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Acceptance and Commitment Therapy for Depression following psychosis: An examination of clinically significant change

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Abstract

Depression following psychosis is common and can impact negatively on individuals' quality of life. This study conducted post-hoc analyses on 14 participants with psychosis from a larger randomised controlled trial who presented with clinically important levels of depression at baseline. Eight of the participants received Acceptance and Commitment Therapy (ACT), whilst the remaining six individuals received treatment as usual (TAU). The focus was on investigating *clinically significant* change in outcome measures between baseline and 3-months post-baseline in the participants. Participants completed measures assessing depression and anxiety (HADS), psychosis symptoms (PANSS) and psychological inflexibility (AAQ-II) between baseline and at 3-month post-baseline assessments. Odds ratio analysis indicated that participants receiving ACT, compared to TAU, were 15 times more likely to achieve clinically significant decreases in depression scores (Fisher's Exact Test p = 0.05). Differences between the ACT and TAU groups in clinically significant changes in anxiety, psychological inflexibility, positive symptoms, negative symptoms and general level of psychopathology were not statistically significant. The study provides tentative support for the use of ACT to treat depression emerging in the context of psychosis.

Introduction

The experience of psychosis is associated with increased levels of depression (Birchwood et al., 2000). Those who develop depression appraise psychosis as a humiliating threat to their future status that will lead to the loss of a sense of personally valued social roles and goals (Birchwood et al., 2006; Birchwood et al., 2000). Consistent with these threat appraisals,

internalised stigma and shame are key features evident in depression occurring in the context of schizophrenia (Gumley et al., 2010). Prevalence studies show that several months after an acute episode of psychosis, rates of depression can be up to 50% of cases (Whitehead et al., 2002; Birchwood, 2003). Depression has been identified as a major factor contributing to poor quality of life in individuals with psychosis (Saarni et al., 2010; Meijer et al., 2009).

There is limited evidence supporting the use of pharmacological and psychological interventions for depression in the context of schizophrenia (Whitehead et al. 2002; Wykes et al., 2008). Although effective at treating positive symptoms, Cognitive Behavioural Therapy for psychosis (CBTp) is less effective for treating emotional dysfunction associated with psychosis such as depression, hopelessness and suicide risk (Birchwood, 2003; Wykes et al., 2008; Tarrier et al., 2006). Whereas traditional CBTp tends to emphasize the importance of changing the content of these appraisals, increasing research attention is being directed toward the benefits of applying acceptance-based approaches to the psychological treatment of psychosis (Tai & Turkington, 2009). Acceptance-based approaches place less emphasis on altering the content of cognitions in favour of focusing on how individuals *relate* to these cognitions. One possibility that warrants research attention is whether these newer approaches provide alternative options for conceptualising and treating depression in the context of psychosis.

Acceptance and Commitment Therapy (ACT) conceptualises psychological suffering as being largely caused by experiential avoidance, cognitive entanglement, and associated psychological rigidity that impedes people's ability to take behavioural steps that are consistent with their core values (Hayes & Smith, 2005). Preliminary findings with non-psychotic populations provide evidence that ACT can reduce levels of depression (Zettle & Hayes, 1986; Zettle & Raines, 1989; Petersen, 2007) with medium to large effect sizes (Forman et al., 2007; Lappalainen et al., 2007). In addition, Bohlmeijer et al. (2011) found that an ACT-based early intervention for people with mild to moderate levels of depression (total N = 93) was effective in reducing depressive symptomatology. The ACT intervention led to statistically significant reduction in depressive symptomatology (as assessed by the *Center for Epidemiologic Studies Depression Scale*; Radloff, 1977), which were maintained at the three-month post-baseline.

There is growing research interest in the application of ACT to difficulties faced by individuals experiencing psychosis. Randomised controlled trials (RCTs) have shown that individuals receiving ACT demonstrated significantly lower belief in positive symptoms compared to Treatment As Usual (TAU) (Bach & Hayes, 2002; Gaudiano & Herbert, 2006).

Bach and Hayes (2002) also found that the ACT interventions were associated with significantly reduced rates of rehospitalization at follow-up compared to a TAU. In addition, a cross-sectional study of patients with psychotic-spectrum disorders conducted by Shawyer et al. (2007) reported that greater acceptance of voices was associated with lower depression, greater confidence in coping with command hallucinations, and greater subjective quality of life. Recently, we completed a feasibility randomised controlled trial which found that ACT reduced depression in individuals with psychosis to a significantly greater extent than did TAU (White et al., 2011).

However, these preliminary treatment signals need further scrutiny in order to more precisely specify what additional benefit can be gained from ACT versus standard treatment approaches. Gaudiano (2006) called for greater emphasis to be placed on examining the clinical significance of symptomatic outcome in trials of psychological interventions for psychosis. In line with this call, the authors of the current paper identified participants recruited to the White et al. (2011) RCT who had clinically important levels of depression at baseline assessment. Post-hoc analyses were performed to determine if there were clinically significant changes in depression, anxiety, symptoms of psychosis and psychological flexibility between baseline and three-month post-baseline assessments. Specifically, we were interested to compare whether the proportion of individuals achieving clinically significant changes in depression was greater for those randomised to ACT compared to those randomised to TAU.

Method

Design

A repeated measures design was employed. Participants were assessed at baseline and then again at a point 3-months post-baseline, which was intended to coincide with the end of the delivery of the intervention to those in the ACT arm of the study.

Participants

Participants in the current study were a subsample of participants recruited to a feasibility RCT of ACT for emotional dysfunction following psychosis (ACTp: White et al., 2011); please consult the White et al. (2011) paper for further details of the inclusions and exclusion criteria. None of the participants in the RCT were acutely unwell with psychosis (as defined by a score ≥ 5 on an item of the PANSS Positive Syndrome subscale). Participants were included in the current study on the basis that they were presenting with clinically important levels of depression at baseline assessment; defined as a score ≥ 8 on the Depression subscale of the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). Fourteen of the 27 individuals recruited to the feasibility RCT met this criterion, eight were subsequently randomized to receive ACT and six to TAU; 8 of these individuals were subsequently

randomized to receive ACT, whereas 6 were randomised to TAU. Case file reviews were used to ensure that all participants had an ICD-10 (WHO, 1992) diagnosis of a psychotic disorder (i.e., schizophrenia, schizoaffective disorder, schizophreniform disorder, delusional disorder, brief psychotic disorder, psychotic disorder NOS), bipolar disorder (with psychotic features), or depressive disorder with psychotic symptoms.

Measures

The *Hospital Anxiety and Depression Scale* (HADS; Zigmond & Snaith, 1983) is a widely used self-report instrument designed as a brief assessment tool of the distinct dimensions of anxiety and depression in non-psychiatric populations. Sellwood et al. (2013) have recently demonstrated that the internal consistency of the anxiety and depression sub-scales of the HADS in a sample of individuals diagnosed with schizophrenia were sufficiently high (α = 0.86 and α = 0.83 respectively).

The *Positive Scale of Positive and Negative Syndrome Scale* (PANSS; Kay et al., 1987): The PANSS is a 30-item observer rated scale used to assess the presence and severity of positive (e.g. delusions, hallucinatory behaviour) and negative (e.g. blunted affect, emotional with-drawl) symptoms. Psychometric studies have reported good inter-rater reliability and satisfactory internal consistency, construct validity, and concurrent validity in relation to other measures of psychopathology (Kay et al., 1988; 1989). Two research assistants who were blind to the randomisation procedures completed the PANSS (JMcT and LR). According to PANSS accuracy criteria (Kay, 1991; Lambert, 1996), the two raters achieved highly reliable ratings on PANSS assessments.

Acceptance and Action Questionnaire – II (AAQ-II; Bond, Hayes, Baer, Carpenter et al., 2011): The AAQ-II was developed specifically for assessing ACT outcomes. The total score provides an indication of psychological inflexibility. Example items include: *I worry about not being able to control my worries and feelings*, and *Emotions cause problems in my life*. The AAQ-II has been shown to demonstrate satisfactory structure, reliability and validity (Bond et al., 2011).

Procedure

The research procedures were approved by the West of Scotland NHS Research Ethics Committee No. 3 (ref: 09/S0701/74), and R&D approval (ref: PN09CP213) granted from NHS Greater Glasgow and Clyde NHS. Further details about recruitment of participants to the RCT is detailed by White et al. (2011). The ACT intervention was delivered by the lead author (RGW) and consisted of up to 10-sessions of individual therapy. The ACT sessions incorporated work focusing on the following themes: (1) Distinguishing between different types of experience: internal experience vs. 5-sense experience; (2) Recognising how we get caught up struggling to move away from suffering; (3) Moving towards our values (4) Getting

distance between us and our 'life stories', (5) Exploring how trying to control difficult mental experiences can be part of the problem rather than the solution, (6) Noticing that we can notice: focusing on the context in which mental experiences occur rather on the content of these experiences, and (7) Exploring worry thoughts associated with psychosis. All therapy sessions were recorded and competence and fidelity assessed by an expert in ACT (GM). All participants were also free to receive whatever drug treatments, case management, and/or additional psychotherapy that the clinical team deemed necessary. Research Assistants administering the assessments were blind to treatment allocation.

Analysis

In accordance with previous research (e.g. Jacobson and Truax, 1991), clinically significant changes on outcome measures were deemed to have been achieved if the following two criteria were met:

1. The change in outcome score was reliable according to the *Reliable Change Index* (RCI) (RCI < -1.96, or > 1.96).
2. Post-baseline scores fell below clinical cut-off scores.

Jacobson and Truax's (1991) method was used to calculate RCI (see: Figure 1) for the HADS Depression and Anxiety subscales, Positive and Negative Syndrome Scale and the Acceptance and Action Questionnaire-II. These calculations were based on estimates of test-retest reliability for the:

- HADS Depression and Anxiety subscales obtained by Herman (1997) (r = 0.85 and 0.84 respectively);
- PANSS Positive Syndrome, Negative Syndrome and General Psychopathology subscales obtained by Kay et al. (1987) (r = 0.80, 0.68 and 0.60 respectively);
- AAQ-II obtained by Bond et al. (2011) (r = 0.81).

Jacobson et al.'s method (1984; 1986; 1988) (see: Figure 2) was used to determine clinically significant cut-off scores for the HADS Anxiety and Depression sub-scales and the AAQ-II for the participants recruited to this study. This technique is based on the rationale that there is a greater likelihood of the participant being in the normative distribution than a clinical distribution after treatment. The cut-off points reflect a point where the probability of coming from each of the distributions is equal. HADS normative data obtained by Crawford et al. (2001) from a non-clinical sample broadly representative of the UK general adult population (N = 1792) yielded clinical cut-off scores for the HADS Depression and Anxiety subscales of 8.07 and 8.66 respectively. These scores were rounded to the nearest whole number so that a cut-off of 8 or above indicated clinically important levels of depression, and a score of 9 or above indicated clinically important levels of anxiety. Normative data for the AAQ-II (M = 18.51, SD = 7.05; Bond et al., 2011) produced a value of 21.14, which meant that a score of

21 or above was used to classify clinically important levels of psychological inflexibility. Because the PANSS is not routinely used in normative contexts, the authors elected to define clinically cut-off scores for the PANSS on the basis of the median values of the PANSS subscales for the sample of participants included in this study (Positive subscale = 11.5; Negative subscale = 14.5; General subscale = 30.5).

Fisher's Exact Tests (one-tailed) were used to investigate whether the proportion of participants in the ACT group achieving clinically significant changes in assessment measures was significantly higher than in the TAU group. As an indication of effect size for Fisher's Exact Tests, Odds Ratios were also calculated where possible.

INSERT FIGURE 1 HERE

INSERT FIGURE 2 HERE

Results

Table 1 provides information relating to the age/sex of the participants and scores on the assessment measures at baseline. There were no significant differences between participants receiving ACT and TAU in age. In terms of ethnicity, all of the participants identified as being 'White British'.

INSERT TABLE 1

The analyses performed to determine if there were clinical significant changes on the outcome measures for the ACT and TAU groups are presented in Tables 2 and 3 respectively.

INSERT TABLE 2 HERE

INSERT TABLE 3 HERE

Table 4 indicates that of the eight individuals who received ACT, six (75%) had clinically significant decreases in depression at 3-month post-baseline. This can be compared with only one of the six individuals (17%) who received TAU. An Odds Ratio indicated that the odds of clinically significant decreases in depression were 15 times more likely in individuals receiving ACT compared to TAU. The difference between the two groups in the proportion of people achieving clinically significant decreases in depression scores was at the threshold of statistical significant ($p = 0.05$).

Table 4 also presents data relating to the comparisons made between the ACT and TAU groups in the proportion of participants achieving clinical significant change on the AAQ-II, HADS-Anxiety subscale, PANSS Positive Syndrome subscale, PANSS Negative Syndrome subscale and the PANSS General subscale. None of the difference between the groups on these measures were statistical significant.

INSERT TABLE 4 HERE

Discussion

The current study conducted post-hoc analyses on a subsample of 14 participants presenting with clinically important levels of depression at baseline assessment who had originally been recruited to a randomised controlled trial (RCT) conducted by White et al. (2011). Unlike the original RCT, the current study investigated *clinically significant* changes in outcome measures between baseline and 3-months post-baseline in the participants who received ACT (N=8) compared to those receiving TAU (N=6). Compared with participants in the TAU group, participants who received ACT were 15-times more likely to achieve clinically significant decreases in depression ($p = 0.05$). There were no significant differences between the groups in clinically significant decreases in anxiety, psychological inflexibility, positive symptoms, negative symptoms and general levels of psychopathology ($p > 0.05$).

Only one previous study has examined clinically significant changes in symptoms associated with an ACT intervention. In a trial of ACT for psychosis, Gaudiano & Herbert (2006) found that 50% of participants in the ACT group reached a clinically significant improvement on Brief Psychiatric Rating Scale total score which was a significantly greater proportion than in the enhanced treatment as usual group (7%). Participants were recruited to the White et al. (2011) feasibility trial on the basis that they were no longer acutely unwell. Consequently, only a comparatively small number of participants in the current study had clinically significant levels of positive or negative symptoms. As such, it is not surprising that there were no significant differences between the ACT and TAU groups in the number of participants who had clinically significant decreases in positive and negative symptoms from baseline to 3-month post-baseline assessment.

The finding that clinically significant changes in depression can occur in the context of psychosis in the absence of marked changes in positive and negative symptoms is consistent with previous research evidence suggesting that 'post-psychotic' depression emerges independently of positive symptom severity, relapse and negative symptoms (Birchwood et al., 2000; Iqbal et al., 2000). It has been suggested that depression is more closely associated with interpersonal adjustment than severity of psychiatric symptoms (Rocca et al., 2005).

There were a number of limitations with the current study. The number of participants that were included was small. In addition, the same therapist delivered the ACT intervention across the participants. It may be that the better outcomes noted for the participants receiving the ACT intervention were attributable to the therapist rather than the therapy *per se*. Additional research recruiting larger numbers of participants and multiple therapists is

required to explore whether the findings reported in this study are replicable. Post-hoc analyses were conducted in this study. Participants were not recruited and into the White et al. (2011) trial on the basis that they had clinically important levels of depression. Therefore the randomization procedure may not have adequately controlled for potential biases in group allocation.

Conclusions

Depression emerging in the context of psychosis is a common but somewhat neglected issue. Despite depression being a limiting factor in the long-term prognosis of individuals, there has been an absence of interventions aimed at addressing this issue. The findings from this study tentatively suggest that ACT offers promise for bringing about clinically significant changes in the depression that people with psychosis can experience, however in light of the limitations of the current study further research is required. With this in mind, the authors of the current paper are undertaking a randomised controlled trial of ACT for post-psychotic depression.

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Table 1. Information about the age/sex of participants and scores on measures at baseline assessment.

Highlights

- Depression can impact negatively on quality of life of individuals with psychosis.
- Fourteen participants with depression in the context of psychosis were included.
- Eight participants received ACT and six received treatment as usual.
- Participants were assessed at baseline and three-months post-baseline.

- Clinically significant changes in depression were more pronounced in the ACT group.

Table(s)

Table 1. Information about the age/sex of participants and scores on measures at baseline assessment.

	Age (Median/IQR)	AAQ-II	HADS-Depression	HADS-Anxiety	PANSS-Positive	PANSS-Negative	PANSS-General	Sex (N)	
								Male	Female
Participants receiving ACT (N = 8)	32.50 (28.0 – 38.75)	30.00 (23.00-35.75)	11.50 (9.50-13.75)	11.00 (5.25-12.75)	11.00 (11.00-11.75)	14.50 (12.25-19.00)	30.50 (28.50-31.75)	5	3
Participants receiving TAU (N = 6)	34.50 (24.75 – 47.25)	34.50 (26.25-44.50)	11.00 (8.75-14.50)	14.50 (10.75-18.25)	15.00 (11.50-17.25)	14.50 (11.50-18.75)	31.00 (27.50-36.50)	5	1
All Participants (N = 14)	32.5 (25.5 – 44.5)	32.00 (23.00-37.25)	11.50 (9.00-14.00)	12.00 (15.50)	11.50 (11.00-14.50)	14.50 (12.00-17.00)	30.50 (28.00-33.00)	10	4

Table(s)

Table 2. Information about changes in outcome measures for the ACT Group

Participant	Measure	Baseline	3 Month Post-baseline	RCI	Below clinical cut off score 3-months Post-baseline	Score ≥ the baseline median at baseline	Score < the baseline median at 3-month post-baseline	Clinical significant change
1	AAQ-II	32	14	-2.68	Yes			Yes
	HADS Dep	11	2	-6.57	Yes			Yes
	HADS Anx	4	2	-0.76	Yes			No
	PANSS Positive	11	8	-1.51		No	Yes	No
	PANSS Negative	26	18	-1.77		Yes	No	No
	PANSS General	31	22	-2.71		Yes	Yes	Yes
2	AAQ-II	30	9	-3.13	Yes			Yes
	HADS Dep	14	5	-6.57	Yes			Yes
	HADS Anx	3	1	-0.76	Yes			No
	PANSS Positive	11	7	-2.01		No	Yes	No
	PANSS Negative	13	10	-0.66		No	Yes	No
	PANSS General	24	21	-0.90		No	Yes	No
3	AAQ-II	21	27	0.90	No			No
	HADS Dep	11	4	-5.11	Yes			Yes
	HADS Anx	9	3	-2.37	Yes			Yes
	PANSS Positive	11	8	-1.51		No	Yes	No
	PANSS Negative	20	12	-1.77		Yes	Yes	No
	PANSS General	32	24	-2.41		Yes	Yes	Yes
4	AAQ-II	38	24	-2.09	No			No
	HADS Dep	12	3	-6.57	Yes			Yes
	HADS Anx	12	4	-3.03	Yes			Yes
	PANSS Positive	13	7	-4.26		Yes	Yes	Yes

	PANSS Negative	15	10	-1.10		Yes	Yes	No
	PANSS General	31	21	-3.01		Yes	Yes	Yes
5	AAQ-II	23	24	0.15	No			No
	HADS Dep	13	3	-7.30	Yes			Yes
	HADS Anx	12	8	-1.52	Yes			No
	PANSS Positive	9	17	3.02		No	Yes	*Yes
	PANSS Negative	16	9	-1.55		Yes	Yes	No
	PANSS General	30	20	-3.01		No	Yes	No
6	AAQ-II	30	24	-0.90	No			No
	HADS Dep	9	8	-0.73	No			No
	HADS Anx	13	12	-0.38	No			No
	PANSS Positive	11	10	-0.50		No	Yes	No
	PANSS Negative	14	8	-1.32		No	Yes	No
	PANSS General	30	25	-1.51		No	Yes	No
7	AAQ-II	37	30	-1.04	No			No
	HADS Dep	15	9	-4.38	No			No
	HADS Anx	15	10	-1.89	No			No
	PANSS Positive	12	17	2.51		Yes	No	No
	PANSS Negative	12	10	-0.44		No	No	No
	PANSS General	33	35	0.62		Yes	No	No
8	AAQ-II	23	8	-2.23	Yes			Yes
	HADS Dep	9	1	-5.84	Yes			Yes
	HADS Anx	10	4	-2.27	Yes			Yes
	PANSS Positive	11	7	-2.01		No	Yes	No
	PANSS Negative	12	10	-0.44		No	Yes	No
	PANSS General	28	18	-3.01		No	Yes	No

*Clinically significant increase

Key for Tables:
AAQ-II = Acceptance and Action Questionnaire
HADS Dep = Hospital Anxiety and Depression Scale – Depression Subscale
HADS Anx = Hospital Anxiety and Depression Scale – Anxiety Subscale
PANSS Positive = Positive and Negative Syndrome Scale – Positive Symptom Scale
PANSS Negative = Positive and Negative Syndrome Scale – Negative Symptom Scale
PANSS General = Positive and Negative Syndrome Scale – General Psychopathology Scale

Table(s)

Table 3. Information about changes in outcome measures for the TAU Group

Participant	Measure	Baseline	3 Month Post-baseline	RCI	Below clinical cut off score 3-months Post-baseline	Score ≥ the baseline median at baseline	Score < the baseline median at 3-month post-baseline	Clinical significant change
1	AAQ-II	34	25	-1.34	No			No
	HADS Dep	10	11	0.73	No			No
	HADS Anx	11	9	-0.76	No			No
	PANSS Positive	21	14	-3.52		Yes	No	No
	PANSS Negative	30	22	-1.77		Yes	No	No
	PANSS General	38	20	-5.42		Yes	Yes	Yes
2	AAQ-II	35	33	-0.30	No			No
	HADS Dep	12	12	0.00	No			No
	HADS Anx	12	13	0.38	No			No
	PANSS Positive	10	8	-1.01		No	Yes	No
	PANSS Negative	15	19	0.88		Yes	No	No
	PANSS General	33	36	0.90		Yes	No	No
3	AAQ-II	32	35	0.30	No			No
	HADS Dep	14	8	-4.38	No			No
	HADS Anx	17	14	-1.14	No			No
	PANSS Positive	12	11	-0.50		Yes	Yes	No
	PANSS Negative	10	9	-0.22		No	Yes	No
	PANSS General	29	24	-1.51		No	Yes	No
4	AAQ-II	49	-	-	-			-
	HADS Dep	16	9	-4.58	No			No
	HADS Anx	19	14	-1.89	No			No
	PANSS Positive	16	22	3.02		Yes	No	No

	PANSS Negative	14	18	0.88		No	No	No
	PANSS General	36	49	3.92		Yes	No	No
5	AAQ-II	43	34	-1.34	No			No
	HADS Dep	9	8	-0.73	No			No
	HADS Anx	18	18	0.00	No			No
	PANSS Positive	16	13	-1.51		Yes	No	No
	PANSS Negative	15	10	-1.10		Yes	Yes	No
	PANSS General	26	31	1.51		No	Yes	No
6	AAQ-II	9	28	2.84	No			*Yes
	HADS Dep	8	5	-2.19	Yes			Yes
	HADS Anx	10	13	1.14	No			No
	PANSS Positive	14	9	-2.51		Yes	Yes	Yes
	PANSS Negative	12	15	0.66		No	No	No
	PANSS General	28	20	-2.41		No	Yes	No

*Clinically significant increase

Key for Tables:
AAQ-II = Acceptance and Action Questionnaire
HADS Dep = Hospital Anxiety and Depression Scale – Depression Subscale
HADS Anx = Hospital Anxiety and Depression Scale – Anxiety Subscale
PANSS Positive = Positive and Negative Syndrome Scale – Positive Symptom Scale
PANSS Negative = Positive and Negative Syndrome Scale – Negative Symptom Scale
PANSS General = Positive and Negative Syndrome Scale – General Psychopathology Scale

Table 4. Information about the proportion (%) of participants achieving clinical significant change on the outcome measures

Outcome Measure	Proportion (%) of ACT group achieving clinically significant change	Proportion (%) of TAU group achieving clinically significant change	Odds Ratio	P-value
HADS Dep	6/8 (75%)	1/6 (17%)	15	p = 0.05
HADS Anx	3/6 (50%)	0/6 (0%)	N/A	p > 0.05
AAQ-II	3/8 (38%)	0/4 (0%)	N/A	p > 0.05
PANSS Positive	1/2 (50%)	1/5 (20%)	4	p > 0.05
PANSS Negative	0/4 (0%)	0/3 (0%)	N/A	p > 0.05
PANSS General	3/4 (75%)	1/3 (33%)	6	p > 0.05

Key for Tables:
AAQ-II = Acceptance and Action Questionnaire
HADS Dep = Hospital Anxiety and Depression Scale – Depression Subscale
HADS Anx = Hospital Anxiety and Depression Scale – Anxiety Subscale
PANSS Positive = Positive and Negative Syndrome Scale – Positive Symptom Scale
PANSS Negative = Positive and Negative Syndrome Scale – Negative Symptom Scale
PANSS General = Positive and Negative Syndrome Scale – General Psychopathology Scale

Figure 1. The equation for calculating Reliable Change Index

$$RCI = \frac{X_1 - X_2}{\sqrt{2\left(S_1\sqrt{1 - r_{xx}}\right)^2}}$$

Where X_1 = baseline score; X_2 = 3-month post-baseline score; S_1 = the standard deviation at baseline; and r_{xx} = the test-retest reliability

Figure 2. The equation for calculating Cut-off Scores

$$Cut - off = \frac{(S_1 \times X_2) + (S_2 \times X_1)}{S_1 + S_2}$$

Where X_1, S_1, X_2, S_2 specify the means and standard deviations of the participants with psychosis and a normative sample respectively.