of emotional disorders in adults, including social anxiety (Fergus, Valentiner, Wu, & McGrath, 2015; McEvoy & Mahoney, 2012). Levels of NPO have been shown to predict self-rated SAD symptoms, severity and overall functioning in youth aged 8–17 years with SAD (Hearn et al., 2017), and children aged 8–12 years with SAD have been found to report NPO at levels equivalent to those of children with GAD (Hearn et al., 2016). Thus, there is preliminary evidence to suggest that youth with SAD, like youth with GAD, are afflicted with a NPO.

Cognitive avoidance (CA) is yet another cognitive variable that has been found to associate with worry, and is central to the models of GAD proposed by both Dugas and Wells. CA refers to efforts undertaken to avoid confronting the thoughts, images or emotions associated with worry, and includes strategies such as thought suppression, thought substitution, and distraction (Dugas et al., 1998; Dugas & Robichaud, 2007; Dugas et al., 2007; Wells, 1995). CA strategies are ineffectual, typically resulting in inadequate processing and failed resolution of worry, and having the paradoxical consequence of increasing worry (Lavy and van den Hout, 1990; Wegner & Zanakos, 1994). Adolescents with high levels of worry have been found to engage in significantly more CA strategies than low- (Laugesen et al., 2003) or moderate-level worriers (Gosselin et al., 2007). In young people, CA has been found to correlate with youth-rated SAD symptoms (Hearn et al., 2017), although youth with SAD report lower levels of CA than children with GAD (Hearn et al., 2016). Thus, the association between SAD and CA in youth is unclear and appears weaker than the association between SAD and some of the other cognitive variables.

Taken together, the research conducted to date suggests several commonalities between GAD and SAD in terms of underlying cognitive mechanisms. This study builds upon two of our previous studies investigating the role of worry and its associated cognitive variables in youth SAD. The first of these examined the role of worry, IU, NBW, PBW, NPO and CA in children aged 8–12 years with a primary diagnosis of GAD, SAD or no anxiety diagnosis. It was found that there were no significant differences between children with GAD and children with SAD on levels of worry, IU, NBW, and NPO (Hearn et al., 2017). The second study investigated whether these same variables were associated with SAD severity, symptoms and overall functioning in 126 youth aged 8–17 years. It was found that NPO was an important predictor of SAD severity, self-reported ratings of SAD symptoms, and overall functioning, and that IU and worry also predicted self-rated SAD symptom severity (Hearn et al., 2017).

As noted above, CBT has been found to be less effective for SAD than for other anxiety disorders in youth. We contend that failure to tackle worry and its associated cognitive variables in the treatment of youth SAD may at least in part explain the poorer treatment outcomes for this disorder. This study seeks to examine whether a cognitive behavioural therapy (CBT) program for SAD leads to changes in worry, IU, NBW, PBW, NPO and CA despite not targeting these constructs directly. The study is exploratory in nature. It is likely that CBT for SAD may indirectly target some cognitive variables but not others, and thus we may see reductions in some cognitive variables but not others at the 12-week assessment and by follow-up. Thus, precise hypotheses are not stipulated.

As well as examining whether CBT for SAD leads to changes in worry and the cognitive variables with which it is associated, we are also interested in determining whether baseline levels of worry and the cognitive variables, as well as changes in worry and the cognitive variables, differ between those whose SAD remits following treatment and those who retain their SAD diagnosis at post-assessment. If particular cognitive variables do not reduce following CBT and differentiate between those who lose versus retain their SAD diagnosis, then we will have some evidence to suggest that including strategies directly targeting these particular cognitive variables may improve treatment outcome.

2. Methods

2.1. Participants

Participants were 125 youth (75 females) aged between 8 and 17 years ($M = 11.28$, $SD = 2.68$) with a primary diagnosis of SAD. This study formed part of a larger RCT examining the relative efficacy of a generic online program for youth anxiety disorders (Brave-G) and a SAD-specific online program (Brave-S), the results of which are presented elsewhere (Spence, Donovan, March, Kenardy, & Hearn, 2017). Because no differences were found between the two programs in terms of treatment outcome in that study, they were combined for the purposes of the current study into one 'treatment' group (TX), resulting in 95 participants in the TX condition and 30 in the waitlist condition (WLC). Table 1 presents the diagnostic and sociodemographic information for the participants and Fig. 1 shows the flow of participants through the study.

Participation requirements included being aged between 8 and 17 years, having a minimum reading age of 8 years, being English speaking, and having access to a computer and the Internet. Participants were required to meet DSM-5 criteria for a primary diagnosis of SAD at a clinical severity rating (CSR) of 4 or more (on a scale from 0 to 8) according to the Anxiety Disorders Interview Schedule (ADIS, see below; Silverman & Albano, 1996). Comorbidity with other anxiety disorders, depression and externalising disorders was permissible. Ineligibility criteria included the presence of a pervasive developmental disorder, an intellectual or learning disability, a diagnosis of dysthymia or depression at a CSR of 5 or higher, having acute psychiatric disorders (including psychosis or suicidal ideation) or receiving current treatment for anxiety. Excluded youth were provided with

Table 1
Sociodemographic details for participants at baseline.

	Total	WLC	Treatment
	(N = 125)	(n = 30)	(n = 95)
Age in Years (*SD*)	11.28 (2.68)	11.60 (2.72)	11.18 (2.67)
Range (years)	8–17	8–16	8–17
Female N (%)	75 (60)	16 (53.3)	59 (62.1)
Country of Birth (%)			
Australia	104 (83.3)	26 (86.7)	78 (82.1)
USA/Canada	6 (5.6)	1	5
United Kingdom	5 (4.0)	1	5
New Zealand	3 (2.4)	1	2
Europe	2 (1.6)	1	1
Africa	2 (1.6)	0	2
Asia	1 (0.8)	0	2
Other/Missing	2 (1.6)	0	0
Indigenous Australian (*n* = 124, %)	3 (2.4)	0	3 (3.2)
Living Arrangements			
Both biological parents	106 (84.9)	27 (90)	79 (83.2)
SES (*n* = 119, *SD*)			
High (> AUS$100 001)	69 (54.8)	14 (46.7)	55 (57.9)
Low + Middle (< 100,000 k)	50 (40.5)	15 (50.0)	35 (36.8)
Program Age Group (%)			
Child	79 (63.2)	18 (60)	61 (64.5)
Teen	46 (36.8)	12 (40)	34 (35.8)
CSR (Primary DX: SAD, %)	6.85 (0.97)	6.73 (0.8)	6.88 (1.0)
CGAS (%)	46.03 (6.83)	46.53 (6.08)	45.87 (7.07)
Secondary Diagnosis (%)			
None	27 (21.6)	5 (16.7)	22 (23.3)
Selective mutism	14 (11.2)	3 (10.0)	11 (11.6)
GAD	44 (28.9)	8 (26.7)	36 (37.9)
Separation Disorder	10 (6.6)	2 (6.7)	8 (8.4)
Specific Phobia	21 (13.8)	8 (26.7)	13 (13.9)
Dysthymia	6 (3.9)	3 (10.0)	3 (3.2)
Other Enur/pan/agor/ODD/OCD	3 (2.0)	1 (3.3)	2 (2.2)
Tertiary Diagnosis (%)			
None	54 (43.2)	25 (83.3)	76 (80.0)
GAD	26 (20.8)	1 (3.3)	2 (2.1)
Separation Disorder	13 (10.4)	0	3 (3.2)
Specific Phobia	22 (17.6)	3 (10)	12 (12.7)
Dysthymia	3 (2.4)	0	2 (2.1)
Other Enur/pan/agor/ODD/OCD	7 (5.6)	1 (3.3)	0
Number of anxiety DXs	2.86 (1.56)	2.73 (1.14)	2.90 (1.67)
Total number of DXs	3.03 (1.70)	2.93 (1.39)	3.06 (1.80)
Cognitive Variables			
Worry	28.02 (8.82)	27.18 (8.15)	28.03 (8.82)
IU	36.37 (10.59)	37.48 (12.77)	36.01 (9.86)
NPO	10.66 (4.61)	10.14 (5.05)	10.82 (4.48)
PBW	8.96 (3.17)	8.86 (2.45)	8.99 (3.38)
NBW	13.17 (3.63)	12.21 (3.27)	13.15 (3.74)
CA	53.30 (11.53)	54.14 (10.04)	53.04 (11.99)

Note: Values represent number of participants (percentages) or means ± SD, as appropriate. CSR = Clinician Severity Rating; CGAS = Children's Global Assessment Scale; DX = diagnosis; GAD = Generalized Anxiety Disorder; Enur = Enuresis; Pan = Panic Disorder; Agor = agoraphobia; ODD = Oppositional Defiant Disorder; OCD = Obsessive Compulsive Disorder; IU = Intolerance of Uncertainty; NPO = Negative Problem Orientation; PBW = Positive Beliefs About Worry; NBW = Negative Beliefs About Worry; CA = Cognitive Avoidance.

appropriate referral options.

2.2. Procedure

Ethical approval was granted from the Griffith University Human Research Ethics Committee. Participants self-referred and were recruited across Australia via information sent to teachers, parents, mental health professionals, the media and social media. Applicants meeting telephone screening inclusion and exclusion criteria were directed to an online site for additional information and were required to provide consent and agreement to participate. The child and participating parent completed a structured diagnostic interview by telephone and completed online questionnaires. Interviews were conducted by provisional psychologists with extensive training and experience in conducting ADIS interviews, with supervision provided by experienced clinical psychologists. Following initial assessment, families were randomly allocated to Brave-G, Brave-S or WLC. Participants in the WLC received access to the Brave-S program following completion of post-assessment measures.

3. Measures

3.1. Diagnostic status and clinician severity rating (CSR)

Child diagnostic status was assessed using the semi-structured Anxiety Disorders Interview Schedule for Children (ADIS C/P; Silverman & Albano, 1996) that enables clinicians to diagnose anxiety and related disorders according to DSM-IV diagnostic categories. Prior to confirming diagnoses, clinicians compared ADIS results and interview data against DSM-5 criteria to ensure that DSM-5 criteria were also met. Following administration of the ADIS, and based upon combined child and parent reports as stipulated by Silverman and Albano (1996), clinicians established a clinical severity rating (CSR) for each diagnosis obtained. CSRs range from 0 to 8, with CSRs of 4 or more considered to be clinical-level. The ADIS is considered the gold standard for determining diagnostic status in children (Silverman, Saavedra, & Pina, 2001) and when administered over the telephone, it retains its excellent psychometric properties and inter-rater reliability (Lyneham & Rapee, 2005). In the present study, high inter-rater agreement was found for the ADIS composite primary diagnosis, with a kappa of 0.84, an inter-rater reliability Cronbach's alpha of 0.98, and an intra-class correlation of 0.96 for the CSR.

3.2. Social anxiety symptoms

Symptoms of social anxiety were assessed using parent and child reports of the 10-item version of the Social Phobia and Anxiety Inventory for Children (SPAI-10; Beidel, Turner & Morris − personal communication, 2012). The SPAI-C/P-10 comprises 10 items measuring cognitive, somatic and behavioural aspects of social anxiety, eight of which have subsidiary ratings. In total, there are 29 ratings, each made on a 3-point scale from 0 ("never or hardly ever") to 2 (most of the time or always"). Scores may range from 0 to 58, with higher scores indicating greater social anxiety. At baseline in the present study, the Cronbach's alpha was 0.91 for the child version and 0.92 for the parent version.

3.3. Overall functioning

After administering the ADIS, clinicians established each child's level of overall functioning using the Children's Global Assessment Scale (CGAS; Shaffer et al., 1983). CGAS scores can range from 1 to 100, with higher scores indicating better overall functioning. The CGAS is a valid and reliable instrument, with an inter-rater reliability of 0.84 and a six-month test-retest reliability of 0.85 (Shaffer et al., 1983). In the present study, inter-rater reliability for the CGAS was determined in the same manner as the ADIS, and yielded a Cronbach's alpha of 0.90 and an intra-class correlation of 0.80 between independent raters.
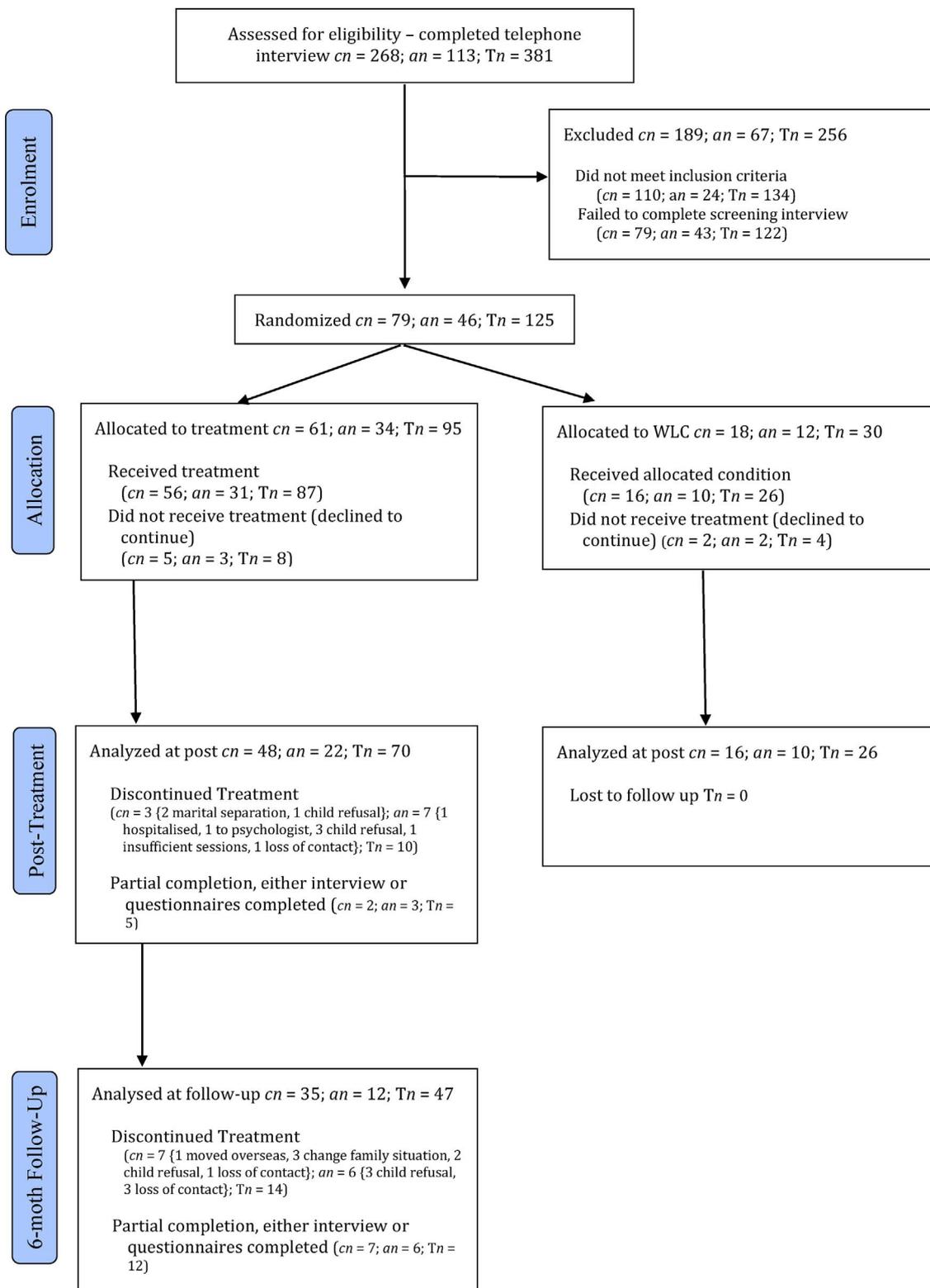
Fig. 1. Flow diagram showing the progression of participants through the study.

Note: cn = number of child participants, an = number of adolescent participants; Tn = total number of participants.

3.4. Penn state worry questionnaire for children short form (PSWQ-C-SF; Muris, Meesters, & Gobel, 2001).)

The 11-item PSWQ-C-SF was used to assess worry. Youth were required to indicate how true each statement was for them on a 4-point Likert scale ranging from 0 ("not at all true") to 3 ("always true").

Scores could therefore range from 0 to 33, with higher scores indicating greater worry. The PSWQ-C-SF has yielded a Cronbach's alpha of 0.89 for children in a previous study (Muris, Meesters, & Gobel, 2001), and in the present study yielded an internal consistency of 0.90.

3.5. Intolerance of uncertainty scale – 12 (IUS-12; Carleton, Norton, & Asmundson, 2007).)

IU was measured using a modified version of the adult IUS-12. To facilitate understanding for a younger sample, 8 items (items 1, 4, 6, 7, 8, 9, 10, 11) from the 27-item Intolerance of Uncertainty Scale for Children (IUS-C; Comer et al., 2009) were substituted without change with the corresponding 8 items from the IUS-12. The modified IUS-12 required youth to rate the extent to which each item described them on a 5-point Likert scale ranging from 1 ("not at all") to 5 ("very much"). The total score can range from 12 to 60, with higher scores indicating greater IU. The IUS-C has yielded excellent internal consistency ($\alpha = 0.94$) in a clinically anxious sample of youth aged 7–17 years (Comer et al., 2009), and the IUS-12 has demonstrated good internal consistency ($\alpha = 0.94$) with adults (Carleton et al., 2007). The internal consistency for the modified IUS-12 used in the present study was 0.90.

3.6. Social problem solving inventory revised short-form (SPSI-R-SF; D'Zurilla et al., 2001)

NPO was assessed using the 5-item NPO subscale of the SPSI-R-SF. Youth were required to rate how true each item was for them on a 5-point Likert Scale ranging from 0 ("not at all true of me") to 4 ("extremely true of me"). Scores could range from 0 to 20, with higher scores indicating greater NPO. Minor wording modifications were made to two items to suit a younger population. For example, "When I am faced with a difficult problem, I doubt that I will be able to solve it on my own no matter how hard I try" was modified to read "When I am faced with a difficult problem, I don't believe I can solve it no matter how hard I try." The NPO subscale has demonstrated good test-retest reliability of 0.79 over a three-week period, and has previously demonstrated Cronbach's alphas of 0.83–0.86 (D'Zurilla et al., 2001; Hawkins et al., 2009). The internal consistency of the NPO subscale in this study was 0.82.

3.7. Meta-Cognitions questionnaire for children (MCQ-C; Bacow, Pincus, Ehrenreich & Brody, 2009).)

The PBW and NBW subscales of the MCQ-C were used to measure PBW and NBW. Each subscale contains six items and each requires youth to indicate their degree of agreement with each statement on a 4-point Likert scale ranging from 1 ("do not agree") to 4 ("agree very much"). Scores on each subscale may range from 6 to 24, with higher scores indicating greater PBW or NBW. Cronbach's alphas have been found to range from 0.60 to 0.89 for the PBW subscale, and between 0.74 and 0.76 for the NBW subscale (Bacow et al., 2009). In the present study, Cronbach's alphas of 0.65 and 0.75 were found for the NBW and PBW subscales respectively.

3.8. White)bear suppression inventort (WBSI; Wegner & Zanakos, 1994)

The 15-item WBSI assesses Cognitive Avoidance and requires youth to indicate their agreement with each item on a 5-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Scores may range from 15 to 75, with higher scores indicating greater CA. Minor wording modifications were made to three items to suit a youth population. For example, in item 4, the word 'erase' was substituted for 'get rid of', in item 5 the word 'frequently' was substituted for 'often', and in item 10 the word 'intruding' was substituted for 'coming'. Farrell and Barrett (2006) used a similarly modified version of the WBSI with children aged 6–17 years, yielding an internal consistency of 0.93. The Cronbach's alpha for the WBSI in this study was 0.92.

4. Treatment

Participants received one of two online CBT treatment programs for

anxiety, either Brave-G, or Brave-S. Brave-G was designed as an online generic CBT treatment program for anxious youth aged 8–18 years, and has demonstrated efficacy (for more details see March, Spence, & Donovan, 2009; Spence et al., 2008; Spence et al., 2011). The Brave Program for Social Anxiety (Brave-S; Spence et al., 2017) includes additional elements including social skills training and greater emphasis of SAD specific cognitions. Both programs consist of 10 weekly, 60-minute interactive sessions for youth, with two booster sessions following program completion with brief therapist support. Neither program focuses directly on the cognitive variables considered in this study (i.e., worry, IU, NBW, PBW, NPO and CA).

5. Statistical analyses

To establish treatment efficacy, it was important to demonstrate that the TX group was superior to the WLC in terms of anxiety reduction. This was achieved with linear mixed modelling (LMM) using Intention-to-treat (ITT) analyses. LMM with ITT analyses were also used to assess whether worry and its associated cognitive variables changed as a function of treatment. To assess whether there were significant differences between those who lost versus retained their SAD diagnosis, a series of one-way between-group analyses of variance (ANOVAs) were conducted, with loss versus retention of diagnosis serving as the between group variable and worry and cognitive variable change scores, as well as baseline levels of worry and the cognitive variables, serving as dependent variables.

In terms of power, we would expect a large effect size between the TX and WLC group. A power analysis using Gpower indicated that a total sample of 62 participants would be needed to detect a large effect size (.4) with 80% power with an alpha at 0.05. Therefore, the study was sufficiently powered.

6. Results

6.1. Pre-treatment differences

There were no significant pre-treatment differences between the TX and WLC groups on demographic variables, SAD symptoms, SAD severity, overall functioning, number of comorbid diagnoses, worry, or any of the cognitive variables. See Table 1.

6.2. Correlations

Bivariate correlations suggest that youth-rated SAD symptoms were positively and significantly related to worry, IU, NBW, NPO and CA and were unrelated to PBW (Table 2). Parent-rated SAD symptoms were significantly and positively related to worry, IU, NBW and NPO and were unrelated to PBW and CA. CSR was significantly and positively related to IU and NPO. Finally, overall functioning was significantly and negatively related to worry, IU and NPO.

6.3. Treatment-related changes

The estimated means and standard errors for the CSR, CGAS, SPAI-C/P and cognitive variables for each group at each occasion are shown in Tables 3 and 4 , , with details regarding effect sizes and confidence intervals presented in Tables 5 and 6 , .

6.3.1. 12-week-assessment

There were significant time effects for CSR, $F = 60.00$ (118.97), $p < 0.001$, CGAS, $F = 81.58$ (115.63), $p < 0.001$, SPAI-C, $F = 20.80$ (101.21), $p < 0.001$, and SPAI-P, $F = 25.88$ (105.67), $p < 0.001$. Significant group by time effects were also evident for CSR, $F = 14.22$ (118.97), $p < 0.001$ CGAS, $F = 12.42$ (115.63), $p = 0.001$, SPAI-C, $F = 5.06$ (101.21), $p = 0.027$, and SPAI-P, $F = 10.41$ (105.67), $p = 0.002$. Table 2 suggests that compared to the WLC group from pre-

Table 2
Correlations and Descriptive Statistics at Baseline (N = 125).

Variables	CSR	CGAS	SPAI-P	SPAI-C	IU	NPO	PBW	NBW	CA	worry
CSR	–									
CGAS	−0.89**	–								
SPAI-P	.40**	−0.35**	–							
SPAI-C	.36**	−0.32**	.41**	–						
IU	.20*	−0.23*	.32**	.60**	–					
NPO	.35**	−0.43**	.27**	.32**	.45**	–				
PBW	0.10	−0.06	0.07	0.01	0.18	−0.02	–			
NBW	0.09	−0.07	.23*	.36**	.37**	.23*	0.08	–		
CA	0.06	−0.13	0.16	.41**	.56**	.48**	0.08	.42**	–	
Worry	0.16	−0.19*	.27**	.58**	.67**	.48**	0.02	.48**	.56**	–
M (total)	6.78	46.40	35.81	29.03	36.37	10.66	8.96	13.17	53.30	28.03
SD (total)	0.98	7.57	11.13	11.59	10.59	4.61	3.17	3.63	11.53	8.82

Note: CSR – Clinician Severity Rating; CGAS – Children's Global Assessment Scale; SPAI-P/C – Social Phobia and Anxiety Inventory, child and parent versions; IU – Intolerance of Uncertainty; NPO – Negative Problem Orientation; on Inventory; PBW – Positive Beliefs About Worry; NBW – Negative Beliefs About Worry; CA – Cognitive Avoidance.
* p < 0.05.
** p < 0.01.

Table 3
Estimated Marginal Means and Standard Errors for Continuous Variables from Baseline to 12-week Assessment for ITT Analysis.

Condition		WLC		Treatment	
Measure	Time	*M*	*SE*	*M*	*SE*
CSR	Baseline	6.73	0.30	6.88	0.17
	12-wks	5.95	0.31	4.62	0.18
CGAS	Baseline	46.53	1.48	45.87	0.83
	12-wks	51.41	1.54	56.99	0.90
SPAI-C	Baseline	26.64	2.23	28.39	1.25
	12-wks	23.96	2.35	20.50	1.38
SPAI-P	Baseline	37.09	1.98	36.18	1.11
	12-wks	34.94	2.08	26.54	1.24
Worry	Baseline	27.03	1.55	28.07	0.87
	12-wks	25.26	1.61	22.32	0.95
IU	Baseline	37.00	1.99	35.46	1.12
	12-wks	33.67	2.08	28.07	1.22
NPO	Baseline	10.46	0.86	10.86	0.48
	12-wks	9.26	0.88	6.95	0.53
PBW	Baseline	8.84	0.61	8.99	0.34
	12-wks	9.23	0.63	8.77	0.38
NBW	Baseline	13.58	0.69	13.15	0.38
	12-wks	13.14	0.72	12.05	0.44
CA	Baseline	53.10	2.30	53.04	1.30
	12-wks	49.81	2.41	45.526	1.44

Note. CSR = Clinician Severity Rating; CGAS = Children's Global Assessment Scale; SPAI-C/P = Social Phobia and Anxiety Inventory for Children- Child/Parent; IU = Intolerance of Uncertainty; NPO = Negative Problem Orientation; PBW = Positive Beliefs About Worry; NBW = Negative Beliefs About Worry; CA = Cognitive Avoidance.

Table 4
Estimated Marginal Means and Standard Errors from Baseline to 12-week Assessment and 6- Follow-up for ITT Analysis.

Condition		Treatment	
Measure	Time	*M*	*SE*
CSR	Baseline	6.88	0.21
	12-wks	4.63	0.23
	6-mth fup	2.93	0.25
CGAS	Baseline	45.87	0.98
	12-wks	56.92	1.05
	6-mth fup	63.43	1.10
SPAI-C	Baseline	28.39	1.19
	12-wks	20.54	1.33
	6-mth fup	16.71	1.49
SPAI-P	Baseline	36.14	1.14
	12-wks	26.47	1.28
	6-mth fup	21.94	1.38
Worry	Baseline	28.07	0.80
	12-wks	22.34	0.90
	6-mth fup	20.60	1.00
IU	Baseline	35.46	1.01
	12-wks	28.04	1.13
	6-mth fup	24.84	1.28
NPO	Baseline	10.83	0.45
	12-wks	6.96	0.50
	6-mth fup	5.49	0.58
PBW	Baseline	8.99	0.33
	12-wks	8.78	0.37
	6-mth fup	7.97	0.42
NBW	Baseline	13.15	0.38
	12-wks	12.01	0.43
	6-mth fup	11.72	0.50
CA	Baseline	53.04	1.34
	12-wks	45.48	1.51
	6-mth fup	42.58	1.72

Note. CSR = Clinician Severity Rating; CGAS = Children's Global Assessment Scale; SPAI-C/P = Social Phobia and Anxiety Inventory for Children-Child/Parent; IU = Intolerance of Uncertainty; NPO = Negative Problem Orientation; PBW = Positive Beliefs About Worry; NBW = Negative Beliefs About Worry; CA = Cognitive Avoidance.

to post-assessment, the TX group demonstrated a significantly greater reduction in diagnostic severity and child/parent rated SAD symptoms, as well as a significantly greater improvement in terms of overall functioning. Additionally, for the ITT sample, 13.68% of TX participants no longer met criteria for their SAD diagnosis at post-assessment compared to 2.3% of the WLC. A Chi-square test for independence (with Yates Continuity Correction) indicated no significant difference between the TX group and the WLC in terms of percent free of their primary diagnosis at post-assessment, χ^2 (1, 125) = 1.53, p = 0.22, phi = 0.14.

6.3.2. 6-month follow-up

At 6-month follow-up when the WLC were no longer part of the study, there were significant time effects found on CSR, F = 119.93

(163.29), p .001 < 0.001, CGAS, F = 150.47 (158.26), p < 0.001, SPAI-C, F = 41.15 (128.03), p < 0.001, and SPAI-P, F = 61.26 (141.86), p < 0.001. Tables 3 and 4 suggest that the reductions in CSR and child/parent rated SAD symptoms, and the improvement in overall functioning evident at 12-week assessment for the TX group, were maintained or further enhanced at 6-month follow-up. Furthermore, for

Table 5
Mixed Model Effects for Treatment vs WLC Comparing Baseline and 12-week Processing for ITT Analysis.

	CSR			CGAS			SPAI-P			SPAI-C			Worry		
	B (SE)	t (CIs)	d	B (SE)	t (CIs)	d	B (SE)	t (CIs)	d	B (SE)	t (CIs)	d	B (SE)	t (CIs)	d
Treatment vs WLC															
Intercept at Pre-															
WLC	6.73 (.30)	22.72*** (6.15–7.32)		56.99 (.90)	63.48*** (55.22–58.76)		26.54 (1.24)	21.43*** (24.10–28.99)		20.50 (1.38)	14.86*** (17.78–23.22)		22.32 (.95)	23.50*** (20.45 – 24.19)	
WLC vs Treatment	0.15 (.34)	0.44 (=0.52 – 0.82)		−5.58 (1.78)	−3.13** (−9.10−2.06)		8.39 (2.42)	3.47** (3.63–13.16)		3.46 (2.73)	1.27 (−1.92–8.83)		2.94 (1.87)	1.57 (−0.75 – 6.63)	
Slope Pre to 12 wks															
WLC	−78 (.34)	2.30* (−1.45–0.11)	0.48	−11.12 (.89)	−12.47*** (−12.89−9.35)	1.37	9.59 (1.19)	8.08*** (7.24–11.95)	0.89	7.89 (1.19)	6.65** (5.54–10.24)	0.65	5.76 (.79)	7.29*** (4.19–7.32)	0.68
WLC vs Treatment	−1.48 (.39)	−3.77*** (−2.26−0.70)	0.91	6.24 (1.77)	3.54** (2.73 – 9.75)	0.77	−7.44 (2.31)	−3.23** (−12.02−2.87)	0.69	−5.21 (2.32)	−2.25* (−9.81−0.62)	0.43	−3.98 (1.53)	−2.60* (−7.01−0.95)	0.47
Random Effects															
Residual variance	1.61			32.43			52.47			50.96			22.78		
Intercept variance	1.03			33.50			64.21			97.91			49.20		

	IU			NPO			PBW			NBW			CA		
	B (SE)	t (CIs)	d	B (SE)	t (CIs)	d	B (SE)	t (CIs)	d	B (SE)	t (CIs)	d	B (SE)	T (CIs)	d
Intercept at Pre-															
WLC	28.07 (1.22)	22.94*** (25.65–30.48)		6.95 (.53)	13.07*** (5.90–8.00)		8.77 (.38)	23.27*** (8.03–9.52)		12.05 (.44)	27.44*** (11.18–12.92)		45.53 (1.44)	31.54*** (42.68–48.37)	
WLC vs Treatment	5.61 (2.41)	2.33* (.85–10.36)		2.31 (1.03)	2.24* (.28–4.33)		0.45 (.74)	0.62 (−1.0−1.91)		1.09 (.85)	1.29 (−0.58–2.76)		4.28 (2.81)	1.52 (−1.26–9.83)	
Slope Pre to 12 wks															
WLC	7.40 (1.06)	6.98*** (5.30–9.50)	0.68	3.91 (.52)	7.50*** (2.87–4.94)	0.85	0.21 (.34)	0.62 (.46 – 0.89)	0.06	1.10 (.47)	2.34* (.17 – 2.04)	0.29	7.52 (1.35)	5.57*** (4.84–10.19)	0.60
WLC vs Treatment	−4.07 (2.06)	−1.97 (−8.16−.02)	0.37	−2.70 (1.02)	−2.65** (−4.73−.68)	0.59	−0.60 (.66)	−0.91 (−1.92 – 0.71)	0.18	−0.67 (.93)	−0.72 (−2.50–1.17)	0.18	−4.22 (2.61)	−1.62 (−9.40–0.95)	0.36
Random Effects															
Residual variance	41.67			9.74			4.22			8.37			66.73		
Intercept variance	77.27			11.19			6.73			5.54			91.53		

Note: *p < 0.05, **p < 0.01, ***p < 0.001. CSR = Clinician Severity Rating; CGAS=Children's Global Assessment Scale; SPAI-C/P = Social Phobia and Anxiety Inventory for Children-Child/Parent; IU = Intolerance of Uncertainty; NPO=Negative Problem Orientation; PBW = Positive Beliefs About Worry; NBW = Negative Beliefs About Worry; CA = Cognitive Avoidance.

Table 6
Mixed Model Effects for Treatment Group Comparing Baseline and 6-month Follow-up for ITT Analysis.

	CSR			CGAS			SPAI-P			SPAI-C			Worry		
	B (SE)	t (CIs)	d	B (SE)	t (CIs)	d	B (SE)	t (CIs)	d	B (SE)	t (CIs)	d	B (SE)	t (CIs)	d
Intercept at Pre-Treatment	6.88 (0.21)	32.43*** (6.47–7.30)		45.87 (.98)	46.91*** (43.94–47.80)		36.14 (1.14)	31.78*** (33.89–38.38)		28.40 (−11.68)	23.78*** (26.03–30.75)		28.07 (.80)	35.03*** (26.49–29.66)	
Slope Pre to 12 wks.	−3.96 (.26)	−32.43*** (6.47–7.30)	1.91	17.56 (1.04)	16.62*** (15.49–19.62)	1.84	−14.20 (1.36)	−10.42*** (−16.89−−11.51)	1.28	−11.68 (1.39)	−8.44*** (−14.42−−8.94)	1.00	−7.48 (.98)	−7.64*** (−9.41−5.54)	0.96
Slope Pre to 6-mth	−2.26 (0.25)	−15.23** (−4.47−−3.44)	1.10	11.05 (0.98)	11.25** (9.11–12.99)	1.16	−9.66 (1.25)	−7.71** (−12.14−−7.19)	0.87	−7.85 (1.22)	−6.46*** (−10.26−−5.45)	0.67	−5.74 (.87)	−6.60*** (−7.45−4.02)	0.73
Random Effects															
Residual variance	2.47			39.31			59.08			54.10			28.17		
Intercept variance	1.81			51.53			63.72			81.30			32.85		

	IU			NPO			PBW			NBW			CA		
	B (SE)	t (CIs)	d	B (SE)	t (CIs)	d	B (SE)	t (CIs)	d	B (SE)	t (CIs)	d	B (SE)	T (CIs)	d
Intercept at Pre-Treatment	35.46 (1.01)	35.05*** (33.46–37.46)		10.82 (.45)	23.82*** (9.93–11.72)		8.99 (.33)	27.15*** (8.33–9.64)		13.15 (.38)	34.97*** (12.41–13.89)		53.04 (1.34)	39.70*** (50.40–55.68)	
Slope Pre to 12 wks	−10.63 (1.27)	−8.38*** (−13.14−−8.12)	1.08	−5.33 (.60)	−8.86*** (−6.52−−4.14)	1.24	−1.01 (.39)	−2.57* (−1.80−−0.23)	0.31	−1.44 (.38)	−2.74** (−2.47−−0.40)	0.39	−10.47 (1.73)	−6.06*** (−13.88−−7.05)	0.80
Slope Pre to 6-mth	−7.42 (1.12)	−6.67 (−9.62−−5.22)	0.75	−3.86 (.53)	−7.29*** (−4.91−−2.81)	0.90	−0.21 (.34)	−0.61 (−0.89−0.47)	0.07	−1.14 (.46)	−2.49* (−2.05−−0.24)	0.31	−7.56 (1.52)	−1.52 (−10.56−−4.55)	.58
Random Effects															
Residual variance	46.88			10.26			4.33			7.89			85.81		
Intercept variance	50.39			8.25			6.07			5.55			83.75		

Note: *p < 0.05, **p < 0.01, ***p < 0.001. CSR = Clinician Severity Rating; CGAS = Children's Global Assessment Scale; SPAI-C/P = Social Phobia and Anxiety Inventory for Children-Child/Parent; IU = Intolerance of Uncertainty; NPO = Negative Problem Orientation; PBW = Positive Beliefs About Worry; NBW = Negative Beliefs About Worry; CA = Cognitive Avoidance.

the ITT group by 6-month follow-up, the number of TX youth who were free of their SAD diagnosis had increased to 64.2%.

6.4. Changes in worry and cognitive variables following treatment

6.4.1. 12-week assessment

Significant time effects were found for worry, $F = 24.25$ (101.13), $p < 0.001$, NPO, $F = 25.11$ (97.44), p < 0.001, IU, $F = 27.04$ (103.21), $p < 0.001$, and CA, $F = 17.15$ (101.85), $p < 0.001$. Significant group by time interactions were only evident for worry, $F = 6.77$ (101.13), $p = 0.011$, and NPO, $F = 7.04$ (97.44), $p = 0.009$. Inspection of Table 5 suggests that from pre- to 12-week assessment, the TX group demonstrated a significantly greater reduction in worry and NPO compared to the WLC, and that both the TX and WLC groups reduced in IU and CA to the same extent over the same time period. Neither group demonstrated reductions in PBW or NBW at 12-week assessment.

6.4.2. 6-month follow-up

From pre- to 6-month follow-up when the WLC was no longer part of the study, there were significant time effects for worry, $F = 36.24$ (133.73), $p < 0.001$, IU, $F = 41.61$ (134.20), $p < 0.001$, NPO, $F = 47.63$ (128.37), $p < 0.001$, PBW, $F = 3.41$ (125.11), $p = 0.036$, NBW, $F = 4.96$ (135.04), $p = 0.008$, and CA, $F = 22.31$ (133.04), p .001 < 0.001. Table 6 suggests that the reductions in worry, NPO, IU and CA evident at 12-week assessment were maintained or further enhanced at 6-month follow-up, and that there were significant reductions in NBW and PBW evident at 6-month follow-up that were not evident at the 12-week assessment point.

6.5. Differences between those who lost versus retained their SAD diagnosis following treatment

6.5.1. Changes in worry and its associated cognitive variables

Inspection of Tables 7 and 8 , demonstrates that there were no significant differences between those who lost versus those who retained their SAD diagnosis at 12-week assessment on changes in worry or any of the cognitive variables. However, by 6-month follow-up, there was a statistically significant difference between those who lost and those who retained their SAD diagnosis on changes in worry scores from pre- to follow-up, $F(1.48) = 9.43$, $p. = 0.004$, even after

Table 7

Means of change scores in worry and cognitive variables from pre- 12-weeks, and pre- to 6-month follow-up, for those who lost versus those who retained their SAD diagnosis.

Mean change of worry and cognitive variables						
	12-weeks			6-month Follow-up		
	Retained SAD DX	Lost SAD DX		Retained SAD DX	Lost SAD DX	
	M (SE)	M (SE)	p.	M (SE)	M (SE)	p.
Measures						
Worry	7.56 (8.93)	9.36 (8.78)	0.56	7.62 (8.83)	10.89 (8.49)	0.004**
IU	11.00 (10.82)	12.00 (12.02)	0.80	8.90 (11.03)	12.25 (11.03)	0.31
NPO	5.98 (4.32)	3.30 (5.16)	0.14	4.93 (.99)	5.52 (4.93)	0.69
NBW	1.6 (3.05)	−0.25 (4.96)	0.17	.89 (2.33)	2.15 (4.72)	0.29
CA	8.09 (12.02)	7.67 (15.08)	0.17	5.45 (12.00)	14.71 (15.60)	.031*

Note: *p < 0.05, **p < 0.01, ***p < 0.001.
DX = diagnosis; IU = Intolerance of Uncertainty; NPO = Negative Problem Orientation; NBW = Negative Beliefs About Worry; CA = Cognitive Avoidance.

Table 8

Means of baseline levels of worry and cognitive variables at 12-weeks and 6-month follow-up, for those who lost versus those who retained their SAD diagnosis.

Mean of baseline levels of worry and cognitive variables						
	12-weeks			6-month Follow-up		
	Retained SAD DX	Lost SAD DX		Retained SAD DX	Lost SAD DX	
	M (SE)	M (SE)	p.	M (SE)	M (SE)	p.
Measures						
Worry	29.76 (7.63)	23.46 (4.41)	0.01**	29.00 (7.35)	27.43 (8.87)	0.45
IU	37.33 (9.90)	30.25 (10.64)	0.03*	37.00 (8.70)	32.87 (11.05)	0.10
NPO	11.79 (4.29)	7.25 (3.41)	0.001***	12.18 (3.57)	9.39 (4.34)	0.01**
NBW	13.74 (3.52)	11.39 (4.41)	0.038*	13.39 (3.60)	12.52 (.64)	0.33
CA	56.00 (10.32)	47.00 (10.32)	0.009**	55.81 (10.66)	51.81 (12.38)	0.22

Note: *p < 0.05, **p < 0.01, ***p < 0.001.
DX = diagnosis; IU = Intolerance of Uncertainty; NPO = Negative Problem Orientation; NBW = Negative Beliefs About Worry; CA = Cognitive Avoidance.

controlling for baseline severity, $F(2.47) = 6.34, p. = 005$, and changes in CA scores from pre- to follow-up, $F(1.46) = 4.95$, $p. = 0.031$, even after controlling for baseline severity, F(2.45) = 3.23, $p. = 0.041$, indicating that those who had lost their diagnosis by 6-month follow-up demonstrated greater reductions in worry and CA compared to those who retained their diagnosis. There were no significant differences between those who lost versus retained their diagnosis at 6-month follow-up in terms of changes in IU, NBW, PBW or NPO.

6.5.2. Baseline levels of worry and its associated CVs variables and loss of diagnosis

There were statistically significant differences found at 12-week assessment between those who retained versus those who lost their SAD diagnosis on baseline levels of worry, $F(1.73) = 7.04$, $p. = 0.010$, IU, $F(1.73) = 5.05$, $p. = 0.028$, NPO, $F(1.71) = 11.91$, $p. = 0.001$, NBW, $F(1.76) = 4.44$, $p. = 0.038$, and CA, $F(1.76) = 7.23, p. = 0.009$, but not PBW. These results were retained even after controlling for baseline severity, worry, $F(2.72) = 6.69$, $p. = 0.013$, IU, $F(2.72) = 4.64$, $p. = 0.036$, NPO, $F(2.71) = 8.67$, $p. = 0.010$, NBW, $F(2.75) = 5.62$, $p. = 0.030$, and CA, $F(2.75) = 6.94$, $p. = 0.008$. Thus, it would seem that those who retained their diagnosis at 12-week assessment reported higher baseline levels of worry, IU, NPO, NBW and CA compared to those who lost their diagnosis. By 6-month follow-up, there was a statistically significant difference found between those who retained versus those who had lost their SAD diagnosis on baseline levels of NPO only, $F(1.59) = 7.58$, $p. = 0.01$, even after controlling for severity, $F(2.44) = 7.56$, $p. = 0.001$, with no significant differences between those who lost versus retained their diagnosis on baseline levels of worry, IU, NBW or CA. Hence, those who retained their SAD diagnosis at 6-month by follow-up demonstrated higher baseline levels of NPO.

7. Discussion

There were three main findings from this study. First, by 6-month follow-up of an online treatment program for youth SAD, worry, IU, NBW, PBW, NPO and CA had significantly reduced despite not being directly targeted in treatment. Second, compared to youth who retained their SAD diagnosis, those who had lost their diagnosis by 6-month follow-up showed greater reductions in worry and CA from pre-assessment to 6-month follow-up. Third, compared to youth who retained their SAD diagnosis, those who lost their diagnosis by 6-month follow-

up demonstrated lower baseline levels of NPO.

In addition, by the 12-week assessment point, many participants retained their SAD diagnosis, and this is thought to have occurred in part because not all participants had completed their online treatment by this point. Thus, by the 12-week assessment point, treatment related improvements were noted in severity, symptoms and overall functioning, and there were significant reductions in worry and NPO, and retention of SAD was found to be related to higher entry levels of worry, IU, NPO, NBW and CA.

Turning to the first main finding, the results suggested that worry, IU, NBW, PBW, NPO and CA improved significantly as a function of CBT treatment for SAD without being directly targeted during therapy. Thus, it would seem that online CBT treatment for SAD is sufficient to produce reductions in these cognitive processes. Although it is not possible to determine exactly how each of the cognitive variables changed as a function of the strategies taught in the online CBT program, it is likely that the cognitive restructuring and exposure components of the program had an indirect effect on these cognitive processes. With respect to the effects of cognitive restructuring, socially anxious youth frequently have cognitions such as, "No one will talk to me at the party and I'll look stupid" (worry thought), "I didn't talk enough and I said stupid things" (PEP thought), "If I worry through all possible eventualities, I'll be better prepared to deal with it when things go wrong at the party" (PBW thought), "If I don't stop worrying about the party, I'm going to make myself sick" (NBW thought), and "I need to stop thinking about the upcoming party!" (CA thought). Once young people were taught to identify, challenge and replace their unhelpful thoughts with more helpful thoughts through the program's cognitive restructuring sessions, such cognitions and the processes that underpin them, were likely reduced.

Exposure is also likely to have reduced worry and at least some of its related cognitive components for the youth in this study. Previous research has found that exposure to worry thoughts through planning for exposure can reduce worry, NBW and CA in adults (Hoyer et al., 2009), and can disconfirm worry thoughts and beliefs and demonstrate to the individual that the things they fear are unlikely to happen and that if they do happen, that they can cope better than they previously imagined (Bouchard, Mendlowitz, Coles, & Franklin, 2005; Kendall et al., 2006; Rapee et al., 2000; Tiwari, Kendall, Hoff, Harrison, & Fizur, 2013). Thus, planned and successful exposure to feared social situations may have served to reduce worry, IU, NPO, CA, NBW and PBW.

The second main finding of the study was that those who had lost their diagnosis by 6-month follow-up reported a greater reduction in CA and worry by that time point than those who retained their diagnosis. That greater reductions in CA and worry were related to loss of diagnosis speaks to the importance of worry and CA to youth SAD. That reductions in worry emerged as being related to a loss of SAD diagnosis is not surprising given that worry has been proposed to be transdiagnostic across the anxiety disorders (DiNardo & Barlow, 1990; McEvoy et al., 2010). Furthermore, one of the central maintaining features of SAD is negatively valenced repetitive thinking (Clark & Wells, 1995; Rapee & Heimberg, 1997), and the worry that occurs before and after social interactions for those with SAD is repetitive and negative, and centres on the perceived reasons for, and implications of, their social difficulties.

The importance of CA to youth with SAD is also not surprising given that socially phobic individuals are known to become preoccupied with negative thoughts concerning social situations and to have difficulty disengaging from unwelcome cognitions so as to enable them to engage in accurate processing of events (Clark & Wells, 1995; Kashdan & Breen, 2008; Magee & Zinbarg, 2007; Rapee & Heimberg, 1997), thus leading to attempts to avoid these distressing cognitions. This cognitive disengagement, or CA, results in the negative cognitions around social situations remaining unprocessed and social problems remaining unresolved, while the fear and avoidance of social situations persists. Although CBT for SAD was shown to reduce both worry and CA

significantly, it may be the case, given that both changes in worry and CA were associated with loss of SAD diagnosis that including strategies directly targeting worry and CA in treatment programs for youth SAD would enhance treatment outcome. Alternatively, they may be introduced as part of a stepped care approach for treatment non-responders. Future research should examine these ideas.

The third important finding from the study was that higher entry levels of NPO were linked to SAD retention by 6-month follow-up. Again, this finding is not altogether surprising given that NPO has been linked to SAD and other disorders that feature repetitive negative thought processes in adults (Fergus et al., 2015; McEvoy & Mahoney, 2012). Within SAD, ruminative negative thought about social interactions might activate the avoidance of future social situations where problems might occur. This avoidance of problems might prevent one from learning how to cope with and resolve social problems, and therefore increase the desire to avoid future social problems, thereby leading to a negative mindset around problems, or a NPO (Hasegawa et al., 2016). Given that high levels of NPO at baseline were associated with retention of SAD diagnosis at 6-month follow-up, it may be that assessing for NPO in socially anxious clients should be conducted as a matter of course. If high levels of NPO are found, then strategies directly targeting NPO should be included in treatment to enhance treatment outcome. Future research should examine the impact of including strategies aimed at reducing NPO in those with high baseline levels of the construct, perhaps in terms of a stepped care approach for treatment non-responders.

IU, PBW and NBW did not emerge as important to youth SAD in this study. IU was found to be related to SAD in youth, and reduced with CBT, but it was not found to be related to a loss or retention of SAD. In terms of PBW and NBW, it is possible, given the mixed findings related to the age effects in these variables as previously discussed, that either they do not develop until late adolescence or early adulthood, that the measures are inadequate to capture the existence of these constructs in youth (note the low alphas for PBW and NBW in this study), or that PBW and NBW are related to GAD but not SAD. Further research is required in order to understand these constructs and whether they are related in any way to SAD across the lifespan. If, in fact, IU, PBW and NBW are not related to SAD, then these variables would emerge as important discriminators between the worry in GAD versus SAD.

This study had a number of strengths. It was the first of its kind to examine how worry, IU, NBW, PBW, NPO and CA respond to current CBT treatments for SAD despite not being directly targeted. It was also the first to investigate the relationship between worry, IU, NBW, PBW, NPO and CA and treatment response. Furthermore, the study had sufficient power, ensured diagnostic status via gold standard clinical interviews and cross-informant procedures, and used measures with sound psychometric properties. Despite its strengths however, the study was not without its limitations. First, and perhaps most importantly, the fact that this treatment study was conducted using an online CBT treatment program, rather than face-to-face therapy, means that the results are somewhat confounded. Specifically, it is not clear whether the findings of the present study are the result of 'CBT treatment' or are the result of unspecified features of internet delivery. Although the program used in this study has been found to be equally efficacious as face-to-face CBT for youth anxiety (Spence et al., 2011), it is possible that aspects of internet delivery were responsible for the results. Thus, future research should replicate this study using a face-to-face therapy approach.

A second limitation is that although measures were chosen on the basis of their sound psychometric properties and prior use, some were not designed specifically for youth and are yet to undergo rigorous testing with youth populations. Future research should attempt to develop and psychometrically test the IUS-12 (Carleton et al., 2007) and the WBSI (Wegner & Zanakos, 1994) with child and youth populations to ensure psychometric strength. Additionally, this study does not provide information on whether worry, IU, NBW, PBW, NPO and CA

can explain SAD symptoms, severity and overall functioning over and above the variables hitherto found to be central to the disorder, nor the extent to which they might play a role in the maintenance of SAD. Future research should investigate these questions. Finally (and as alluded to above), it would be of interest to examine whether the inclusion of strategies aimed at reducing worry, CA and NPO into current CBT interventions might improve treatment outcomes, particularly for treatment non-responders or those who enter therapy with high levels of NPO.

In terms of additional areas for future research, given that GAD and SAD are highly comorbid, it would be interesting in future research to investigate whether the results found here would differ for those with pure SAD compared to those with SAD and secondary GAD. Future research could also investigate the effects of age and cognitive development on levels of, and changes in, worry and each of its associated cognitive variables

8. Conclusion

The current study advances our understanding of the cognitive constructs associated with youth SAD, a relatively common and debilitating disorder. The study demonstrated that worry, IU, NBW, NPO and CA are related to youth SAD, and that CBT treatment for SAD can reduce worry and the cognitive variables associated with it despite not targeting them. The study highlighted the particular importance of worry, CA and NPO to youth SAD. This research constitutes an important step in the examination of worry and its associated cognitive variables in youth SAD, and it is hoped that this study might spark new directions for research within the SAD literature. It is our hope that this research may help to improve our conceptualisation and treatment of SAD in youth so that the suffering experienced by young people afflicted with SAD can be alleviated.

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