

AN INVESTIGATION OF AN INTERNET-BASED COGNITIVE BEHAVIORAL THERAPY
PROGRAM FOR AUDITORY HALLUCINATIONS

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ABSTRACT

**KATY MARGARET HARPER: An Investigation of an Internet-Based Cognitive Behavioral Therapy Program for Auditory Hallucinations
(Under the direction of David Penn)**

Many individuals with schizophrenia spectrum disorders experience on-going symptoms despite adequate medication trials. Cognitive behavioral therapy (CBT) for psychosis and CBT for auditory hallucinations have been found to be effective adjunctive treatments in reducing positive and general symptoms associated with psychosis but are not widely available in North America. Internet CBT has emerged as a promising way to deliver empirically supported treatments to individuals who may not be able to otherwise access them. Internet CBT programs have been widely developed for anxiety, depressive, eating and substance use disorders yet, despite evidence that individuals with schizophrenia spectrum disorders are willing and able to use computer based interventions, no internet CBT programs have been developed for psychotic disorders. The current study is an investigation of a novel internet CBT program (Coping with Voices) for auditory hallucinations. Twenty-three individuals participated in a self-directed, ten session CBT program designed to alter maladaptive beliefs associated with auditory hallucinations, increase positive coping strategies and provide psychoeducation about psychosis and auditory hallucinations. Subjects completed measures of general and positive symptoms as well as measures regarding the dimensions of voices and beliefs about voices. Results indicated a significant reduction in total psychiatric symptoms, as well as the general

symptoms associated with schizophrenia. A significant reduction in the intensity of auditory hallucinations and a trend towards a reduction in positive symptoms and improvements in overall functioning were also found. No significant differences were found in measures of beliefs about voices or community and social functioning. Client satisfaction was generally high and feedback about the program positive. Limitations of this study include the lack of a control group or comparison treatment, the small sample size, and the lack of blinded raters. Overall results suggest the Coping with Voices program may be a promising intervention for individuals experiencing auditory hallucinations.

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ABBREVIATIONS

AH	Auditory hallucinations
BAVQ-R	Belief about voices questionnaire-revised
BPRS	Brief psychiatric rating scale
CBT	Cognitive behavioral therapy
CFE	Client feedback from
CSQ	Client satisfaction questionnaire
DSM-IV-TR	Diagnostic and statistical manual of mental disorders , 4 th edition, text revision
EMA	Ecological momentary assessment
ES	Effect size
IQ	Intelligence quotient
MMSE	Mini mental status exam
PSYRATS	Psychotic symptom rating scales
PANSS	Positive and negative syndrome scale
SLOF	Specific level of functioning
TAU	Treatment as usual
US	United States

UNC	University of North Carolina
WAIS	Working alliance scale-short form
WASI	Weschler abbreviated scale of intelligence
WRAT	Wide range achievement test

CHAPTER 1

INTRODUCTION

General Overview

This study investigated an internet-based cognitive behavioral program for auditory hallucinations. Auditory hallucinations are a common feature in schizophrenia, with over 60% of individuals reporting hallucinations at some point in the course of illness (Slade & Bentall, 1988). Although pharmacological interventions are helpful in reducing or eliminating auditory hallucinations, 25-50% of individuals experience residual symptoms despite adequate treatment with anti-psychotic drugs (Kane & Marder, 1993, Pinkham, Gloege, Flanagan & Penn, 2004, Wiersma, Nienhuis & Sloof, 1998). Further, individuals who experience auditory hallucinations report that abusive language is common (Nyani & David, 1996) and that the experience is distressing (Pinkham et al., 2004).

This has led researchers and clinicians to explore adjunctive treatments for auditory hallucinations, such as cognitive behavioral therapy (CBT) for psychosis (Penn, Meyer, Evans, Wirth, Cai & Burchinal, 2009). CBT for psychosis has been associated with improvements in positive symptoms, such as auditory hallucinations, in both individual (Wykes, Steel, Everett, & Tarrrier, 2008) and group formats (Wykes, Parr & Landau, 1999). A recent meta-analysis (Zimmermann, Farrod, Trieu, & Pomini, 2005) found a positive effect of CBT for psychosis in reducing positive symptoms when compared to other adjunctive treatments, with a moderate overall mean weighted effect size (ES) of 0.37, which was similar to the mean-weighted effect (ES=0.43) size for CBT for psychosis

identified by Wykes et al. (2008). Although a more recent review of CBT for psychosis suggested that these benefits may be dissipate when compared to other psychological treatment control groups (Jones, Hacker, Cormac, Meaden, & Irving, Claire, 2012), the number of studies included in the review for each treatment outcome was small and treatment modality varied from study to study. Further Jones et al. (2012) noted the efficacy of CBT for psychosis in reducing distress and depression. Thus, although evidence may be inconsistent as to whether CBT for psychosis offers a unique advantage over other forms of psychological treatment, there is evidence supporting both it's efficacy and feasibility in treating individuals with schizophrenia (Mueser, Penn, Deavers, & Cassisi, Under Review).

Despite the promise of CBT for psychosis, it is not widely available in the United States (US) (Kuller, Ott, Goisman, Wainwright & Rabin, 2010, Penn et al., 2009). Recently, group CBT for psychosis has been developed to increase access to treatment (Penn et al., 2009, Pinkham et al., 2004); however a paucity of trained providers of CBT for psychosis limits the ability to disseminate this practice in the US (Kuller et al., 2010).

The problem of access to CBT is not unique to psychotic disorders. The discrepancy between the development and dissemination of evidence based treatments, such as CBT, has been noted for anxiety disorders, depressive disorders, post-traumatic stress disorder and eating disorders (Barak, Hen, Boniel-Nissam & Shapira, 2008, Derrig-Palumbo & Zeine, 2005, Zabinski et al., 2001). Internet CBT has been developed as a potential way to increase access to evidence based treatments (Barak et al., 2008) and has shown promise in treating a variety of diagnoses. A systematic review and meta-analyses of 92 studies of internet interventions for a variety of problems, including depression, anxiety, physiological issues, and body image issues found an overall mean weighted effect size of 0.53, indicating a medium effect (Barak et al., 2008). Further, internet therapy has been shown to be a

potentially efficacious treatment when compared to face-to-face treatment for anxiety disorders (Reger & Gahm, 2009) and substance use disorders (King et al., 2009). Despite this promise and the integration of some internet CBT programs into national healthcare systems in Britain and the Netherlands (Knaevelsrud, & Maercker, 2007, Proudfoot, Goldberg, Mann, Everitt, Marks & Gray, 2003), currently there are no available internet CBT programs for schizophrenia. The current study investigates the feasibility and possible clinical benefits of a newly developed self-directed internet CBT program, called Coping with Voices, for individuals who experience auditory hallucinations.

Studies of internet CBT for other clinical populations have also shown differential effects based on the amount of therapist support (Palmqvist, Carlbring & Andersson, 2007, Spek Cuijpers, Nyklícek, Riper, Keyzer, & Pop, 2007). Thus, the current study also explored the relationship between an individual's perceived level of support and treatment outcome in the internet CBT program.

The introduction will provide the reader with the most relevant background concerning cognitive models of auditory hallucinations, CBT for psychosis, CBT for auditory hallucinations, the availability of CBT for auditory hallucinations, internet CBT, factors related to outcome in internet CBT and CBT for psychosis, and an overview of computer based treatments in schizophrenia. Finally, there will be an overview of the Coping with Voices program, the treatment outcomes of interest and the exploratory aims of the study. The introduction will end with the present study's aims and hypotheses.

Cognitive model of auditory hallucinations

Auditory hallucinations are primarily experienced as voices, familiar or unfamiliar, and are perceived as being distinct from one's own thoughts (American Psychiatric Association [DSM-IV-TR], 2000). The cognitive model of auditory hallucinations

conceptualizes voices as “involuntary thoughts that are attributed to an external source” (van der Gaag, Hagerman, & Birchwood, 2003, p. 542). In support of this idea, there is evidence that individuals who experience auditory hallucinations are more likely to misattribute internal events to external sources (Baker & Morrison, 1998, Bentall & Slade, 1985, Woodward, Menon & Whitman, 2007).

Furthermore, individuals who experience auditory hallucinations develop beliefs about them (Chadwick & Birchwood, 1994). These beliefs concern the identity, power and purpose of the voices (Chadwick & Birchwood, 1995). An individual’s beliefs about his or her voices will dictate his or her affective and behavioural response to the voices (Chadwick & Birchwood, 1994, van der Gaag et al., 2003). Malevolent appraisals of voices are associated with resistance while benevolent appraisals are associated with engagement (Chadwick & Birchwood, 1994). Likewise, levels of subjective distress, disability and coping are associated with these belief structures (Sayer, Ritter, & Gurney, 2000, Morrison, 1998). Malevolent and omnipotent beliefs have been associated with higher levels of distress, anxiety and depression, while benevolent beliefs have been associated with lower levels of distress (Hacker, Birchwood, Tudway, Meaden, & Amphlett, 2008, van der Gaag et al., 2003). These associations have been found independent of the content of voices. Individuals who reported negative voice content did not necessarily have higher levels of distress, rather it is the belief regarding whether the voice is helpful or harmful that is related to distress levels, depression and anxiety (van der Gaag et al., 2003). These beliefs are also associated with the level of perceived threat from the voices. An association has been found between the beliefs that voices have the ability to harm (omnipotence) and the intent to harm (malevolence) and the perception that the voice is capable of causing shame, physical harm or loss of control (Hacker et al., 2008). Harboring more malevolent beliefs

about voices has also been associated with a history of self-harming behaviours, and greater suicidal ideation (Simms, McCormack, Anderson, & Mulholland, 2007). There is also evidence of high levels of anxiety and depression in individuals who hear voices, which are hypothesized to be part of the behavioural and cognitive sequelae of appraisals of voices (Fannon, Hayward, Thompson, Green, Surguladze & Wykes, 2009, Mawson, Cohen & Berry, 2010).

In a systematic review of studies, Mawson and colleagues (2010) found a consistent relationship between cognitive appraisals of voices and levels of distress. However, modifying cognitive appraisals regarding the malevolence and supremacy of voices was not consistently related to a reduction in distress (Mawson et al. 2010). Mawson et al. (2010) note that other underlying mechanisms, such as social cognition, may mediate the relationship between cognitive appraisals and levels of distress; however this has yet to be conclusively established by the literature.

In a longitudinal examination of beliefs about voices, Csipke and Kinderman (2006) found that individual's beliefs about their voices were relatively stable over time and that specific interventions targeting beliefs may be required in order to alter them. In a study of interpretations of auditory hallucinations, Morrison, Nothad, Bowe and Wells (2004) found similarities between beliefs associated with distress, such as voice signalling loss of control, and the catastrophic misinterpretations associated with panic disorder, and suggest these beliefs may be modified using similar approaches (e.g. CBT). Evidence also suggests that appraisals of supremacy or power can be modified by interventions targeting voices, including CBT (Mawson et al., 2010, Thomas, Rossell, Farhall, Shawyer & Castle, 2011). Trower, Birchwood, Meadon, Byrne, Nelson and Ross (2004) found that CBT for command

hallucinations resulted in a decrease in compliance with voices and improvements in beliefs about the power and control of voices.

As noted above, beliefs about voices have also been shown to impact the affective and behavioural response of an individual to his or her voices (Hacker et al., 2008). Safety behaviours, such as avoidance, may be used to reduce distress and anxiety associated with voices (Hacker et al., 2008). These behaviours appear to be common (over 86% of Hacker et al.'s 2008, sample reported them) and may have serious consequences for treatment outcome. Trower et al., (2004) found that these behaviours may lead to treatment withdrawal, with one individual withdrawing from treatment due to a belief that the voice may hurt or kill him for disclosing information in therapy. Hacker et al. (2008) suggest that safety behaviours maintain distorted beliefs about voices, in that they do not give individuals a chance to obtain evidence that challenges maladaptive beliefs. Behavioural responses to voices illustrate the strong of impact the attributions and beliefs that individuals hold about their hallucinations. Cognitive behavioural interventions may be helpful in reducing the use of safety behaviours by focusing on the affective and behavioural impacts of distorted cognitions and providing the opportunity for behavioural experiments designed to disprove maladaptive beliefs about voices.

There is consistent evidence to support that the disability associated with hearing voices is, at least in part, mediated by cognitive factors (Morrison et al., 2004) and can be improved by interventions targeting cognitions, beliefs and attributions and the behavioural responses. However the relationship between cognitive factors and auditory hallucinations is likely complex and influenced by other factors such as voice characteristics and affect. Dimensions of voices, such as loudness, frequency and duration, have also been found to impact attributions and emotions associated with voices, with voices that are louder, last

longer and occur more frequently being associated with more negative feelings (Copolov, MacKinnon & Trauer, 2004). Low self-esteem and depression has also been associated with voices of greater severity suggesting that voice hearers may be vulnerable to a cycle of voices precipitating low mood which then may increase vulnerability to hearing more voices (Smith et al., 2006). Thus, although there is significant support for cognitive model of hallucinations, due to the complexity of the relationships between cognitive, affective and behavioural components of auditory hallucinations, interventions must take all three components into account.

Cognitive Behavioural Therapy for Psychosis

Based on the cognitive model of psychotic symptoms, CBT for psychosis has emerged as an efficacious adjunct to pharmacotherapy in the management of symptoms associated with schizophrenia spectrum disorders (Zimmermann et al., 2005, Wykes et al., 2008). The primary goal of CBT for psychosis is to assist individuals in identifying, monitoring and evaluating their assumptions, beliefs and thoughts regarding psychotic experiences, and assist individuals in examining the relationship between these thoughts, beliefs and assumptions and emotions and behaviours (Hagen & Turkington, 2011). Within the CBT model, psychotic symptoms are considered to be one end on a continuum of normal psychological processes (Tai & Turkington, 2009). These symptoms can be maintained through a variety of cognitive and behavioural processes, such as faulty beliefs, distorted thinking, biased information processing and safety behaviours (Hagen & Turkington, 2011, Tai & Turkington, 2009). By targeting these cognitive and behavioural factors, CBT for psychosis aims to reduce symptoms and increase adaptive coping skills.

A recent meta-analysis of CBT for psychosis conducted by Zimmermann et al. (2005) found a mean weighted effect size of 0.37, across 14 randomized controlled trials.

Although this is a modest effect size, the authors note that CBT increased the success rate for reducing positive symptoms by 18% (Zimmerman et al., 2005). Wykes and colleagues (2008) conducted a meta-analysis of CBT for psychosis interventions aimed at the treatment of positive symptoms and found an estimated overall effect size of 0.43. Positive symptoms have been linked to serious self-harm behaviours, including suicide attempts and completed suicides, (Kelly, Shim, Feldman, Yu & Conlet, 2004), highlighting the importance of interventions that can reduce these symptoms. As noted above a recent review (Jones et al., 2012) failed to find an advantage of CBT for psychosis over other control treatments (e.g. supportive therapy). However the authors did note CBT for psychosis' efficacy in reducing depression and distress, which, as discussed above, may impact both treatment engagement and voice severity (Hacker et al. 2008, Smith et al. 2006).

Taken together current research reviews are mixed as to the specific benefit of CBT for psychosis over other psychological treatment controls, however evidence does suggest that CBT for psychosis is associated with improvements in positive, negative and general symptoms (Zimmerman et al.2005, Wykes et al., 2008) as well as functional domains, and that these improvements may be particularly pronounced when compared to treatment as usual (Gumley, O'Grady, McNay, Reilly, Power and Norrie, 2003, Mueser, Penn, Deavers, & Cassisi, 2013, Tarrier et al., 2004)

Specific trials of CBT for psychosis have found reductions in positive, negative and general symptomatology in both acutely ill and chronic populations. Lewis et al. (2002) compared five weeks of CBT for psychosis and routine care, to supportive therapy and routine care and routine care alone. Lewis et al. (2002) found that individuals in the CBT group had tendency to improve the fastest of the three treatment groups. Improvements in auditory hallucinations were significantly faster than routine care alone or routine care with

supportive therapy (Lewis et al., 2002). Gumley et al. (2003) examined the effect of a two-phase CBT intervention on relapse as compared to treatment as usual (TAU). The CBT group received a median amount of five engagement sessions of CBT and five targeted sessions of CBT, which were administered after an increase in the participants' self-reported signs of relapse. At 12-month follow-up, the CBT group had significantly fewer relapses, compared to TAU and spent fewer days hospitalized (Gumley et al., 2003). The CBT group also showed significant improvements in positive and negative symptoms, and general symptoms. The authors also noted an improvement in pro-social functioning in the CBT group (Gumley et al., 2003). Rector, Seeman and Segel (2003) found improvements in positive and overall symptoms for individuals who received CBT plus enriched TAU, but these differences were not statistically significant when compared to individuals who received enriched TAU alone. However the authors found an advantage of CBT in improving negative symptoms compared to enriched TAU at six-month follow-up (Rector et al., 2003).

Tarrier and colleagues (2004) compared the addition of CBT or supportive counselling to TAU, to TAU alone in a sample of acutely ill in-patients experiencing first episode psychosis. The authors found that both CBT and supportive counselling resulted in improvements in positive, negative and general symptoms, compared to TAU alone, but found no significant differences between CBT and supportive counselling at 18-month follow-up. However consistent with Lewis et al.'s (2002) results, the CBT group demonstrated significantly faster recovery (Tarrier et al., 2004). Also in a sample of acutely ill inpatients, Startup, Jackson and Bendix (2004) compared up to 25 weekly CBT sessions against TAU alone and found improvements in both positive and negative symptoms in the CBT group at 12 month follow up. The authors also noted improvement in general

symptoms and social functioning at 12-month follow-up. Compared with the CBT intervention used in the Tarrier et al. (2004) sample, the intervention Startup and colleagues (2004) used was significantly longer, with over half of participants receiving 12 or more sessions of CBT.

Investigations of CBT in chronically ill populations have also been conducted. Tarrier et al. (1998) found significant improvement in the severity and number of positive symptoms for individuals that received CBT compared with supportive counseling. These gains were maintained at 12-month follow-up (Tarrier, Wittkowski, Kinney, McCarthy, Morris & Humphreys, 1999). CBT has also been associated with improvements in psychotic symptom severity in individuals experiencing medication refractory symptoms (Durham et al., 2003, Sensky et al., 2000, Tarrier et al., 2003).

Taken together, these results indicate that CBT interventions can reduce psychotic and general symptoms in individuals with schizophrenia spectrum disorders. Furthermore client satisfaction with CBT is generally high, particularly for individuals who feel they have gained CBT skills and knowledge (Miles, Peters & Kuipers, 2007, Wykes, et al., 1999), suggesting CBT is an effective and acceptable intervention for psychosis.

Cognitive Behavioral Therapy for Auditory Hallucinations

CBT programs designed to specifically target auditory hallucinations have also been developed. These interventions typically focus on patient's belief about the dimensions of voices (e.g. intent to harm, power of the voice) and attempt to modify the conviction with which these beliefs are held (Thomas et al., 2011). Some interventions have also incorporated a central focus on coping with auditory hallucinations in addition to challenging beliefs (Wiersma, Jenner, van de Willige, Spakman, & Nienhuis, 2001).

Trower et al. (2004) examined the efficacy of six months of individual CBT compared to TAU in a group of individuals experiencing command auditory hallucinations and found significant decreases in the belief in the omniscience of voices, the perceived power of the voices and improvement in perceived control over voices. There was also a decrease in the intensity of distress related to voices and the frequency of voices at six months for the CBT group although these differences were not maintained at 12 months. Furthermore, individuals in the CBT group had reduction in positive, negative and overall symptoms at 12-month follow-up when compared to TAU. This is consistent with earlier work conducted by Chadwick and Birchwood (1994), which found reductions in conviction for beliefs about the omnipotence, identity and purpose of voices in four individuals with treatment refractory auditory hallucinations after cognitive therapy.

Wiersma et al. (2001) found similar improvements when CBT was combined with coping training. Participants reported a decrease in the burden they experienced from hearing voices (anxiety, interference from voices, fear of loss control) after receiving CBT with coping training (Wiersma et al., 2001). However, due to the naturalistic design participants were permitted to alter anti-psychotic medication during the study limiting the conclusions that can be drawn. Similarly Thomas et al. (2011) found a reduction in hallucination severity after receiving CBT for auditory hallucinations and that lack of insight, high delusional conviction regarding voices and cognitive disorganization were not barriers to improvement. Like Wiersma et al. (2001), this study was also uncontrolled, however, the authors note improvements in psychotic symptoms arose independent of medication changes (Thomas et al., 2011).

Group CBT for auditory hallucinations has been examined as a potential way to increase the cost-effectiveness and availability of CBT. In a trial of group CBT, Wykes, et

al. (1999) found improvements in overall symptoms, a reduction in auditory hallucinations and an increase in insight compared to a wait-list control condition. Similarly in an uncontrolled study, Newton, Landau, Smith, Monks, Shergill and Wykes (2005) found reductions in distress related to auditory hallucinations, trends for a reduction in the perceived power of the voices, and an increase in perceived control over voices for individuals in a CBT group compared to a wait-list control condition. A pilot study of group CBT for auditory hallucinations also found significant reductions in distressing beliefs about voices and voice frequency (Pinkham et al., 2004), however this study had no control condition. A subsequent RCT of the same group CBT intervention for voices failed to find these improvements when compared to supportive therapy but did find a reduction in overall symptoms for individuals in the CBT group (Penn et al., 2009). In contrast to these results, Wykes et al. (2005) failed to find an effect on symptoms after a study of group CBT for psychosis but did find improvement in social functioning.

It is notable that most the above studies used a CBT protocol developed by Wykes et al, 1999), which Penn et al. (2009) noted focused more on coping with voices than directly challenging beliefs. In comparison Chadwick, Sambrooke, Rasch and Davies (2000) developed a CBT intervention that focused directly on challenging beliefs related to voices, and found reductions in conviction of beliefs about the omnipotence and control of voices but did not find any changes in symptoms. It is possible that the particular focus of CBT for auditory hallucinations may result in different improvements across groups; future research is needed to determine the active ingredients of particular CBT for auditory hallucinations interventions.

Availability of CBT for Auditory Hallucinations

Despite some mixed results, there is evidence that suggests CBT for auditory hallucinations is an efficacious intervention (Chadwick et al., 2000, Newton et al., 2005, Pinkham et al., 2004, Wykes et al., 1999) Furthermore, all CBT for auditory hallucinations interventions resulted in some clinical improvement (e.g. general symptoms), despite the failure to support specific study hypotheses, (e.g. Penn et al., 2009). Given the potential for the severe consequences of auditory hallucinations, such as self-harm (Hacker et al. 2008, Simms et al., 2007) and the limits of pharmacotherapy in eliminating voices, (Kane & Marder, 1993, Pinkham, et al. 2004, Wiersma, et al., 1998), adjunctive treatments such as CBT for psychosis and CBT for voices are needed. However, despite the promise of these treatments, the availability of CBT for psychotic symptoms remains limited (Kuller et al., 2010, Penn et al., 2009) particularly in North America.

Kuller et al. (2010) note that the US is not “equipped to effectively disseminate and utilize the latest psychological treatments” (p.7) due to the lack of training opportunities in empirically supported treatments and differences in the health care delivery system compared to other countries (e.g. Britain). Significant delays in the recognition, adoption and implementation of empirically supported treatments have been widely noted in the literature (Gotham, 2006) and in regards to CBT for psychotic symptoms, the lack of trained therapists to administer treatments is a significant barrier (Wykes et al., 2008). The authors note that specific training in CBT for psychotic symptoms may be warranted in order to achieve desired treatment effects and that these interventions require “experienced and trained personnel” to implement (Wykes et al., 1998, p. 534). In addition to the lack of trained therapists, the number of sites offering CBT for psychotic symptoms is also limited. A survey of individuals with schizophrenia in the United Kingdom found that only 14% of

individuals had access to CBT, and only 23% to another form of talk therapy (Rethink, 2008). A recent survey of 60 members of the International CBT for Psychosis group indicated that CBT for psychosis programs are available at only nine U.S. centers across six states (Gottlieb, unpublished data), underscoring the need to develop innovative ways to deliver CBT for psychotic symptoms.

Internet based Cognitive Behavioral Therapy

The problem of availability is not unique to CBT for psychotic disorders and occurs across diagnoses. Internet CBT has been found to be a promising way to deliver effective treatment to individuals who might otherwise be unable to receive it (Barak et al. 2008, Cuijpers et al., 2009, Reger & Gahm, 2009). The internet has emerged as promising way to deliver mental health information and psychological treatments. Surveys suggest that the internet is a primary vehicle in the delivery of health-related information; an estimated 75% to 80% of American internet users and 63.6% of British internet users look online for health information, (Fox & Madden, 2006, Powell & Clarke, 2006). Survey respondents indicated that the anonymity and convenience of the internet was an important factor in their decision to search for health information online. As noted above, the most recent meta-analyses of internet therapy found an effect size of 0.53 across interventions and diagnoses (Barak et al., 2008). However the effect size for internet CBT was higher than internet interventions in general (ES=0.81) (Barak et al., 2008) and reviews and meta-analyses of internet CBT for anxiety and depressive disorders have reported large effect sizes, ranging from 0.93-0.99 for anxiety disorders (Cuijpers et al., 2009, Reger & Gahm, 2009) and greater than 1.1 for depressive disorders (Titov, 2011). When compared to face-to-face CBT, internet CBT has been found to be equally effective (Barak et al., 2008, Reger & Gahm 2009), suggesting that it is viable modality of treatment when access to face-to-face CBT is limited.

Several internet CBT programs have transitioned from research programs to the public domain with success. MoodGYM (Christensen, Griffiths, Mackinnon & Brittliffe, 2006) is an Australian web-based CBT program for anxiety and depression consisting of five interactive modules with no therapist input and can be accessed through a website (<http://moodgym.anu.edu.au>) at no charge. When compared to a control group, MoodGYM resulted in reductions in depression and anxiety symptoms (Christensen, Griffiths & Jorm, 2004) and has attracted a large number of public registrants, with the website reporting over 400,000 registrants. Beatingtheblues (<http://www.beatingtheblues.co.uk>, Proudfoot et al., 2003) and FearFighter (Kenwright, Liness and Marks, 2001, Marks, Kenwright, McDonough, Whittaker & Mataix-Cols, 2004) are free computerized CBT programs offered through the United Kingdom's (UK) National Health Service to individuals and practitioners that qualify. Research has shown improvements in depression and anxiety symptoms for beatingtheblues users (Proudfoot et al., 2003) and improvements in both panic and phobic symptoms for FearFighter participants (Kenwright et al., 2001, Marks et al., 2004). Although these programs are largely uncontrolled convenience samples, client satisfaction with such programs has generally been high (MacGregor, Hayward, Peck & Wilkes, 2009). The successful integration of these programs into the national health care system of the UK suggests that individuals seeking mental health treatments and caregivers are willing to participate in internet CBT programs and generally experience improvement and satisfaction as a result.

Furthermore internet therapies have been implemented successfully with disorders of varying severity, including panic disorder (Panikprojeket; Carlbring, Westling, Ljungstrand, Ekselius & Andersson, 2001), substance dependence (King et al., 2009), and Bulimia Nervosa (Fernandez-Aranda et al., 2009) with improvements in target symptoms observed,

compared to control groups.

Common methodological limitations of these studies include small sample sizes, heterogeneous samples, lack of adequate control groups, unblinded assessment of outcomes, high-drop out rates and the lack of well-defined diagnostic groups due to the inclusion of non-clinical or sub-threshold samples (Cuijpers et al., 2009; Gainsbury & Blaszczynski, 2010; Postel et al., 2008; Reger & Gahm, 2009). However, well-controlled studies (Kay-Lambkin, Baker, Lewin & Carr, 2009, Reger & Gahm, 2009) have also found positive results indicating the promise of internet therapy despite the need for larger, better-controlled investigations.

Although few trials of internet therapy include individuals with severe and/or co-morbid disorders, there is some evidence that internet interventions can be used with individuals with more severe psychological disorders or co-morbid presentations. King et al. (2009) conducted a trial of internet-based group therapy in opioid-dependent adults, currently receiving both methadone treatment and individual counselling at an addiction treatment program. Subjects in the internet group experienced a reduction in drug use as evidenced by negative drug screen results and reported that they would prefer internet therapy over traditional therapy in the future, citing the convenience and increased confidentiality of the online group. Kay-Lambkin et al. (2009) compared therapist-supported internet therapy for substance use to the same intervention in a face-to-face format and a no treatment control group in a sample of adults with co-morbid depression and problematic alcohol and/or marijuana use. Findings indicated problematic alcohol use decreased in all groups, and depression scores improved in both treatment groups compared to controls. Like individuals with psychosis, individuals with substance use disorders have been found to have lower-rates of internet use (Clayton et al., 2009). The above trials indicate that

individuals with substance use disorders can benefit from computer based interventions and suggest that internet therapy, including CBT, can be implemented successfully independent of internet access, or perceived disorder severity.

Although internet use differs significantly by age, with 95% of 18 to 29 year olds reporting internet use, compared to only 42% of individuals over 65 (PIP, 2010), internet CBT programs have been developed to target older individuals with success. Colour Your Life (www.trimbos.nl) is a Dutch self-help program based on CBT principles and geared towards people aged 50 and older. The program has been shown to be as efficacious as group CBT in reducing depression and suggests that older individuals can benefit from computer based CBT treatments as well as younger individuals (deGraff et al., 2009).

One of the advantages of internet CBT is the ability to reach rural or remote users. A key difficulty facing these areas is the lack of trained professionals to provide services (Jameson & Blank, 2007). Internet CBT has the potential to address this gap by providing an alternative method of service delivery, allowing trained professionals to access individuals needing care. This may be particularly important for individuals with psychotic disorders. Wallace, Weeks, Wang, Lee and Kazis (2006) found that although veterans living in rural areas were less likely to have a mental illness; those that did experienced a greater disease burden and incurred more health care costs, likely to due to limited access to care.

In addition to addressing availability issues, internet CBT programs may also reduce the burden of stigma related to mental illness. In individuals with schizophrenia spectrum disorders, stigma has been found to be a barrier to recovery (Lysaker, Davis, Warman, Strasburger, & Beattie, 2007, Kleim, Vauth, Adam, Stieglitz, Hayward, & Corrigan, 2008). Furthermore, some dimensions of stigma have been associated with the likelihood of seeking care (Cooper, Corrigan & Watson, 2003). Specifically, Corrigan (2004) notes the

relationship between shame and treatment seeking, with individuals who express shame related to mental illness being less likely to be involved in treatment. Users of internet therapy have reported anonymity among their reasons for seeking computer-based treatment (King et al., 2009, Young, 2005). Given that a central dimension of CBT for psychosis is normalizing symptoms (Dudley & Turkington, 2011), internet CBT for psychosis has the potential to both increase access to anonymous care and reduce self-stigmatizing beliefs through the presentation of psychotic symptoms as being on a continuum of normal experiences (Newton et al., 2005). Furthermore, as described by Trower et al. (2004), individuals with auditory hallucinations may have difficulty disclosing personal information in face-to-face CBT due to beliefs about the power and malevolence of voices. Internet CBT for auditory hallucinations may provide such individuals with an arena to dispute these maladaptive beliefs in a way that is less threatening than person-to-person disclosure.

Computer-Based Interventions for Schizophrenia

Computer based psychological treatments have experienced tremendous growth since the 1990s, particularly CBT (Ainsworth, 2002, Barak et al., 2008). Despite this growth, the development of computer based psychological interventions for schizophrenia has lagged behind that for other disorders. There are a variety of possible reasons why these interventions have not been developed at the same rate as other internet therapies, including evidence suggesting that individuals with severe mental illness have lower rates of internet use (Clayton et al., 2009). Others have suggested that individuals with psychosis are not appropriate for internet therapy due to the severity of psychotic disorders (Derrig-Palumbo & Zeine, 2005). However, the development of other computer based treatments for schizophrenia and the use of cutting edge technology in research paradigms for

schizophrenia suggests that individuals with schizophrenia can both use and benefit from technology-based interventions.

Ahmed, Bayog and Boisvert (1997) reported on the use of computers to facilitate therapy with three inpatients diagnosed with schizophrenia. In these case studies, content from therapy sessions was displayed on a computer for the patient's review. The authors suggest that displaying information visually on a screen was helpful in compensating for subject deficits in attention, auditory processing and memory, and allowed subjects to review information and pay better attention to the task of therapy (Ahmed et al., 1997).

Like internet therapy, the use of ecological momentary assessment (EMA) was once argued to be ill suited for individuals with severe mental disorders (Grahlm, Loh & Swendon, 2008). However, investigations of EMA have shown that individuals with schizophrenia are able and willing to complete computerized assessments (Grahlm et al., 2008). Individuals with schizophrenia found EMA to be acceptable and were able to reliably report information on their level of stress, emotions and psychotic symptoms with only 13% of individuals not completing EMA assessments (Grahlm et al., 2008).

One of the more widely used technology based interventions in schizophrenia is computerized cognitive remediation. Computer-based cognitive remediation programs are designed to provide supportive, graduated training and practice across several domains of cognition. Cognitive remediation computer programs vary (d'Amato et al., 2011) but can include games, feedback and progress reports. Studies have shown improvements in cognition after program participation (d'Amato et al., 2011, McGurk et al., 2007). Furthermore, individuals have shown a willingness to come into a clinic or research laboratory to participate in these computerized interventions over extended time periods (e.g. 1 year; Kurtz, Seltzer, Shagan, Warren, Thimea, & Wexler, 2006) indicating that

individuals with schizophrenia are both able and willing to participate in extended computerized interventions. In addition, Farrell, Mahone and Guilbaud (2004) found that individuals with serious mental illnesses who were consulted about the development of a web-based portal to access community mental health resources were enthusiastic and excited about such a project. This provides a further indication that individuals with psychotic disorders are interested in the development of computer based resources and treatment.

Online self-help groups also indicate that individuals with schizophrenia are making use of internet resources in coping with their illness. Haker, Lauber, and Rossler (2005) analyzed 1200 postings from 597 users of 12 different Internet schizophrenia forums. The authors found that the postings on these sites were primarily from individuals who identified as having a diagnosis of schizophrenia or a related illness, as opposed to caregivers or family members. Furthermore, levels of self-disclosure in regards to symptoms, emotions and medications were high. These results indicate that individuals with schizophrenia spectrum disorders do seek out support and information on the internet and are willing to disclose personal information about their illness experiences. Furthermore, the authors suggest these sites may be helpful to individuals with schizophrenia spectrum disorders but note the paucity of such sites on the internet when compared to other psychiatric diagnoses (e.g. depression; Haker et al., 2005). As with internet based CBT, it appears that the development of online self-help groups for schizophrenia lags behind that of other disorders, despite their apparent utility. Use of online self-help groups suggests that self-guided interventions are a viable treatment option for this population.

Rotundi et al. (2005) compared an internet-based intervention for individuals with schizophrenia and family or other caregivers to usual care. Use of the study's therapy group,

psychoeducational resources and general internet use were tracked for both affected individuals and family members. Over the three-month study period, there were over 17,000 hits on the schizophrenia guide home page created for the study by individuals with schizophrenia alone. Furthermore, the two therapy groups were the most often used components of the intervention (compared to other aspects, like ask an expert or informational resources) by individuals with schizophrenia and these groups were used more consistently over the three month period than psychoeducational or other resources. Individuals with schizophrenia who were assigned to the internet based intervention also reported lower levels of perceived stress at the end of the study and reported that the online therapy group was extremely valuable (Rotundi et al., 2005). These results suggest that internet interventions are likely to be used frequently by individuals diagnosed with the illness and that those individuals perceive a benefit to these interventions. The authors suggested that computer based interventions may enhance the delivery of services to individuals with schizophrenia and their families and recommended an increase in research regarding these interventions.

Factors Related to Outcome in Internet CBT and CBT for Psychosis

Given the promise that internet CBT has shown as a treatment for widespread psychiatric disorders (Barak et al., 2008, Reger and Gahm, 2009, Titov 2011) and the lack of availability of CBT for psychosis and CBT for auditory hallucinations, internet CBT for voices has the potential to be a feasible and efficacious treatment for auditory hallucinations. In investigating the Coping with Voices program, it is important to review factors that have been linked to outcome in the literature regarding internet CBT and CBT for psychosis.

Internet CBT programs range in the amount of therapist contact provided, from self-directed interventions, to phone support, regular email communication and/or in person

support. The amount of therapist contact has been linked to outcome in internet therapies, including CBT. In a review of computer-based psychological treatments, Newman, Szkodny, Llera, and Przeworski (2011) found that therapies that included at least some therapist contact have been the most beneficial for the greatest variety of disorders. Palmqvist and colleagues (2007) reviewed 15 studies of internet CBT for anxiety disorders and depression, including several high quality programs (MoodGYM, Panic Online, & Panikprojektet), and found a significant correlation between effect size and the amount of therapist contact. Spek et al. (2007) completed a meta-analysis of 12 Internet CBT studies and found that interventions that involved some therapist support showed larger effect sizes than interventions without support. However, in a meta-analysis of internet based treatment for anxiety disorders, Reger and Gahm (2009) failed to find significant differences in effect sizes between treatments that included therapist contact and those with no contact. Titov (2011) reviewed both high-intensity internet interventions for depression, those involving greater than three hours of therapist support, and low-intensity interventions, those involving less than three hours of support, and found that low-intensity interventions were associated with improvements in several studies. He also notes some studies have shown that increasing the amount therapist contact does not consistently produce further gains, which Titov (2011) argues may be suggestive of a curvilinear relationship between therapist contact and outcome.

Studies that have included varying amounts of therapist support have generally not found meaningful differences in outcome related to therapist support (Klein et al., 2009, Titov, Andrews, Choi, Schwencke & Mahoney, 2008). Results regarding therapist-supported interventions versus completely self-directed interventions have been mixed, with some studies finding that self-directed interventions were equal to control groups (de Graaf

et al., 2009) and others finding no difference between therapist supported and self-directed interventions (Vernmark et al., 2010). It is possible that minimal therapist support is sufficient for high quality structured interactive interventions (Palmqvist et al., 2007) but more extensive support may be needed with less structured interventions or interventions of lower quality.

Therapeutic alliance in the context of internet interventions has also been examined. Knaevelsrud and Maercker (2006) found that alliance was a less relevant predictor of outcome for online narrative therapy than for face-to-face therapy of the same nature, although internet clients reported a stable and high level of alliance. Similarly Klein and colleagues (2009) found that users of an internet CBT program reported a high level of alliance for treatment of PTSD. Of note, total therapist time was less than four hours over 10 weeks. The relationship between alliance and outcome in internet CBT has not been well studied (Knaevelsrud & Maercker, 2006) but alliance has been linked to client satisfaction with online therapy in one study, indicating it may play a role in treatment outcome (Leibert, Archer, Munson, & York, 2006).

Although alliance has been linked to a variety of outcomes for individuals with psychotic disorders (Hooas, Lindholm, Berge, & Hagen, 2011), the relationship between therapeutic alliance and outcome in CBT for psychosis is not well understood. Qualitative analyses of the experiences of individuals who have received CBT for psychosis suggest that for clients, the alliance with their therapist is a key part of treatment. Messari and Hallam (2003) found that individuals who received CBT for psychosis emphasized the value of a respectful and trusting relationship between themselves and their therapist as an important aspect of treatment. In sample of individuals with schizophrenia, Dunn, Morrison and Bentall (2006) found that the therapeutic alliance was linked to homework completion,

which has been linked to treatment outcome in CBT for Post-traumatic Stress Disorder in individuals with severe mental illness (Mueser et al., 2008). However, this relationship has yet to be explored in CBT for psychosis.

Summary of Background Research related to Internet CBT for Auditory Hallucinations

There is evidence to support the cognitive model of auditory hallucinations as internal stimuli misattributed to external sources (Chadwick & Birchwood, 1996, van der Gaag et al., 2003). Further, studies suggest that the beliefs individuals formulate about these experiences have behavioral and emotional consequences, such as resistance and depression (Chadwick & Birchwood, 1994, van der Gaag et al., 2003). CBT for psychosis has been shown to reduce positive, negative and general symptoms associated with schizophrenia and is a recommended adjunctive treatment for schizophrenia but remains inaccessible for many individuals (Gumley et al., 2003, Pinkham et al., 2004, Startup et al., 2004). CBT for auditory hallucinations has also been shown to be effective in modifying maladaptive beliefs about voices and reducing symptoms but, like CBT for psychosis, is not widely available.

Internet CBT has shown promise when compared to face-to-face therapy (Barak et al., 2008) and has the potential to reach users who may be unable to receive CBT otherwise. Furthermore, evidence suggests that individuals with schizophrenia are willing and able to participate in technology-based interventions and would make use of internet-based therapies when offered (Grahlm et al., 2008, Rotundi et al., 2005). However, internet based treatments have not been widely developed for psychotic disorders.

The success of other technology-based interventions and assessments for psychotic disorders combined with the lack of availability of CBT for psychosis supports the need for internet based CBT for auditory hallucinations. The current study seeks to examine the Coping with Voices CBT program for auditory hallucinations as a potential

way to expand access to empirically support treatments for psychosis. This novel program is based on the cognitive model of auditory hallucinations already established in the literature and comprises many of the same domains as face-to-face CBT for auditory hallucinations. Based on previous work investigating CBT for auditory hallucinations, we expected this program to be a feasible and acceptable intervention for individuals diagnosed with schizophrenia spectrum disorders experiencing auditory hallucinations (Thomas et al., 2011, Penn et al., 2009).

CHAPTER 2

THE CURRENT STUDY

Coping with Voices program

The Coping with Voices program is a 10 session CBT program designed to challenge an individual's beliefs about their voices and increase coping strategies to deal with voices, in addition to providing psychoeducation about the source of auditory hallucinations and psychosis in general. The goal of this study was to assess the effect of this no-cost, stigma-free Coping with Voices program on general and positive symptoms. In addition, this study sought to examine the specific effects of the program on the intensity and frequency of voices, as well as to explore the potential impact of the program on beliefs about voices, voice-related distress and social functioning. The intervention was evaluated in a carefully controlled, research environment that was monitored by a clinically trained support person to ensure both its safety and to document its clinical effects. Support persons were a graduate student in clinical psychology (KHR), one advanced undergraduate, an incoming graduate student in clinical psychology, and a trained research assistant or clinical psychologist (Boston site) who received training in both CBT for psychosis and the Coping with Voices program through didactic readings, practice sessions using the program and supervised sessions with individual subjects (supervised by KH or J. Gottlieb). As the program is largely self-directed, support persons were present to answer any questions and assist with any technical issues (e.g. internet connectivity) but did not input information into the program for the individual. Rather, the individual was responsible for completing games

and program content with the support person available to provide assistance if required. This project was guided by the larger goal of eventually creating efficacious self-guided computer program packages that target improved coping across a broad range of symptoms and impairments related to schizophrenia, such as negative symptoms, paranoia, and social functioning. These programs have the potential to be used as stand-alone treatments for people with schizophrenia who do not access mental health services, as an adjunct to in-person CBT for psychosis or as a treatment service provided under supervision at clinics that lack CBT for psychosis clinicians. Previous work on CBT for psychosis and auditory hallucinations, internet CBT and computer-based interventions for schizophrenia demonstrates the potential efficacy and need for programs such as Coping with Voices. A detailed description of the program is located in the Methods section. The current study was supported in part by a grant from the North Carolina Foundation of Hope whose mission is to promote scientific research aimed at discovering the causes and potential cures for mental illness in order to develop a more effective means of treatment.

Aims & Hypotheses

Aim 1: Evaluate the feasibility of the Coping with Voices program. As the current study is the first investigation of the Coping with Voices program, we sought to evaluate the feasibility and tolerability of the program. Based on prior research indicating that CBT for psychosis (Miles et al., 2007, Wykes et al., 1999) and internet CBT are generally well tolerated (MacGregor et al., 2009), we hypothesized that client satisfaction with the program, as measured by the Client Satisfaction Questionnaire (CSQ) would generally be high, as represented a mean score of 27 or higher on the CSQ, which has been operationalized as a score reflecting high satisfaction (Larsen, Attkisson, Hargreaves, & Nguyen, 1979). Mean client satisfaction scores were also compared to the CSQ scores found

for other treatments, such as assertive community treatment (Chue, Tibbo, Wright & Van Ens, 2004) and outpatient psychiatric treatment (Perreault, Rogers, Leichner & Sabourin, 1996), in order to explore the similarities in client satisfaction with the Coping with Voices program and other treatments individuals with psychotic disorders are likely to receive. In order to establish the tolerability of the Coping with Voices program, we computed the average time to complete one session, the average visit length, and the average number of visits to complete all ten sessions. In addition, we compared rates of drop out and rates of treatment completion to other studies of CBT for psychosis among individuals with schizophrenia.

Aim 2: Evaluate the effect of the Coping with Voices program on the Severity and Intensity of Auditory Hallucinations. Some previous work regarding CBT for auditory hallucinations has shown reductions in the severity of auditory hallucinations (Pinkham et al., 2004, Thomas et al., 2011) but other trials have not found this effect (Penn et al., 2009, Wykes et al., 2005). However, this may be due to differences in the specific CBT for auditory hallucinations protocol used and the differing emphasis on coping versus challenging of beliefs (e.g. Penn et al., 2009 vs. Thomas et al., 2011). Given that the Coping with Voices program has a focus on identifying maladaptive thinking styles and challenging beliefs about voices, as well as factors that exacerbate voices, in addition to coping strategies, we hypothesized that participants would experience a reduction in voice severity defined by a significant reduction in the PSYRATS auditory hallucinations subscale between pre and post treatment. We also hypothesized that the participants would experience clinical improvement on the PSYRATS, defined as a five point decrease in the mean total score of the PSYRATS between pre-treatment and post-treatment, which corresponds to a clinically reliable change calculated from test-retest reliability data on the

PSYRATS (Drake et al., 2007, Thomas et al., 2011) and can indicate a treatment effect when small sample size reduces statistical power (Pinkham et al., 2004).

Aim 3: Evaluate the effects of the Coping with Voices program on General and Positive Symptoms. The third aim was to examine the effect of participation in the Coping with Voices program on the amount of general and positive symptoms as measured by the PANSS (Kay et al., 1987). Previous work on both CBT for psychosis and CBT for auditory hallucinations has indicated that participation in these interventions can reduce both general and positive symptoms as measured by the PANSS scale (Gumley et al., 2003, Lewis et al., 2002, Thomas et al., 2011, Zimmermann et al., 2005). The PANSS general subscale consists of symptoms that are related to psychotic disorders, such as poor attention and active social avoidance, but do not represent positive (hallucinations, delusions) or negative (avolition, anhedonia) symptoms. Based on previous evidence, we hypothesized that participation in the Coping with Voices program would be associated with significant reductions in both the positive and general symptom subscale scores on the PANSS at post-treatment compared to baseline.

Aim 4: Evaluate the effect of the Coping with Voices program on Total Symptoms. The fourth aim of this study was to examine the effect of participation in the Coping with Voices program on symptoms associated with schizophrenia, including depression, anxiety, and suicidality as measured by the Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962). As discussed earlier, research suggests that participation in CBT for psychosis or auditory hallucinations can reduce total psychiatric symptoms associated with schizophrenia as measured by the Brief Psychiatric Rating Scale (BPRS) (Startup et al., 2004). The BPRS has been used extensively to examine psychopathology associated with schizophrenia and other severe mental illnesses and includes a broad range of symptoms

(Sawamura, Morishita, & Ishigooka, 2010), facilitating comparisons with other research on CBT for psychosis and auditory hallucinations (Startup et al., 2004). Based on previous research, we hypothesized that the Coping with Voices program would be associated with a significant reduction in total BPRS score. Previous work (Lieberman et al., 1994) has defined clinically significant improvement on the BPRS as a reduction of 20% total BPRS score (Lieberman et al., 1994). Therefore, it was also hypothesized that the Coping with Voices program would result in clinically significant reductions in total BPRS score, defined as a reduction of 20% or more between baseline and post-treatment. We also hypothesized that the Coping with Voices program would result in a clinically significant reduction in total symptoms as measured by PANSS total score, and defined as a 20% reduction (Cramer, Rosenheck, Xu, Henderson, Thomas & Charney, 2001) in mean total PANSS score between baseline and post-treatment.

Exploratory Aims

Exploratory Aim 1: Evaluate the effect of the Coping with Voices program on Beliefs about Voices. Previous research regarding the effects of CBT for auditory hallucinations on beliefs about voices has been inconsistent, with some studies showing that CBT for auditory hallucinations can modify beliefs about voices (Chadwick et al., 2000, Pinkham et al., 2004, Trower et al., 2004), while other trials fail to find effects (e.g. Penn et al., 2009). As such, we explored the possible effects of the Coping with Voices program on individuals' beliefs about voices using the Belief about Voices Questionnaire—Revised (BAVQ-R) (Chadwick et al., 2000). We used the BAVQ-R subscale scores (malevolence, benevolence, resistance, engagement, and omnipotence) for this aim.

Exploratory Aim 2: Effects of therapeutic alliance on outcome. Although studies have been inconsistent, there is some evidence that treatment outcome in Internet CBT is

associated with amount of therapist support (Titov, 2011). There is also evidence suggesting an association between therapeutic alliance and outcome (Knaevelsrud & Maercker, 2006), although it appears that alliance may be a less important predictor of outcome in internet therapy, than in face-to-face therapy. As this is a pilot project designed to establish initial feasibility and efficacy, the intervention took place with the support person present (as discussed above) at each session to assist with any clinical (e.g. distress) or technical issues (e.g. computer problems) that arose. In order to investigate the potential association between alliance and outcome, we explored the relationship between total score on the Working Alliance Inventory-Short form (WAI-S) and the primary treatment outcomes (BPRS total score, PANSS general and positive score, PSYRATS Auditory Hallucinations subscale score).

Exploratory Aim 3: Association between client satisfaction and treatment outcome.

Client satisfaction has generally been found to be high for both internet CBT and CBT for psychosis. In addition to examining client satisfaction for the purpose of establishing feasibility of the Coping with Voice program, we also explored the potential relationship between client satisfaction and treatment outcome. A small number of studies have found an association between symptom levels and client satisfaction (Primm, Gomez, Tzolova-Iontchev, Perry & Crum, 2000, Sloan, Hutchinson, O'Boyle, 1997). Therefore, we explored the relationship between client satisfaction, as measured by the Client Satisfaction Questionnaire (CSQ) and symptoms, as measured by the change in total BPRS score from pre-treatment to post-treatment.

Exploratory Aim 4: Evaluate the effects of the Coping with Voices program on

Social and Community Functioning. In addition to improvements in symptoms, other psychosocial gains, like improvements in social functioning, have been found after

participation in CBT for psychosis (Startup, et al., 2004, Wykes et al. 2005). As such, we explored the effect of the Coping with Voices program on levels of social functioning as measured by the Interpersonal Relationships subscale of the Specific Levels of Functioning Questionnaire (SLOF, described below). We also explored the potential effect of the Coping with Voices program on other dimensions of social and community functioning including social acceptability (using the Social Acceptability subscale of the SLOF), daily living skills (using the Community Living Skills subscale of the SLOF), and work skills (using the Work Skills subscale of the SLOF), as well as on the SLOF total score.

Exploratory Aim 5: Comparison of within-group effect sizes with other trials of CBT for psychosis. In order to evaluate the magnitude of pre-post treatment change and facilitate comparison with previous trials of CBT for voices or psychosis (e.g. Pinkham et al., 2004), within-group effect sizes were calculated for the primary outcome variables in the current study (BPRS, PANSS, & PSYRATS) as well as from the published data of other trials.

Exploratory Aim 6: Examination of qualitative feedback regarding the Coping with Voices program. Personal experience and observations have been identified as providing valuable insight about newly developed interventions (Mueser & Drake, 2005). As such, we reviewed the qualitative feedback about the Coping with Voices program provided by the Client Feedback Form. Percentages for each response on the Likert-type items (e.g. “How useful was the program to you? Not useful, useful, very useful”) were computed to characterize the most common responses to each item. We also descriptively examined the open-ended items (e.g. “What did you like most about the Computerized CBT for Symptoms Program?”) for re-occurring themes and tabulated the most common responses.

CHAPTER 3

METHODS

Participants

Eighteen individuals were recruited for participation from the University of North Carolina Hospitals, and the surrounding mental health clinics and clubhouses of Durham and Wake counties. We also included an additional five participants who participated in this pilot study at the Freedom Trail Clinic in Boston, MA under Dr. Jennifer Gottlieb, co-developer of the Coping with Voice program. The Freedom Trail Clinic is a large community-based mental health facility that specializes in the treatment of schizophrenia and other serious mental illnesses and is part of the Boston Department of Mental Health. An n of 23 is similar to sample sizes for treatment groups in studies of internet CBT (Carlbring et al., 2003, Klein et al., 2001, Lange, van de Ven, Schrieken, & Emmelkamp, 2001) and studies of CBT for auditory hallucinations (Pinkham et al., 2004, Trower et al., 2004). Demographic data for the sample is summarized in Table 1. Inclusion criteria for participants included the following: DSM-IV-TR (American Psychiatric Association, 2000) diagnosis of Schizophrenia, Schizoaffective disorder, Major Depression with Psychotic Features or Psychotic Disorder Not Otherwise Specified (NOS) as confirmed by the Structured Clinical Interview for DSM-IV (SCID-I; First et al., 2002); auditory hallucinations of a least moderate severity as indicated by a score of 3 or above on the PANSS hallucinations item; on the same medication(s) and dose(s) for at least one month prior to study participation; between the ages of 18 and 65; IQ greater than 80 as measured

by the Wechsler Abbreviated Scale of Intelligence (WASI); reading level of at least fourth grade as measured by the reading scale of the Wide Range Achievement Test (WRAT); no current suicidal ideation; no hospitalizations in the three months preceding study participation and not having participated in CBT for psychosis in the past three years (Fig.1).

Exclusion criteria included, terminal physical illness expected to result in the death of the study participant within one year; primary diagnosis of dementia or a diagnosis of a psychiatric disorder secondary to a medical condition; comorbid dementia (severe cognitive impairment) as indicated by a Mini-Mental State Examination (MMSE) score of less than 24; current, active substance abuse or dependence with the need for specialized substance abuse services; does not speak English; does not achieve a fourth grade reading level as demonstrated on the Wide Range Achievement Test (WRAT) or has an IQ less than 79 and/or having a legal guardian. Given that the Coping with Voices program was designed with this population in mind and adheres to several of the recommendations for websites for SMI, as put forth by Rotundi et al. (2005), including having the contents of the program organized into a small number of primary modules (ten sessions with an average of seven steps), and that it requires limited computer skills (the ability to type and use a mouse), we did not include familiarity with computers or the internet as an exclusion/inclusion criteria. However, these were assessed using an internet use questionnaire at baseline and indirectly, using detailed client feedback forms

Coping with Voices program

The Coping with Voices program designed by Brian Chiko of www.schizophrenia.com and Jennifer Gottlieb Ph.D., (Appendix C) consists of ten sessions that are designed to take approximately 50 to 80 minutes to complete, depending on client

speed. The initial session begins with a self assessment designed to evaluate an individual's current beliefs about voices, distress level and current coping strategies and then moves into a tutorial of CBT as applied to auditory hallucinations. Subsequent sessions include a daily voices log where individuals can input the voices they heard since last session, note coping strategies and note whether or not the coping strategies were helpful. Various video tutorials are used throughout the program to orient the individual to topics such as psychosis and thinking styles. Games structured around these tutorials are also used to assist individuals in applying concepts from the tutorials. At the end of each session, the participant views a social feed that allows them to view anonymous daily voices logs from other program participants, and what coping strategies others have found helpful; this is included to aid in the process of normalizing psychotic symptoms. Each session ends with a session summary and homework assignments (example Summary sheets and homework assignments can be found in Appendix C). At the following session, subjects are asked to indicate what their homework assignment was, if they worked on it or not, and if so for how long.

Measures

Diagnostic Instruments. The Structured Clinical Interview for DSM-IV (SCID-I; First et al., 2002) was used to confirm diagnosis of a Schizophrenia, Schizoaffective disorder or Psychosis NOS. The main body of the SCID consists of nine diagnostic modules, designed to assess a wide-range of psychiatric diagnoses. A trained assessor with diagnostic and clinical experience administered the SCID in order to confirm diagnosis of a psychotic disorder.

General Psychopathology. The Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962, Appendix E) was used to obtain an estimate of general psychopathology. The BPRS is a frequently used in the assessment of psychopathology associated with

schizophrenia and other serious mental illnesses (Sawamura et al., 2010). The BPRS is a 24 item semi-structured interview that is administered by a trained rater. Each item is rated on a seven point Likert scale from 1 (none) to 7 (extremely severe) with anchors for each item. The BPRS has good psychometric properties, with good internal consistency, good reliability (ICCs of 0.80 or greater) and validity (Perkins, Stroup & Lieberman, 2000). The BPRS was administered at baseline and post-treatment by trained raters at both the UNC and Dartmouth site. For the last four participants at UNC, the BPRS was administered by a trained rater with no knowledge of the Coping with Voices program, study aims or hypotheses.

Psychotic Symptoms. The Positive and Negative Symptoms Scale (PANSS; Kay et al., 1987, Appendix F) is a 30-item scale on which an interviewer rates the subject for severity of positive and negative psychotic symptoms and mood and behavioral symptoms after asking a standard series of questions. Items are rated on a scale of 1 (absent) to 7 (severe), and yield three main subscores: positive symptoms, negative symptoms, and general psychopathology, as well as a total score. A trained rater administered the PANSS at UNC at baseline and post-treatment (n=18). Boston participants did not complete the PANSS (n=5). For the last four participants at UNC, the BPRS and PANSS were rated by a trained rater with no knowledge of the Coping with Voices program, study aims or hypotheses. Although correlations between the total score of the PANSS and BPRS have been found to be high (Perkins et al., 2000), the general scale scores are only moderately correlated suggesting BPRS total score and PANSS general score are tapping into some unique constructs.

The Psychotic Symptom Rating Scales for auditory hallucinations (PSYRATS) (Haddock et al., 1999, Appendix G) consists of 17 self-report items that measure the

severity of auditory hallucinations over the past week. The items measure the frequency, intensity, and interference of auditory hallucinations on a four-point scale. Items are summed for a total score as well as two subscales, Auditory Hallucinations and Delusions. For this study, we focused on the Auditory Hallucinations subscale (higher scores reflect more severe auditory hallucinations). Subjects at baseline and post-treatment completed the PSYRATS.

Cognitive Measures. The Wechsler Abbreviated Scale of Intelligence (WASI) will be used to obtain an estimate of current IQ. It consists of four subscales designed to obtain an estimate of current cognitive functioning. This study only used the Vocabulary and Matrix Reasoning subscales in order to obtain an estimate of IQ (Full-2 Scale IQ).

The Wide Range Achievement Test (WRAT) Reading subscale will be used to obtain a current estimate of reading level. It consists of a brief letter and word reading list. The Mini-Mental Status Exam (MMSE) was used to rule out the presence of dementia, delirium or other cognitive impairments. The WASI, WRAT and MMSE were only administered during the screening visit.

Beliefs about Voices. The Belief about Voices Questionnaire—Revised (BAVQ-R, Appendix H) (Chadwick et al., 2000) is a self-report 35-item measure of beliefs about auditory hallucinations and the emotional and behavioral reactions to them. Performance is indexed based on the five BAVQ-R subscales: malevolence, benevolence, resistance, engagement, and omnipotence. The BAVQ-R has been found to have good reliability, and validity (Chadwick et al., 2000). Subjects at baseline and post-treatment completed the BAVQ-R.

Community and Social Functioning. Specific Levels of Functioning Scale (SLOF; Schneider & Struening, 1983, Appendix I) is a measure of community and social

functioning. The self-report version of the SLOF will be administered as an interview in this study, however subjects will choose each answer from a set of anchors provided rather than the interviewer determining the answer from the subject's report. The SLOF total score provides a measure of overall functioning, while the four subscales measure the following domains of social and community functioning: Interpersonal Relationships (e.g., initiates contact with others), Social Acceptability (e.g., destroys property), Work Skills (e.g., has employable skills) and Community Living skills (e.g., can handle personal finances). The SLOF has shown strong psychometric properties in schizophrenia samples (Bowie, et al., 2008). Higher scores indicate more adaptive community and social functioning.

Measures of Alliance. The working alliance scale, short form (WAI-S; Horvath & Greenberg, 1989; Appendix A) was modified for this study such that participants rate their relationship with the support person rather than a therapist. No other changes were made to item wording or to the 7-point Likert scale, anchors, or three subscales (bond-the degree to which participant and therapist become attached, tasks-the degree of collaboration on therapeutic activities, goal-agreement on objectives of therapy). Research has shown high correlations between the subscales of the WAI (Horvath & Greenberg, 1989, Tracey & Kokotovic, 1989), thus for the proposed study, only the WAI-S total score was used, with higher scores indicating better alliance. As the WAI-S was given at every third visit and the number of visits will differ across participants, an average WAI-S score was calculated for the total amount of visits for each participant. The WAI-S has been used to assess alliance in previous trials of internet therapy (Knaevelsrud & Maercker, 2006).

Client Feedback. The client feedback form (CFF; Appendix B) is an in-depth feedback form designed specifically for this study. It consists of 13 items about the general program and 18 game and tutorial specific items. It was administered as an interview with

subjects rating the helpfulness and difficulty of different program aspects as well as giving specific feedback about positive program aspects and negative program aspects and feedback about changes they would like to make to the program. This was designed to get user input for the purposes of developing future iterations of this pilot program.

Client Satisfaction. The Client Satisfaction Questionnaire (CSQ; Attkisson & Zwick, 1982; Appendix D) is a self-report eight-item questionnaire designed to assess client satisfaction with the services they received. The CSQ is short, easily filled out and has been widely used and translated into several languages (Wilde & Hendriks, 2005). It has also been used in trials of internet CBT (Hedman et al., 2011) enabling client satisfaction with this internet CBT program to be compared to other internet CBT trials. The CSQ items are scored on a four point Likert scale and summed for a total score between eight and 32, with higher scores reflecting higher levels of satisfaction. Larsen et al. (1979) operationalized scores of 8 to 20 on the CSQ as low satisfaction, scores of 21 to 26 as moderate satisfaction, and scores from 27 to 32 as high satisfaction. Subjects completed this at post-treatment.

Procedures

Potential participants at both UNC and Boston sites were contacted by study staff and complete a telephone screen to determine study eligibility. Participants then completed a screening visit to further determine eligibility based on the aforementioned inclusion and exclusion criteria. Before the screening visit began, participants read the informed consent document and were asked to answer questions about the consent to ensure they understand the document. In order to participate in the study, participants had to be able to read and understand the informed consent document.

Eligible participants then went on to complete the baseline assessment, either directly following the screening assessment or scheduled at a different time that was two

weeks or less prior to the start of the computer based sessions. Baseline measures of symptoms, beliefs about voices, social functioning, paranoia, insight, and depression, were obtained in addition to the measures of cognition, literacy and diagnostic assessment (measures are described below). Participants were asked to complete approximately one computer-based session per week, either in an individual format (n=19), for participants located in the Boston or Chapel Hill-Durham area, or in a group format (n=4), for Wake County participants. Individuals were able to request to come in for longer computer based sessions less frequently (e.g. once every two weeks for two hours vs. once a week for one hour) or to complete multiple sessions in one visit.

The group took place at Wake County Human Services once weekly and involved four individuals working on the program individually but in a central computer lab. Participants were directed to ask the support person for assistance rather than each other and were provided with headphones to minimize distraction when listening to videos.

All participants, both individual and group, were asked to work on the program for at least 50 minutes at one time. At every third visit, they were asked to complete a measure of working alliance with their support person (WAI-S). Participants completed a post-treatment assessment battery identical to the baseline assessment, plus the additional symptom measures from the screening visit, once they had completed all ten computer based sessions.

The screening visit took approximately one and a half to two hours. The baseline and post-treatment assessment took approximately one to one and a half hours. Trained raters with experience in conducting research with this population administer all interview-based assessments. Given that this is an initial pilot project to determine the potential efficacy of

the Coping with Voices program, ratings were not blind. However, as noted above, a trained rater with no knowledge of the study administered ratings for the last four UNC participants.

CHAPTER 4

DATA ANALYSES

Descriptive Analyses

Descriptive statistics were computed for all demographic, symptom, and cognitive measures. Statistical significance was set at an alpha level of .05 or below and *PASW* Statistics 18.0 (SPSS) were used for all analyses. Due to the small sample size, power was low to detect anything but large effects. Effect sizes were calculated and evaluated according to Cohen's (1988) recommended conventions: small ($d = .20$), medium ($d = .50$), and large ($d = .80$).

Primary Analyses

In order to characterize treatment dose and related variables, we computed descriptive statistics (mean, standard deviation, & range) for the number of sessions completed, the number of visits to complete ten sessions, average session length, and the amount of homework assignments reported as completed (Table 4). We also calculated the mean CSQ score across participants in order to explore levels of satisfaction with the Coping with Voices program in comparison to other types of treatment individuals with schizophrenia may receive.

To evaluate the other primary aims of this study, that the Coping with Voices program would be associated with a reduction in voice frequency and intensity (as measured by the PSYRATS Auditory Hallucinations subscale [AH]), positive and general symptoms

(as measured by the PANSS), and total psychiatric symptoms (as measured by the BPRS), a single group repeated measures design was used. Four separate models were used: one model for total BPRS score; one model for the general symptoms subscale score of the PANSS; one model for the positive symptoms subscale of the PANSS; and finally, one model for the total score of the PSYRATS AH subscale. Time was the independent variable in each model, which had two observations per subject (pre and post scores on the measure of interest). The change in symptom score (BPRS, PANSS, or PSYRATS AH) from pre-treatment to post-treatment modeled the effect of time, with the null hypothesis that there would be no change over time (i.e. no effect of the Coping with Voices program) on the outcome variable of interest (BPRS, PANSS, or PSYRATS AH).

Exploratory Analyses

For exploratory aims 1 and 2, we also used a single group repeated measures design. For exploratory aim number one, the effect of the Coping with Voices program on beliefs about voices, five models were used, one for each of the BAVQ-R subscales (Malevolence, Benevolence, Omnipotence, Resistance and Engagement). As above, there were two observations per subject (pre and post scores on each of the five subscales) and time was the independent variable. The change in BAVQ subscale score from pre to post treatment modeled the effect of time (i.e. the effect of the Coping with Voices program).

To evaluate exploratory aim two (the effect of alliance on outcome), we used a single group repeated measures approach, where the independent variables were time, average WAI-S score across all sessions, and an alliance by time (WAI X Time) interaction term.

For exploratory aim number three, the examination of the potential association between client satisfaction and symptoms, we computed the correlation between CSQ total score and the difference in pre-treatment and post-treatment BPRS total score.

For exploratory aim four, examination of the potential effects of the Coping with Voices program on community and social functioning, we again used a single group repeated measures design. Four models were used, one for each SLOF subscale (Interpersonal Relationships (IR), Social Acceptability (SA), Community Living Skills (CLS), or Work Skills (WS)) and one for total score. In each model there were two observations per subject (pre and post score on SLOF subscale of interest) with time as the independent variable. We also explored the potential effect of the Coping with Voices program on SLOF total score, using a single group repeated measures design, with two observations per subject, pre and post treatment SLOF total score, with time as the independent variable.

For exploratory aim five, the examination of effect sizes for the primary treatment outcomes (BPRS total score, PANSS positive symptoms subscale score, PSYRATS AH score), the following formula was used to facilitate comparisons to published data:

$$1. d = M_1 - M_2 / s_{\text{pooled}} \text{ where } s_{\text{pooled}} = \sqrt{[(s_1^2 + s_2^2) / 2]}$$

Within group effect sizes were calculated from published data (means, standard deviations) for the primary treatment outcomes in similar CBT for psychosis interventions.

To examine the information drawn from client feedback forms (exploratory aim 6), we used descriptive statistics to characterize responses to the Likert style choice items and transcribed qualitative responses in order to search for recurrent themes in subject feedback.

CHAPTER 5

RESULTS

Descriptive Analyses

No significant differences on demographic or baseline variables (IQ, baseline symptoms & number of hospitalizations) were found between participants who completed the program in the group format and those who completed it individually (Table 2). Visual inspection revealed that the group format only had male participants as opposed to the individual format, where 60% of the participants were male. There was a trend towards individual participants having a higher IQ than group participants. No significant differences were found between completers (those who completed five or more sessions) and non-completers (those who completed less than five sessions) on demographic or baseline variables (IQ, baseline symptoms & number of hospitalizations) (Table 3). Given the small sample size, these statistics should be interpreted with caution.

Primary Analyses

Aim 1: Feasibility of the Coping with Voices program. A total of 18 participants finished all program sessions, with the mean number of sessions completed for all 23 participants being 8.6 sessions (SD 2.8). Five individuals (four UNC participants and one Boston participant) failed to complete all ten sessions, however four of these five individuals completed at least three program sessions. Only one individual declined to complete the post-treatment assessment. One individual at the Boston site did not complete

the SLOF post-treatment and four individuals from the Boston site did not complete the Client Satisfaction Questionnaire at post-treatment. Two individuals, one from each site, did not complete the WAI at any time point.

Study drop out was defined as failing to complete the post-treatment assessment. Treatment completion was defined as completing at least five sessions of the Coping with Voices program. Reasons for failing to complete treatment (n=5, 22%) were reported as follows, relocation to another area, inadequate travel compensation, the start of college, travel burden to the study, and no reason. Our drop-out rate (4.3%) was similar to those reported by Penn et al. (2009; 3.1%), Pinkham et al. (2004; 9%) and Wykes et al. (2005; 8.9%) but lower than other trials of CBT for psychosis (Lewis et al., 2002; 16.8%, Valmaggia, Van der gaag, Tarrier, Pijenborg and Slooff, 2005; 22%,) and the median drop-out value of 14.5% reported in Wykes et al.'s (2008) meta-analysis of 34 CBT for psychosis trials. Our rate of treatment completion (78%) was similar to rates drawn from other trials of CBT for auditory hallucinations, including Penn et al., (2009) (78%) and Valmaggia et al. (2005) (81%).

Overall client satisfaction was generally high, with a mean client satisfaction score of 27.3, within the range identified by Larsen et al. (1979) as high satisfaction (Table 4). This level of satisfaction is comparable to outpatient psychiatric treatment (mean CSQ=27.06) (Perreault et al., 1996), and clozapine treatment (mean CSQ=27.4) (Sloan et al., 1997) but higher than satisfaction with assertive community treatment for individuals with schizophrenia spectrum disorders (mean CSQ=23.5) (Chue et al., 2004).

On average, clients were able to complete all ten sessions in approximately 11 visits, with an average visit length of approximately 61 minutes. Participants reported completing approximately 62% of program homework assignments. The most common

reasons selected for not completing homework assignments were forgetting and feeling anxious about writing things down.

Aim 2: Evaluate the effect of the Coping with Voices program on the Severity and Intensity of Auditory Hallucinations. There was a significant effect of the Coping with Voices program on PSYRATS Auditory Hallucination subscale score $F(1, 21)= 6.436$, $p=.019$. Indicating that the Coping with Voices program was associated with a significant reduction of voice intensity and severity (as measured by the PSYRATS AH subscale) at post-treatment corresponding to a small to moderate effect ($ES=0.41$). The difference of 2.6 points between average pre-treatment total PSYRATS score and average post-treatment score did not reach the level of clinical significance (defined as a five point reduction in PSYRATS total score).

Aim 3: Evaluate the effects of the Coping with Voices program on General and Positive Symptoms. There was a significant effect of the Coping with Voices program on general symptoms, as measured by the general symptom subscale of the PANSS, $F(1, 16)=5.801$, $p=.028$ (Table 5), which corresponded to a moderate effect ($ES=0.59$). There was also a trend for the Coping with Voices program to be associated with a reduction in PANSS positive subscale scores, $F(1, 16)=3.582$, $p=.077$, corresponding to a small to moderate effect ($ES=0.40$).

Aim 4: Evaluate the effect of the Coping with Voices program on Total Symptoms. There was a significant effect of the Coping with Voices program on total symptoms, as measured by BPRS total score, $F(1,21)=14.228$, $p=.001$ (Table 5), corresponding to a large effect ($ES=0.86$). The mean reduction of 8.32 points in total BPRS score also approached clinical significance (defined as 20% reduction in the mean BPRS total score or 10 points) representing a reduction of 16.5%. In regards to total psychotic symptoms as measured by

the PANSS, there was a significant reduction in mean total PANSS score $F(1,16)=10.18$, $p=.005$, but this failed to reach levels of clinical significance (defined as a 20% reduction in total PANSS score or 11.5 points) with a mean reduction in PANSS total score of 10.4% or 5.98 points at post-treatment. BPRS total score and PANSS total score were significantly correlated at both pre ($r=.768$, $p=.00$) and post-treatment ($r=.893$ $p=.00$).

Exploratory Analyses

Exploratory Aim 1: Evaluate the effect of the Coping with Voices program on Beliefs about Voices (as measured by the BAVQ-R). There was no significant effect of the Coping with Voices program on participants' beliefs about the malevolence, omnipotence, or benevolence of their voices (Table 5). The Coping with Voices program was also not associated with a significant increase in resistance to voices. There was a trend for the Coping with Voices program to be associated with a decrease in self-reported engagement with voices, $F(1, 21)=3.709$, $p=.068$.

Exploratory Aim 2: Effects of therapeutic alliance on outcome. There was no relationship between average alliance score and any of the primary treatment outcomes examined (BPRS total score, PANSS general subscale score, PANSS positive subscale score, PSYRATS AH score) (Table 6). This suggests that alliance was not associated with the outcomes of the Coping with Voices program in this sample.

Exploratory Aim 3: Association between client satisfaction and treatment outcome. No significant correlation was found between client satisfaction (as measured by CSQ total score) and treatment outcome (as measured by change in BPRS total score) $r=-.274$, $p=.272$. This indicates that client satisfaction was not associated with changes in outcome for the Coping with Voices program.

Exploratory Aim 4: Evaluate the effects of the Coping with Voices program on Social and Community Functioning. There was no significant effect of the Coping with Voices program on social functioning (as measured by the Interpersonal Relationships subscale of the SLOF), $F(1, 20)=2.533, p=.127$ (Table 5). There was also no significant effect of the Coping with Voices program on social acceptability $F(1, 20)=.254, p=.620$, community living skills, $F(1, 20)=2.579, p=.124$ or work skills, $F(1, 20)=2.164, p=.157$. There was a trend for the mean total SLOF score to increase between pre-treatment and post-treatment ($p=.078$).

Exploratory Aim 5: Comparison of within-group effect sizes with other trials of CBT for psychosis. Within group effect sizes were calculated for all primary treatment outcomes for the current study and for similar trials of CBT for psychosis and CBT for auditory hallucinations using published data (Table 7). It should be noted that some trials used for comparison included participants that were in an acute illness phase (Lewis et al., 2002, Pinkham et al., 2004, Startup et al., 2004). In comparison to trials of CBT for psychosis, the effect size for the PANSS total score represented a moderate effect ($ES=0.60$), as compared to the small effect obtained from Durham et al.'s (2003) data ($ES=0.31$) and the large effect found by Lewis et al. (2002) ($ES=1.38$). When compared to CBT for Auditory Hallucinations specifically (Penn et al., 2009), effect sizes for PANSS total score were similar and in the moderate range ($ES= 0.47$ and 0.60 respectively). The effect size obtained for BPRS total score ($ES=0.86$) was smaller than that computed from Startup et al.'s (2004) trial of CBT for psychosis ($ES=1.72$), however both represent a large effect of treatment on total symptoms.

For positive symptoms (PANSS Positive subscale score) the effect size obtained for the current study represented a small to moderate effect of treatment ($ES=0.40$) and was

lower than those obtained from both trials of CBT for Psychosis (Gumley et al., 2003, Lewis et al., 2002, Rector et al., 2003, Valmaggia et al., 2005) (ES=0.50-2.10) and CBT for Auditory Hallucinations (Penn et al., 2009) (ES=0.51).

For general psychopathology (PANSS general subscale), we obtained a moderate effect of treatment on general symptoms (ES=0.59), smaller than those obtained for trials of CBT Psychosis (Gumley et al., 2003, Rector et al., 2003) (ES=0.95 and 0.79 respectively) with the exception of Valmaggia et al.'s (2005) CBT for psychosis trial for which a moderate effect was also obtained (ES=0.42). In comparison to a trial of CBT for auditory hallucinations (Penn et al. 2009) (ES=0.39), we found a larger effect size however both effects were in the moderate range.

Finally in regards to auditory hallucinations as a treatment outcome (PSYRATS AH subscale score), we found a small to moderate effect of the Coping with Voices program (ES=0.41) on voice intensity and severity. When compared to trials of CBT for psychosis, our effect size was similar to that obtained from Durham et al. (2003) (ES=0.42) but much smaller than the large effect obtained from Lewis et al. (2002) (ES=2.67). When compared to trials of CBT for auditory hallucinations specifically, the moderate effect we obtained was much larger than the small effect obtained from Penn et al.'s (2009) (ES=0.19) data, but smaller than the large effects obtained from Pinkham et al.'s (2004) and Wykes et al.'s (2005) data (ES=0.72 and 0.78 respectively).

When compared to effect sizes for internet CBT, calculated effect sizes for target symptoms (PANSS total, PANSS positive, PANSS general, PSYRATS AH) were generally in the small to moderate range as compared to the large effect (ES=0.81) identified by Barak et al. (2008) for internet CBT interventions across diagnoses, with the exception of the large effect for BPRS total score.

Exploratory Aim 6: Examination of qualitative feedback regarding the Coping with Voices program. Overall client feedback for the Coping with Voices program was positive (Table 7). The majority of program users felt the program was informative, understandable, useful, helpful, interactive and interesting. Qualitative examination of client's feedback revealed that the learning or development of new coping skills to dealing with voices and the normalizing aspect of the program were the most positive aspects of the program identified by participants. The ability to access the experiences of others (via the social feed) was also noted in participant comments to be a positive aspect of the program, for example the following comment from a user "My thoughts are so weird I thought other people didn't have them, but they do". The development of coping skills was also noted in participant responses as a positive aspect of the program. Comments from another user reflect this "I like the CBT program because it helps me with my voices...I understand my voices better since I started the CBT program. I am now feeling better about myself." The length of some games or sections of the program and the program's assumption the voices are universally perceived as negative, unreal and/or harmful were the most negative aspects of the program identified by participants. The most common suggestion for improvement of the program was to include more user input or to expand the program to a wider range of users to not only improve access to the program but also so that more diverse experiences are included in the social feed and examples included in the program.

CHAPTER 6

DISCUSSION

This is the first study to investigate an internet-based CBT intervention for schizophrenia spectrum disorders. We hypothesized that the Coping with Voices program would be a feasible and tolerable intervention for individuals with schizophrenia spectrum disorders who experience auditory hallucinations. We also hypothesized that the Coping with Voices program would be associated with significant reductions in positive and general psychotic symptoms, total psychiatric symptoms, and the intensity and severity of auditory hallucinations. Overall, the Coping with Voices program appears to be a feasible, tolerable and well-liked intervention. Our results suggest, consistent with other trials of CBT for psychosis (Wykes et al., 2008, Zimmerman et al., 2005) and other trials of internet CBT (Barak et al., 2008), that the Coping with Voices program may be associated with reductions in target symptom areas (intensity of voices, general symptoms and total psychiatric symptoms).

Inconsistent with some trials of CBT for psychosis (e.g. Trower et al. 2004), we failed to find hypothesized changes in beliefs about voices and social and community functioning. Furthermore, we failed to find a possible relationship between alliance and outcome or a relationship between client satisfaction and outcome. While the current study's results must be tempered due to the small sample size and lack of a control or comparison group, they do contribute to the limited literature regarding technological interventions for

schizophrenia as well as the broader literature regarding CBT for psychosis. A more detailed description of the results, limitations, implications and future directions are discussed below.

Primary Aims

The primary aims of this study were to evaluate the feasibility and tolerability of the Coping with Voices program and evaluate potential effects on the frequency and severity of voices, the general symptoms associated with schizophrenia, the positive symptoms associated with schizophrenia and total psychiatric symptoms.

In regards to feasibility and tolerability, overall levels of client satisfaction were generally high and comparable to other treatments individuals with schizophrenia spectrum illnesses are likely to encounter (Chue et al., 2004, Perreault et al., 1996, Sloan et al., 1997). Levels of client satisfaction were also similar to those drawn from an internet CBT program for social anxiety (Hedman et al., 2011). Taken together, these results suggest that the Coping with Voices program is at least as satisfactory to participants as other common interventions for schizophrenia (e.g. outpatient psychiatric therapy) and as internet CBT for other disorders.

Consistent with research on internet self-help groups for schizophrenia (Rotundi et al., 2005), the average visit length and average time to complete a session indicate that individuals with psychotic disorders are able to tolerate and make use of computer-based interventions for extended periods of time. The rate of self-reported homework completion was similar to the level of homework completion reported by Dunn et al. (2006) for face-to-face cognitive therapy for psychosis, indicating that homework assignments can be successfully implemented through computer based interventions. Furthermore, our rate of drop out was comparable to other trials of CBT for auditory hallucinations (Penn et al., 2009, Pinkham et al., 2004, Wykes et al., 2005). Our drop out rate was lower than other

trials of CBT for psychosis (Lewis et al., 2002, Valmaggia et al., 2005, Wykes et al., 2008) and lower than trials of comparable internet CBT programs (Cavanagh et al., 2006; beatingtheblues program, Marks et al., 2004; FearFighter program).

Combined with the high level of client satisfaction these results suggest that the Coping with Voices program is a feasible and tolerable intervention for individuals with schizophrenia spectrum disorders, and support the development of computer-based interventions for this population.

Our hypothesis that the Coping with Voices program would result in a significant reduction of voice severity and intensity was supported. This is consistent with results found by several other trials of CBT for auditory hallucinations (Pinkham et al., 2004, Thomas et al., 2011, Valmaggia et al., 2005). Although the lack of control condition in this study precludes causal inference, these results suggest that the Coping with Voices program may alter target psychotic symptoms, including the severity and intensity of voices.

Consistent with previous work on both CBT for psychosis and CBT for auditory hallucinations (Gumley et al., 2003, Lewis et al., 2002, Thomas et al., 2011, Zimmermann et al., 2005), our hypothesis that the Coping with Voices program would result in significant reduction in general symptoms was supported. This suggests that although the Coping with Voices was designed to target auditory hallucinations, the skills may also generalize to other symptom domains.

We also found a trend level result for a reduction in positive symptoms. Although the reduction in positive symptoms did not reach levels of statistical significance, the observed decrease in level of positive symptoms is consistent with investigations of CBT for psychosis in populations experiencing medication refractory symptoms (Sensky et al., 2000, Tarrier et al. 1998, Tarrier et al., 2003). Such samples provide a particularly

relevant comparison group given that many of the individuals drawn to participate interventions like Coping with Voices are likely experiencing medication resistant positive symptoms, and are thus seeking or are referred to adjunctive treatment.

Our hypothesis that the Coping with Voice program would be associated with a significant reduction in total psychiatric symptoms (as measured by total BPRS score) was supported. This is consistent with results found by previous investigations (Haddock et al., 1999, Pinto, La Pia, Mennella, Giorgio, & DeSimone, 1999, Startup et al., 2004). We failed to support our hypothesis that reductions in total BPRS score would reach the level of clinically significant change, (defined as a 20% reduction in score) representing a change of 16.5% from pre to post-treatment. Similarly, changes in total PANSS score failed to reach the level of clinical significance (defined as a 20% reduction in score) representing a change of 10.4% from pre to post-treatment. However, the statistically significant reduction in total symptoms is encouraging for this novel program, and, for the BPRS in particular, is close to reaching the threshold for clinically significant change. Given the breadth of symptoms covered by the BPRS and PANSS, a statistically significant reduction indicates that internet CBT for psychosis programs can possibly have a positive impact outside specific target symptoms (e.g. auditory hallucinations).

Exploratory Aims

Our secondary aims included exploring the potential effect of the Coping with Voices program on beliefs about voices and social and community functioning. We also explored the potential interaction between alliance and treatment outcome and client satisfaction and treatment outcome. Finally, we evaluated participant feedback and

compared effects of the Coping with Voices program with other trials of CBT for psychosis and CBT for auditory hallucinations.

We failed to find statistically significant changes in any of the dimensions of beliefs about voices (Malevolence, Benevolence, Omnipotence, Resistance and Engagement) measured by the BAVQ-R, at post-treatment. There was a trend level result indicating a tendency for levels of engagement with voices to decrease at post-treatment. Previous research regarding the effects of CBT for auditory hallucinations on beliefs about voices has been inconsistent. Several trials have found an effect of CBT for auditory hallucinations on beliefs about voices (Chadwick et al., 2000, Pinkham et al., 2004, Trower et al., 2004), but other trials have failed to find effects (e.g. Penn et al., 2009). The range of score on the BAVQ-R in our sample suggest that individuals in this sample did not have as many strongly held beliefs about voices and were already making significant attempts to resist voices at baseline, indicating the existence of possible floor effects on the Malevolence, Benevolence, Omnipotence, and Engagement scales and the existence of a ceiling effect for the Resistance subscale. The focus of the program on increasing positive coping skills is consistent with the trend we observed towards less engagement with voices.

We failed to find any changes in the level of social or community functioning at post-treatment. This is inconsistent with the small number of studies that have shown gains in social functioning (Startup, et al., 2004, Wykes et al., 2005, Wykes et al., 2008). However, the measures used in both the Startup et al. (2004) and Wykes et al. (2005) studies incorporated informant data regarding functioning into ratings. Informant information accounts for gains in functioning perceived by others that may not be perceived by the target individual. Participant characteristics, such as level of depression, can significantly bias self-reported ratings of functioning (Sabbag, Twamley, Vella, Heaton, Patterson & Harvey,

2012). Until further research is conducted with the Coping with Voices program, we can only conclude that the Coping with Voices program did not result in social or community functioning gains in this sample.

We failed to find a relationship between therapeutic alliance and any of the primary treatment outcomes (BPRS, PANSS General scale, PANSS positive scale, PSYRATS AH scale). Although some investigations of internet therapy programs have found larger effect sizes for interventions with some therapist contact as compared to self-directed interventions (Newman et al. 2011) other studies have not (Reger & Gahm, 2009). Titov (2011) suggests that the relationship between therapist contact and outcome may differ by program nature, such that that minimal therapist support is sufficient for high quality structured interactive interventions (Palmqvist et al., 2007) but more extensive support may be needed with less structured interventions. As the Coping with Voices was designed to be entirely self-directed, it may be more structured than other internet therapies and therefore, alliance had less impact on outcome.

We failed to find a relationship between client satisfaction and total symptoms. While a small number of studies have found associations between symptoms levels and satisfaction (Primm et al., 2000, Sloan et al., 1997), no study has examined this possible association in internet CBT for psychosis. Client satisfaction was generally high in this sample and no score reflected low satisfaction (e.g. the lowest score was 20, at the level of indifference). Thus, the existence of a ceiling effect on the CSQ may have inhibited our ability to see a relationship between satisfaction and outcome.

Client feedback towards the program was very positive, with most participants endorsing that the Coping with Voices program informative, understandable, useful, helpful, interactive and interesting. The most commonly reported positive aspects of the program

were the learning of new coping skills and the normalizing aspect of the program. It is encouraging that clients reported the gain of new skills as a particularly positive program aspect as so much of the content of Coping with Voices is focused on the development of new coping strategies and the evaluation of coping strategies. The normalizing aspect of the program also appeared particularly powerful, which is of particular importance given the association between stigma and recovery (Lysaker et al., 2007, Kleim et al., 2008), and stigma and seeking care (Cooper et al., 2003).

The length of some of the games and sections of the program and the program's assumption that voices are universally perceived as negative were the most commonly reported negative aspects of the program. Client feedback about specific program aspects, like length, will be beneficial to the future iterations of the Coping with Voices program. The assumption that voices are negative was unexpected given the high levels of distress that are typically associated with auditory hallucinations in the literature. This aspect of feedback could reflect the current program's inability to incorporate diverse and sometimes contradictory feelings in responses to voices. For example, in the self-assessment, the program asks if the participant believes the voices are harmful or helpful and for at least a few participants, that answer appears to be both.

Effect sizes for the target treatment outcomes for the Coping with Voices program were generally within the same range as those calculated from published trials of CBT for psychosis and CBT for auditory hallucinations, with the exception of the effect size for positive symptoms, which was smaller than those calculated from published trials. The similarity between the effect sizes calculated for the Coping with Voices program and those calculated from published trials is encouraging, given that this is a pilot study. Although our comparisons suggest the Coping with Voices program is a promising treatment, it is

important to note that effect sizes from studies that use unblinded raters (like this study) are higher than those which use blinded ratings, leading the Wykes et al. (2008) to conclude that unblinded trials appear “overoptimistic” about the effects of CBT for psychosis (p. 531).

Furthermore, as discussed in the introduction, a recent review failed to find an advantage of CBT for psychosis over other control treatments (e.g. supportive therapy) and researchers have theorized that non-specific factors (unconditional regard, emotional support & social interaction) contained in these treatments may be beneficial independent of treatment modality (Penn et al., 2004). As the Coping with Voices program was administered by a support person it is possible that some of these non-specific factors were present during treatment. Specifically some clients reported that coming into the lab and interacting with the support person or other group members was beneficial for them. However, given that the bulk of the session time was spent working on the Coping with Voices program and not in interaction with the support person, it is unlikely that non-specific factors impacted treatment in the same way as been found with treatments designed to target these areas specifically.

Limitations and Future Directions

This study has several limitations. The most salient of which is the lack of control or comparison treatment. Due to uncontrolled design of this study, we cannot conclude that the Coping with Voices program offers any advantages over a wait-list condition or other psychological treatment for schizophrenia (or, “treatment as usual”). It is possible that the changes in outcome were due to the passage of time or attention, and not to participation in the Coping with Voices program. To this end a small randomized controlled trial, comparing the Coping with Voices program to usual care within a publically funded urban community mental health center, is currently underway. If Coping with Voices is found to

be more effective than treatment as usual in this setting, future studies should investigate the program's feasibility with lower levels of support, cost-effectiveness versus clinician time investment and efficacy when compared to an active control treatment.

However, as this is a novel intervention being used with a new population, the encouraging results underscore the importance of further and more stringent investigation, including the development of a randomized controlled trial for the Coping with Voices program. Furthermore, in their discussion of treatment development, Mueser and Drake (2005) note the need for pilot trials when interventions are in the early stages of development.

Another limitation is sample size, which also precludes the drawing of firm conclusions about the effects of the Coping with Voices on psychotic and general psychiatric symptoms. The small sample size may also have contributed to our failure to find significant changes on variables (e.g. beliefs about voices) that have been found in previous investigations. However, the current sample size is similar to other trials of CBT for psychosis that have found positive effects (e.g. Wykes et al., 1999). Regardless, future trials of the Coping with Voices program should incorporate larger sample sizes, in addition to control conditions, to fully understand the effects of the program.

A third limitation was the lack of blinded ratings of primary outcomes. Although it is promising that significant changes were seen on self-report measures (PSYRATS), assessors not blind to the study's design and aims rated the bulk of other primary outcomes (PANSS, BPRS). Unmasked ratings are strongly associated with inflation of treatment effects in CBT for psychosis clinical trials (Wykes et al. 2008). Thus, results regarding these unblinded ratings must be interpreted cautiously.

As noted above, the measure of social and community functioning used in this investigation was a self-report measure, which may be biased by participant characteristics, mood and other factors (Sabbag et al., 2012). Future investigations should attempt to incorporate informant data on social and community functioning in order to fully elucidate the effects (if any) of this internet CBT program for auditory hallucinations on social and community functioning.

Finally, this investigation had no follow-up assessments. It is possible that the reductions observed in voice severity, general, positive and total symptoms would no longer be significant at a follow-up assessment (Penn et al., 2004, Sensky, et al, 2000, Wykes et al, 2008). Future studies using the Coping with Voices program should incorporate follow-up assessments to examine whether participants are able to use the skills learned in the program to manage ongoing symptoms after treatment ends.

In addition to the incorporation of a control condition, blinded raters, follow-up assessments and the incorporation of informant measures of social functioning, future research on the Coping with Voices program should attempt to identify specific motivational cues and barriers to program completion. Based on the limited subject report from this pilot trial, travel considerations (having to do the program outside of the home) were reported by three participants as the primary reason for leaving the study, suggesting that wider access to the program could possibly alleviate the need to drop out for some individuals.

Conclusions

Overall, the results of the current study suggest that the Coping with Voices program may result in reductions in voice severity, general symptoms and total psychiatric symptoms. While these findings are preliminary, they indicate that the Coping with Voices

program is a feasible and tolerable treatment program for individuals experiencing auditory hallucinations. In addition, our results suggest that individuals with psychotic disorders can use computer-based interventions effectively.

One ongoing challenge in the field is that CBT programs for psychosis are not widely available in the US (Kuller et al., 2010). Computer-based interventions, like Coping with Voices, represent a chance to disseminate a potentially efficacious treatment to individuals who otherwise might not have access to such treatment. Furthermore, due to its computer-based nature, the Coping with Voices program may also be used as adjunct to traditional face-to-face treatments, allowing users to continue to work on coping skills outside of treatment visits. Our results underscore the importance of continuing to investigate and develop technology based programs for this population and dispute the argument (e.g. Derrig-Palumbo & Zeine 2005) that individuals with psychotic disorders cannot make use of internet therapies. Given the rates of medication refractory symptoms and the need to increase access to efficacious psychological treatments in this population, the Coping with Voices program appears to be a promising intervention to help fill an important and unmet clinical need.

Table 1
Participant Demographics

	<u>N= 23</u>
	N(%)
Gender (Male)	14(60)
Ethnicity	
Caucasian	13(57)
African-American	9(39)
Asian	1(4)
Diagnosis	
Schizophrenia	18(78)
Schizoaffective	4(18)
MDD w/Psychotic Features	1(4)
Marital Status	
Married	3(26)
Single/Divorced/Widowed	20(74)
	M(SD)
Age	40.9(13.3)
Education (years)	13.0(1.5)
IQ score (WASI)	94.0(15.1)
Reading level grade (WRAT)	11.5(2.1)
Age at First Hospitalization	25.2(9.5)
Total Hospitalizations	6.0(4.4)

Table 2
Individual vs. Group participants

Demographic variable	Individual Format (<i>n</i> =19)		Group Format (<i>n</i> =4)		<i>p</i> value
	<i>n</i>	%	<i>n</i>	%	
Male	10	52	4	100	.113
Caucasian	11	58	2	50	.596
Greater than HS education	11	58	0	0	.382
Diagnosis					.828
Schizophrenia	15	79	3	75	
Schizoaffective	3	16	1	25	
Major Depression w/Psychotic Features	1	5	0	0	
	Mean	SD	Mean	SD	
Age in years	41.90	14.40	36.30	4.60	.178
Hospitalizations	6.30	4.80	4.30	1.30	.118
IQ ¹	96.90	15.10	81.00	5.40	.055 ⁺
Baseline Symptoms ²	50.70	11.40	44.80	5.70	.330

Note. Chi-square for comparison of proportions; t-test for age, # hospitalizations, IQ, baseline symptoms

¹ as measured by the Wechsler Abbreviated Scale of Intelligence (WASI)

² as measured by the Brief Psychiatric Rating Scale (BPRS)

+ significant at *p*=.10

Table 3
Completers vs. Non-completers

Demographic variable	Completers (n=18)		Non-completers (n=5)		p value
	n	%	n	%	
Male	10	56	4	80	.327
Caucasian	10	56	3	60	.663
Greater than HS education	17	94	5	100	.368
Diagnosis					.412
Schizophrenia	13	72	5	100	
Schizoaffective	4	22	0	0	
Major Depression w/Psychotic Features	1	6	0	0	
	Mean	SD	Mean	SD	
Age in years	39.61	12.50	45.60	16.53	.385
Hospitalizations	5.56	4.37	7.40	4.78	.421
IQ ¹	93.41	16.10	96.00	12.69	.746
Baseline Symptoms ²	50.00	11.40	48.40	13.39	.777

Note. Chi-square for comparison of proportions; t-test for age, # hospitalizations, IQ, baseline symptoms

¹ as measured by the Wechsler Abbreviated Scale of Intelligence (WASI)

² as measured by the Brief Psychiatric Rating Scale (BPRS)

Table 4
Program characteristics

	Minimum	Maximum	Mean	SD
Number of visits+	7	16	11.1	2.6
Visit length (min)	43	89	60.9	10.2
Time to complete one session (min)	40	133	66.4	23.6
Self-reported complete homework assignments (%)	0	100	61.7	34.8
Client Satisfaction*	20	32	27.3	3.9

* as measured by Client Satisfaction Questionnaire + completers only

Table 5

Main Outcome Measures

Measure	PreMean (SD)	PostMean (SD)	Range Pre.	Range Post.	F(df)	p
BPRS	50.27(10.64)	41.95(8.72)	36-72	31-68	14.228(1,21)	.001*
PSYRATS						
AH subscale	26.26 (6.62)	23.68(6.06)	14-27	10-33	6.436(1, 21)	.019*
PANSS						
General	28.24(4.38)	25.24(5.70)	21-39	17-40	5.801(1,16)	.028*
Positive	16.56(3.05)	15.12(4.09)	10-21	10-23	3.582(1,16)	.077+
Total	57.39(9.30)	51.41(10.68)	38-77	37-74	10.180(1,16)	.005*
BAVQ-R						
Malevolence	6.96(5.24)	8.32(5.79)	0-16	0-18	.731(1,21)	.402
Benevolence	4.70(5.80)	3.32(3.92)	0-17	0-12	1.186(1,21)	.288
Omnipotence	8.52(4.08)	7.50(3.57)	3-15	3-14	1.045(1,21)	.318
Resistance	15.87(6.91)	16.68(4.42)	0-27	7-24	.005(1,21)	.945
Engagement	6.17(6.89)	4.14(4.91)	0-20	0-20	3.709(1.21)	.068+
SLOF						
IR	23.61(5.10)	24.71(4.14)	12-34	14-31	2.533(1, 20)	.127
SA	25.74(2.72)	25.67(2.71)	19-29	19-30	.254(1, 20)	.620
CL	47.70(8.88)	49.52(5.48)	21-55	33-55	2.579(1,20)	.124
WS	23.00(4.29)	23.86(4.09)	14-30	16-30	2.164(1, 20)	.157
Total	121.04(15.0)	123.67(11.63)	93-153	97-139	3.443(1, 20)	.078+

Note. Negative effect sizes are in the expected direction. BPRS= Brief Psychiatric Rating Scale. PSYRATS AH subscale= Auditory Hallucinations subscale, PANSS General=General subscale, PANSS Positive=Positive subscale, PANSS total =PANSS total score, SLOF IR= SLOF interpersonal relationships subscale SA=Social Acceptability subscale, CL= Community Living subscale, WS=Work Skills subscale. *Significant at p=0.05, + significant at p=.10

Table 6
Alliance and Main Outcomes

Model	F(df)	p
BPRS		
BPRS X WAI	2.224(1,19)	.152
PSYRATS AH		
PSYRATS AH X WAI	.516(1,19)	.481
PANSS		
General X WAI	.110(1,15)	.745
Positive X WAI	.374(1,15)	.55

Note. BPRS= Brief Psychiatric Rating Scale Total Score. PSYRATS AH= Auditory Hallucinations subscale.
WAI=Working Alliance Inventory Average Total Score (Two subjects did not complete the WAI at any time point).
PSYRATS=PSYRATS total score. PANSS General= General Symptom Subscale, PANSS Positive= Positive Symptom subscale

Table 7
Effect size comparison

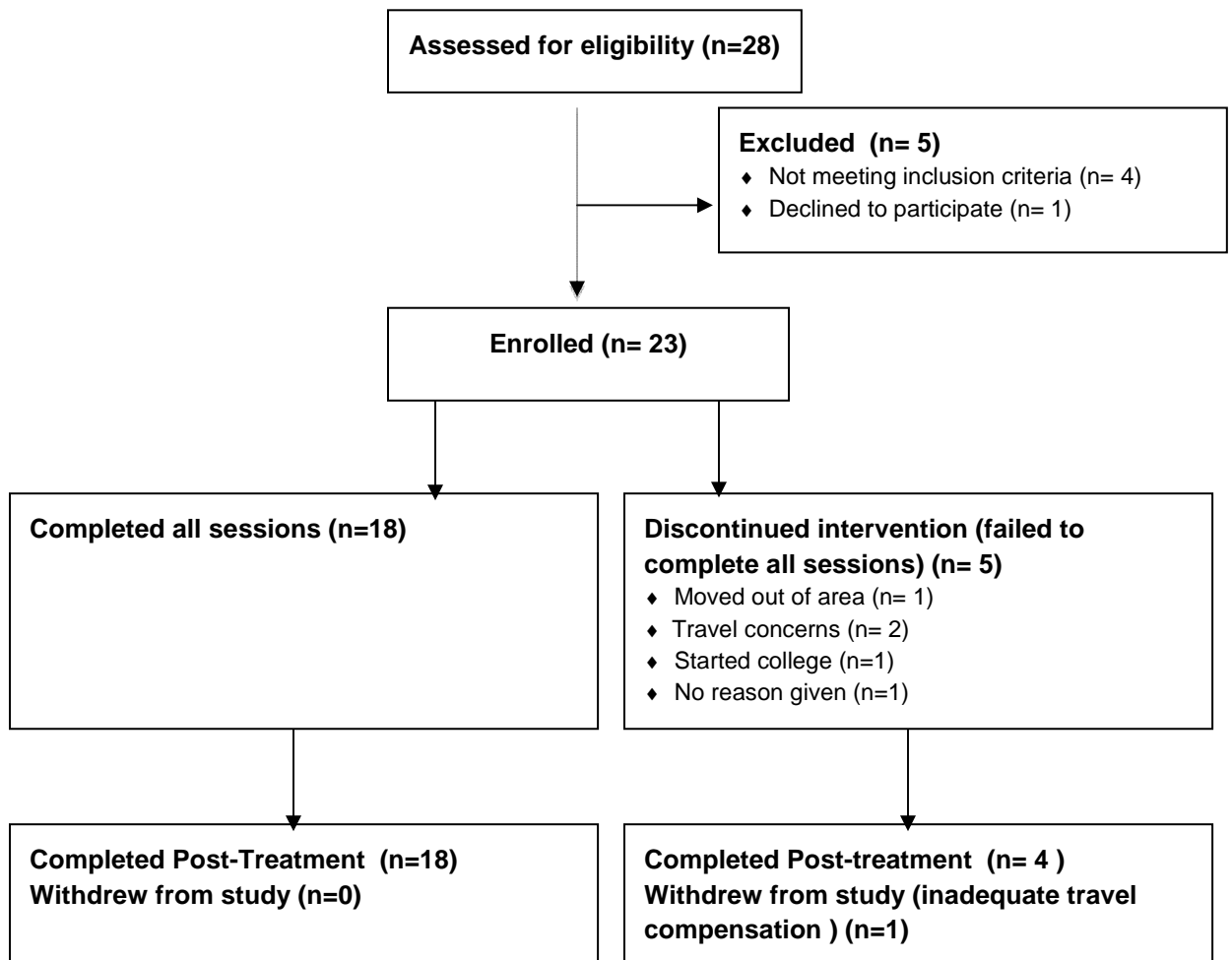
Primary Outcome	Est. d	Treatment Type
BRPS		
Current study	0.86	AH
Startup et al. (2004)	1.72	Psychosis
PANSS total		
Current study	0.60	AH
Lewis et al. (2002)	1.38	Psychosis
Durham et al. (2003)	0.31	Psychosis
Penn et al. (2009)	0.47	AH
PANSS positive		
Current study	0.40	AH
Lewis et al. (2002)	2.10	Psychosis
Gumley et al. (2003)	0.50	Psychosis
Rector et al. (2003)	0.54	Psychosis
Valmaggia et al. (2005)	0.72	AH
Penn et al. (2009)	0.51	AH
PANSS general		
Current study	0.59	AH
Gumley et al. (2003)	0.95	Psychosis
Rector et al. (2003)	0.79	Psychosis
Valmaggia et al. (2005)	0.42	Psychosis
Penn et al. (2009)	0.39	AH
PSYRATS AH		
Current study	0.41	AH
Lewis et al. (2002)	2.67	Psychosis
Durham et al. (2003)	0.42	Psychosis
Pinkham et al. (2004)	0.72	AH
Wykes et al. (2005)	0.78	AH
Penn et al. (2009)	0.19	AH

Note. BPRS= Brief Psychiatric Rating Scale. PSYRATS AH subscale= Auditory Hallucinations subscale, PANSS General=General subscale, PANSS Positive=Positive subscale, PANSS total =PANSS total score. Treatment type refers to whether the intervention was CBT for Auditory Hallucinations (AH) or CBT for Psychosis (Psychosis)

Table 8
Client Feedback

Program Dimension	Response (%)
Understandable	
Not easy to understand	4.8
Easy to understand	71.4
Very easy to understand	23.8
Information	
Not enough information	11.8
Just right amount of information	88.2
Too much information	0
Flow	
Poor Flow	0
Somewhat good flow	33.3
Very good flow	61.1
Useful	
Not useful	9.5
Useful	33.3
Very useful	57.1
Helpful	
Did not help	14.3
Helped	33.3
Helped very much	52.4
Interesting	
Not at all interesting	0
Somewhat interesting	42.9
Very interesting/engaging	57.1
Interactive	
Not enough interaction	11.8
Just right amount	76.5
Too much	11.8
Outside Practice	
Did not complete or hardly completed	29.4
Completed some	41.2
Completed a good deal	29.4
Recommend	
Not willing to recommend	0
Somewhat willing to recommend	28.6
Very willing to recommend	71.4
Overall	
Poor/unhelpful	0
Medium/some helpful parts	19.0
Very good/helpful	81.0

Figure 1. Consort diagram



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