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**Understanding and treating amotivation in people with psychosis: An  
experimental study of the role of guided imagery.**

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## **Abstract (200 words)**

Psychological models propose that the amotivational negative symptoms (ANS) of psychosis are influenced by expectations of future events; both anticipatory success (believing one can achieve something, AS) and anticipatory pleasure (mentally pre-creating potential future experiences of enjoyment, AP). Mental imagery manipulations have been shown to change expectations across a range of settings, and may therefore enhance psychological interventions for ANS in people with psychosis. We set out to investigate the impact of a guided imagery manipulation on AS and AP in this group. Forty-two participants with psychosis and ANS completed measures of ANS severity, before random allocation to either a positive or neutral imagery manipulation. AS and AP towards a dart-throwing task were measured before and after the manipulation. Greater ANS severity was associated with lower levels of AS, but not of AP, irrespective of task performance. AS, but not AP, improved during both positive and neutral imagery manipulations, with no effect of imagery type. Anticipatory success is a candidate psychological factor influencing the severity of ANS in psychosis that may be changed by guided imagery manipulation. Imagery interventions are feasible and acceptable for this group: further investigation is needed of their mechanism of action and potential to improve functioning.

*Key words: negative symptoms, imagery, amotivation, anticipatory pleasure, anticipatory success*

## **1. Introduction**

### **1.1 Psychological models of negative symptoms in psychosis**

Negative symptoms affect over half of people with schizophrenia spectrum psychosis (Bobes et al., 2010) and are predictive of poor functional outcomes (Ho et al., 1998; Lysaker et al., 2004; Lysaker and Davis, 2004). Negative symptoms are conceptualised as loss, or ‘deficit’, symptoms (ICD-10, World Health Organisation, 1992), across two consistently identified subdomains: loss of volition/motivation (‘avolition/apathy’) and flattening of affect (‘diminished expression’) (Strauss et al., 2013; Kirkpatrick, 2014). The former, which we term ‘amotivational negative symptoms’ (ANS, Foussias and Remington, 2010) are considered to have the greatest adverse impact on quality of life (Fervaha et al., 2013; Foussias et al., 2011).

Amotivation in psychosis involves two psychological processes: low expectancies of success, and low expectancies of pleasure (Beck et al., 2011). Negative beliefs about future performance in a particular activity (or defeatist performance beliefs) are thought to result from past experiences of failure (Rector et al., 2005; Rector, 2004; Grant and Beck, 2009; Horan et al., 2010; Avery et al., 2009). Low expectancy of pleasure is considered to arise through difficulties with *anticipatory* pleasure (predicting and pre-experiencing future pleasure), which is both impaired relative to non-clinical controls, and associated with ANS (Gard et al., 2007; Oorschot et al., 2013). We have summarised this body of research in a single anticipatory deficit model of ANS (Figure 1). The model is consistent with neurophysiological studies, suggesting changes in the neural pathways mediating ‘wanting’, while ‘hedonic’ neural pathways, and *consummatory* pleasure (the immediate experiential pleasure of a primary reinforcer) are unaffected (Barch and Dowd, 2010; Kring and Barch, 2014). This consensus suggests focusing interventions on the difference between what is anticipated, and what is likely to be experienced, addressing both anticipatory cognitions and affective pre-experience. Role playing future events (e.g. Grant et al., 2012); broadening present positive affect to apply to a vision of the future (e.g. Johnson et al., 2012); and guided positive imagery of a future activity (e.g. Favrod, 2010), have all been shown to be helpful. However, no study to date has clearly delineated the specific role of mental imagery in the process of change. A better understanding of imaginal processes in ANS could inform more effective, targeted interventions.

### **1.2 Imagery**

Mental imagery is a quasi-perceptual experience, whereby the sensory impact of an object or an event is brought to mind in the absence of external stimuli. Compared to other cognitive phenomena such as thoughts and beliefs, images, although drawing on memory processes (Addis et al., 2007), also elicit current emotional reactions to recalled or predicted events, as if the event were happening in the present moment (Holmes and Mathews, 2010). The ‘hot’ nature of imagery facilitates change in associated appraisals and emotional reactions across clinical and non-clinical settings (Holmes and Mathews, 2010). Imagery manipulations have been shown to reduce distress, improve functioning, reduce negative cognition, and increase resilience to negative mood (Ehlers and Clark, 2000; Holmes et al., 2009; Pictet et al., 2011). Indications that people with schizophrenia may experience difficulties mentally generating coherent scenes of future events (Raffard et al., 2010), and that difficulties imagining pleasurable future events are associated with apathy (Raffard et al., 2013) suggests that using guided imagery in therapy with this client group may be of particular value. Outside the clinical sphere, imagery manipulation is a common feature of sports psychology (Cumming and Ramsey, 2008). Whilst research in that field focuses on enhancing sporting performance, rather than improving mood or social functioning, it nevertheless provides a helpful lens through which to consider interventions for negative symptoms.

### **1.3 Rationale and hypotheses**

The anticipatory deficit in ANS can be conceptualised as the absence of a required bridge between present stasis and future action: in neurophysiological terms, the dopaminergic fronto-striatal pathways through which goal-directed behaviours are hypothesised to be formulated, enacted, and evaluated (Kring and Barch, 2014). If a person is not able to anticipate that a proposed action will bring pleasure or success (i.e. to activate mental representations of carrying out that activity and a causal linkage with mental representations of pleasure or success) they will be missing key ingredients of motivation to act. The ‘here and now’ quality of mental imagery may provide this bridge, giving individuals a positive virtual experience of a specified activity with the intention of setting in motion the anticipation of pleasure and/or success (or, in neurophysiological terms, increasing ‘wanting’), and subsequently changing attitudes and behaviours towards that activity (i.e. increasing motivation and the likelihood of action).

We aimed to test the anticipatory deficit model of ANS and to investigate the effects of guided imagery on the hypothesised psychological mediators of the relationship between

the predisposing factors in the model and ANS. The purpose was to inform the development of cognitive behavioural interventions for negative symptoms.

Task-specific anticipation was measured in relation to a dart-throwing task. A similar task has been used in imagery studies in sports psychology (Nordin and Cumming , 2005), and was selected for this study as a normative leisure activity, requiring little physical effort (to reduce the confounding influence of physical fatigue and physical health problems), upon which performance could be readily quantified.

Firstly, we examined the association of ANS with the postulated mechanisms of change (anticipatory success, AS and anticipatory pleasure, AP) in a group of people with established psychosis and ANS. Secondly, we examined the impact of an experimental imagery manipulation on AS and AP.

We hypothesised that:

- i) there would be a negative correlation between ANS and baseline anticipation (both AS and AP);
- ii) guided imagery would have a positive impact on anticipation (AS and AP); and
- iii) a positive imagery intervention (encouraging participants to imagine high achievement and pleasure in a task) would be more effective in changing anticipation than a neutral imagery intervention (encouraging participants simply to imagine carrying out the task, with no mention of success or pleasure).

Dart throwing performance was also measured, to ensure that observed associations at baseline between anticipation and ANS were not confounded by performance deficits.

## **2. Method**

### **2.1 Participants**

Participants were recruited from two inner-city, UK National Health Service community adult ( $\geq 18$  years) mental health teams, specialising in treating people with an established (i.e. not first episode) schizophrenia-spectrum psychosis. Eligible participants were those judged by the care team to be experiencing ANS; severity of ANS was then confirmed by the researcher at screening.

### **2.2 Measures**

### *2.2.1 Demographic characteristics*

Age, gender, ethnicity (dichotomised into Black or Minority Ethnic, BME, or non-BME) and ICD-10 diagnosis (WHO, 1992) were obtained from participants' clinical records, with their consent.

### *2.2.2 Scale for the Assessment of Negative Symptoms (SANS, Andreasen, 1983)*

The SANS is an observational and interview measure assessing five complexes of negative symptoms of schizophrenia. Inter-rater reliability is excellent (0.92; Andreasen, 1983); subscales have moderate to good internal consistency (co-efficients 0.58 to 0.88). Items are rated from 0 (absent) to 5 (severe). A total ANS score (range 0-35) was created by combining the avolition/apathy and anhedonia/asociality scales, which cluster together in factor analysis (Foussias and Remington, 2010). Internal consistency was good ( $\alpha = 0.78$ ) in the current sample. Participants were stratified into three groups according to their global scores on the avolition/apathy and anhedonia/asociality scales: Low ( $\leq 1$  on both scales); Moderate (highest score of 2 or 3 on either scale); Severe (score of 4 or 5 on either scale).

### *2.2.3 Time Budget (Jolley et al., 2005)*

Occupational and social impairment was assessed by this interview measure of activity during the past week, rated over four time periods/day from 0 (nothing) to 4 (filled with demanding activity); possible range 0-112. Participants with a recent relapse of schizophrenia spectrum psychosis obtained a mean weekly score of 50.1 (SD = 19.7,  $n=276$ ), which correlated moderately with the SANS avolition/apathy subscale ( $r=0.5$ ,  $p<0.001$ ; Jolley et al., 2006).

### *2.2.4 Anticipatory success and pleasure.*

Anticipatory success (AS) was measured by a simplified version of Nordin and Cumming's (2005) visual analogue scales (VAS), adapted for our task, and shortened to reduce participant burden. Participants rated their confidence that, of 12 dart-throws, they would score 'at least 1', 'at least 3', and 'at least 6' bullseyes, on three 100mm scales, from 0 ('Certain I won't') to 100 ('Certain I will'). The mean of the three ratings comprised the AS score. Anticipatory pleasure (AP) was rated along a single VAS from 'I don't expect to enjoy it at all' (0) to 'I expect to enjoy it a great deal' (100). Objective darts accuracy was measured at baseline only, as the mean proximity to the bullseye of 12 throws, with higher scores indicating more accurate throws (range 0-100).

### 2.3 Procedure

Once baseline self-report and observer-rated measures were completed, participants were randomised online (Sealed Envelope, 2014) to either a positive ( $n = 20$ ) or neutral imagery manipulation ( $n = 22$ ).

Magnetic ‘darts’ were thrown at a black canvas magnetic reversible board, placed on the floor, depicting a target of yellow concentric rings, scoring from 10 (outermost) to 100 (bullseye). Participants stood behind an oche 4 feet (121.92cm) away. In piloting, this placement reliably generated a normal distribution of scores.

Before commencing the task, all participants threw three practice darts. At baseline, participants completed VAS ratings of AS and AP before throwing 12 darts (Baseline performance measure). They then listened to a four-minute guided imagery recording via headphones (positive or neutral according to random allocation), completed a second set of VAS ratings and threw 12 more darts (T1). They then listened again to the same imagery script, completed the VAS ratings and threw a final 12 darts (T2).

The imagery script for the facilitative imagery condition followed that provided by Nordin and Cumming (2005), referencing both internal and external processes, guiding participants to imagine themselves feeling confident, enjoying the task, and throwing the dart to the bullseye (e.g. “...feel the sense of accomplishment, the feelings of confidence and satisfaction...follow it all the way, your perfect throw making it land straight in the centre of the board”). The script for the neutral imagery condition guided participants to imagine the task based on their realistic beliefs about their skills and ability at darts. Scripts are available as Supplementary Data.

### 2.4 Analysis

All statistical analyses were carried out using SPSS version 20 (IBM, 2011). Variables were normally distributed with the exception of AP, which was negatively skewed (Baseline:-1.05; T1:-1.33; T2:-1.01). The association of ANS with AS and AP (Hypothesis 1) was tested using correlational analyses, parametric for AS and non-parametric for AP. Task performance was controlled, to reduce the likelihood that expectations were influenced by an accurate perception of poor performance on the immediate task (rather than an overgeneralised bias towards assuming failure, based on past failures in other contexts). Demographic and clinical characteristics of the two imagery groups were compared using t-tests and Chi-square tests. As ANOVA, providing there are no outliers, is relatively insensitive to skew (Moore and McCabe,



2003), the effect of the imagery manipulation (Hypothesis 2), and of imagery type (Hypothesis 3) was tested using repeated measures ANOVA, reporting Greenhouse-Geisser adjusted statistics when the assumption of sphericity was not met. For H2, to test whether anticipation increased after each guided imagery recording, two univariate repeated measures ANOVAs were used to compare these scores across the within subjects factor of trial (x3; Baseline, Trial 1, and Trial 2). Bonferroni-corrected post hoc tests were used to investigate significant main effects and interactions. For H3, to test whether the imagery groups differed in their pattern of change in anticipation over time, two mixed, two-way univariate repeated measures ANOVAs compared AS and AP ratings for the two imagery groups (positive and neutral, between subjects) across the within subjects factor of trial. Partial eta squared effect sizes were reported and interpreted using the conservative convention (Cohen, 1988) 0.01 (small); 0.09 (medium); and 0.25 (large). Post hoc tests were used to investigate significant main effects or interactions.

Previous studies (Nordin and Cumming, 2005; Lang et al., 2011) show large average effects (Cohen, 1992) for pre-post change ( $f=0.34$ ) and group x time interactions ( $f=0.45$ ), suggesting a total sample size in excess of  $n=36$  to achieve 90% power, with alpha adjusted to 0.01 to take account of multiple testing (Faul et al., 2007).

### **3. Results**

#### **3.1 Sample characteristics**

Clinicians identified 117 potentially eligible participants; 52 were uncontactable, 23 declined or did not attend. Forty-two participants completed the study (62%,  $n=26$ , male; mean age 42.21 years,  $SD = 7.87$  years; 74% BME).

Casenote diagnoses were: schizophrenia ( $n=31$ , 74%); schizoaffective disorder ( $n=4$ , 9%); acute and transient psychotic disorder ( $n=3$ , 7%); unspecified nonorganic psychosis, brief psychotic disorder, bipolar disorder, and severe depression with psychotic features (each  $n=1$ , 2%).

Activity impairment (time budget mean 46.40,  $SD = 14.32$ ) and ANS severity were moderate (Andreasen, 1983; overall ANS mean: 16.19,  $SD = 7.68$ ; Lowest: 6.00,  $SD = 3.29$ ; Moderate: 12.63,  $SD = 4.72$ ; Severe: 22.10,  $SD = 5.17$ ).

The two imagery groups did not differ significantly on any demographic or clinical measure or any baseline measure of darts ability, AS or AP ( $t$  values all  $< 1.73$ ,  $\chi^2$  values all  $< 5.3$ ,  $p$  values all  $\geq 0.07$ ).

### **3.2 Hypothesis 1: ANS will be negatively correlated with baseline anticipation**

Baseline AS (Pearson's  $r=-0.33, p=.03, n=42$ ) but not baseline AP (Spearman's  $r=-0.04, p=0.81, n=42$ ), was associated with ANS.

To examine whether the observed relationship between baseline anticipatory success and negative symptoms was affected by ability level, a partial correlation was conducted controlling for darts accuracy at baseline. Controlling for darts accuracy did not affect the size or significance of the correlation ( $r = -0.36, p = 0.02$ ). Further, there was no association between baseline darts accuracy and ANS ( $r = 0.12, p = 0.45$ ), AS ( $r=0.10, p=0.54$ ) or AP ( $r=0.08, p=0.63$ ).

### **3.3 Hypothesis 2: Guided imagery will have a positive impact on anticipation**

Table 1 shows the mean AS and AP ratings at baseline, T1 and T2. There was no relationship between scores on the practice task and baseline anticipatory pleasure ( $r = 0.08, p = 0.63$ ) or baseline anticipatory success ( $r = 0.10, p = 0.54$ ). As hypothesised, mean AS ratings improved significantly across the trials ( $F(2, 40) = 9.46, p = <0.001, \eta_p^2=0.19$ , medium to large effect). Bonferroni-corrected post hoc tests showed a significant increase during the first imagery manipulation from baseline to T1 ( $p = 0.04$ ), and from baseline to T2 ( $p = 0.002$ ), but not during the repeated imagery manipulation from T1 to T2 ( $p = 0.14$ ), suggesting no iterative effect of the manipulation. AP rating increases across trials were not statistically significant ( $F(1.69, 40) = 3.08, p = 0.06, \eta_p^2=0.07$ ; small to medium effect).

Table 1 here

### **3.4 Hypothesis 3: Positive imagery will be more effective in increasing anticipation than neutral imagery**

For AP, there was no main effect of imagery type ( $F(1, 40) = 0.33, p = 0.57, \eta_p^2=0.01$ ) and no significant interaction between type of imagery and trial ( $F(1.69, 40) = 0.70, p = 0.48, \eta_p^2=0.02$ ). For AS, there was no main effect of imagery type,  $F(1, 40) = 0.02, p = 0.90, \eta_p^2<.01$ , and no significant trial x type interaction,  $F(1, 40) = 0.46, p = 0.50, \eta_p^2=0.02$ . Effects were of small magnitude.

## **4. Discussion**

### **4.1 Summary of findings**

We set out to test an anticipatory deficit model of ANS, and to investigate the impact of a guided imagery intervention on anticipation during a darts task in participants with ANS in the context of established psychosis. We hypothesised that ANS would be associated with lower levels of baseline anticipatory success (AS) and pleasure (AP); that a guided imagery manipulation would increase AS and AP; and that positive imagery would be more effective than neutral imagery in increasing AS and AP.

Participants showed moderate levels of negative symptoms, and activity impairment comparable to established psychosis groups. The high proportion of BME participants reflects our local service demographic. As predicted, there was a significant relationship between ANS and baseline AS, even when controlling for performance. This builds on a finding by Avery et al. (2009) which is the only other report, to our knowledge, of an association of ANS with AS directly linked to an imminent task. Importantly, in our study, there was no relationship between an objective measure of task ability (mean darts accuracy score at baseline) and ANS, making it less likely that an objective assessment of poor performance influenced results. In contrast, the Avery study employed tests of executive functioning (category shift in the context of trail-making), which is known to be impaired in people with schizophrenia, and was correlated with negative symptoms in their participants. The possibility that associations reflected awareness of a genuine deficiency is therefore greater, although other studies indicate that such awareness may be generally limited (Cella et al., 2014). Our findings therefore suggest that the association of low AS with ANS pertains even to tasks on which ability is not objectively impaired.

Contrary to hypothesis, we found no relationship between ANS and AP. AP was rated highly, consistent with recent failures to replicate AP deficits (Gard et al., 2014). Findings may also reflect the recreational nature of the task. Comparison with a non-clinical group is necessary to elucidate.

There was a significant effect of trial on AS, which increased from baseline to Time 1 and from baseline to Time 2, but not from Time 1 to Time 2, suggesting that the imagery intervention is effective in changing anticipation, and that the effect is achieved during the first manipulation, rather than iteratively, or through repeated practice on the task. Ratings of AP also increased over trials, but the increase did not reach statistical significance. As the AP ratings are novel, we cannot compare with an existing body of

literature. Nevertheless, our findings are consistent with a stronger role for anticipatory success.

We did not replicate previous research showing benefits specifically of positive imagery (e.g. Pictet et al., 2011; Nordin and Cumming, 2005). The lack of between group differences on any of the measures suggests that the positive imagery intervention was no more beneficial than a neutral imagery intervention. Imagining oneself doing the task, irrespective of outcome, may be sufficient to effect change, particularly in a sample with low baseline activity.

## **4.2 Limitations**

This was a small study with participants selected for research purposes and, although overall ANS levels were moderate, unwillingness to participate may have precluded the involvement of those with the most severe symptoms. The inclusion criteria were driven primarily by those of the services where recruitment took place, and detailed information on variables such as illness length and medication levels was not collected. Participants were stratified for severity of negative symptoms using ad hoc, rather than published criteria, although these were determined a priori. Negative symptoms were assessed using the SANS, which has attracted some criticism, and replicating findings using scales specifically designed to overcome the shortcomings of the SANS (e.g. the Brief Negative Symptom Scale (Kirkpatrick et al., 2011; or the Clinical Assessment Interview for Negative Symptoms (Kring et al., 2013) will be an important future step.

The study was powered to detect the large effects reported by previous researchers. This was deemed appropriate for a preliminary investigation, and although participants with serious mental illness may be expected to show more variability in scores (and consequently smaller effect sizes), only the failure to find a significant change in AP scores appears attributable to issues of limited power. Effect sizes for the difference between positive and negative imagery are small, and further research would be required to determine the real-world meaning of rating scale change. Whilst the measures of AS and AP were closely tied to psychological theories of ANS, they were derived from sports psychology and pertained to a sports task, rather than self-defined recovery goals. The factors influencing AS and AP on a relatively low demand leisure activity may differ from those implicated in occupational functioning, and generaliseability of findings to other contexts should not be assumed without replication. Nevertheless, people with negative symptoms do not solely struggle with occupational activity, and increasing ability to engage in leisure pursuits is an important outcome. Correlational

analyses preclude causal inferences about the association between baseline AS and ANS. An important limitation concerning the effect of the imagery manipulation was the lack of a control group of participants who did not listen to guided imagery. This means that we relied upon repetition of the task to assess the effect of practice, and any associated improvement in performance, on anticipation. A no-imagery condition should be included in future studies. The AP rating was novel, and, given the body of literature implicating poor AP in the maintenance of ANS, our findings suggesting AP is of less importance than AS should be treated with caution, and may have been due to limitations of measurement or design in our study.

### **4.3 Conclusion**

Our findings support the development of imagery-based therapeutic interventions for ANS targeting anticipatory deficits. Collaborative development of imagery scripts with clients focusing on personal recovery goals could usefully augment existing thought-challenging approaches (Grant et al., 2012), subject to further controlled evaluation, facilitating engagement in meaningful and valued activity for this neglected group, and improving their quality of life.

Declaration of interests: None

### **References**

Addis, D. R., Wong, A. T., Schacter, D. L., 2007. Remembering the past and imagining the future: common and distinct neural substrates during event construction and elaboration. *Neuropsychologia*. 45, 1363-77.

Andreasen, N. C., 1983. Scale for the assessment of negative symptoms. University of Iowa, Iowa City.

Avery, R., Startup, M., Calabria, K., 2009. The role of effort, cognitive expectancy appraisals and coping style in the maintenance of the negative symptoms of schizophrenia. *Psychiatry Research*, 167, 26-46.

Barch, D.M. and Dowd, E.C., 2010. Goal representations and motivational drive in schizophrenia: the role of prefrontal–striatal interactions. *Schizophrenia Bulletin*, 36, 919-934.

Beck, A. T., Rector, N. A., Stolar, N., Grant, P., 2011. *Schizophrenia: Cognitive theory, research, and therapy*. Guilford Press, New York.

Bobes, J., Arango, C., Garcia-Garcia, M., Rejas, J., 2010. Prevalence of negative symptoms in outpatients with schizophrenia spectrum disorders treated with antipsychotics in routine clinical practice: Findings from the CLAMORS study. *Journal of Clinical Psychiatry*, 71, 280-286.

Cella, M., Swan, S., Medin, E., Reeder, C. and Wykes, T., 2014. Metacognitive awareness of cognitive problems in schizophrenia: exploring the role of symptoms and self-esteem. *Psychological Medicine*, 44, 469-476.

Cohen, J., 1992. A power primer. *Psychological Bulletin*, 112, 155.

Cumming, J., Ramsey, R., 2008. Imagery interventions in sport. *Advances in Applied Sport Psychology: A review*, 5.

Ehlers, A., Clark, D. M., 2000. A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy*, 38, 319-345.

Faul, F., Erdfelder, E., Lang, A.-G., Buchner, A., 2007. G\*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39, 175-191.

Favrod, J., Giuliani, F., Ernst, F., Bonsack, C., 2010. Anticipatory pleasure skills training: a new intervention to reduce anhedonia in schizophrenia. *Perspectives in Psychiatric Care*, 46(3), 171-181.

Fervaha, G., Foussias, G., Agid, O., Remington, G., 2013. Amotivation and functional outcomes in early schizophrenia. *Psychiatry Research*, 210, 665-8.

Foussias, G., Mann, S., Zakzanis, K.K., van Reekum, R., Agid, O., Remington, G., 2011. Prediction of longitudinal functional outcomes in schizophrenia: the impact of baseline motivational deficits. *Schizophrenia Research*, 132, 24-7.

Foussias, G., Remington, G., 2010. Negative symptoms in schizophrenia: Avolition and Occam's Razor. *Schizophrenia Bulletin*, 36, 359-369.

Gard, D. E., Kring, A. M., Gard, M. G., Horan, W. P., Green, M. F., 2007. Anhedonia in schizophrenia: Distinctions between anticipatory and consummatory pleasure. *Schizophrenia Research*, 93, 253-260.

- Gard, D. E., Sanchez, A. H., Cooper, K., Fisher, M., Garrett, C., Vinogradov, S., 2014. Do people with schizophrenia have difficulty anticipating pleasure, engaging in effortful behavior, or both? *Journal of Abnormal Psychology*, 123(4), 771.
- Grant, P. M., Beck, A. T., 2009. Defeatist beliefs as a mediator of cognitive impairment, negative symptoms, and functioning in schizophrenia. *Schizophrenia Bulletin*, 35, 798-806.
- Grant, P. M., Huh, G. A., Perivoliotis, D., Stolar, N., Beck, A. T. (2012). Randomised trial to evaluate the efficacy of cognitive therapy for low-functioning patients with schizophrenia. *Archives of General Psychiatry*, 69, 121-127.
- Ho, B-C., Nopoulos, P., Flaum, M., Arndt, S., Andreasen, M. D. (1998). Two-year outcome in first-episode schizophrenia: Predictive value of symptoms for quality of life. *American Journal of Psychiatry*, 155, 1196-1201.
- Holmes, E. A., Lang, T. J., Shah, D. M., 2009. Developing interpretation bias modification as a "cognitive vaccine" for depressed mood: imagining positive events makes you feel better than thinking about them verbally. *Journal of Abnormal Psychology*, 118, 76.
- Holmes, E. A. and Mathews, A., 2010. Mental imagery in emotion and emotional disorders. *Clinical Psychology Review*, 30, 349-362.
- Horan, W. P., Rassovsky, Y., Kern, R. S., Lee, J., Wynn, J. K., Green, M. F., 2010. Further support for the role of dysfunctional attitudes in model of real-world functioning in schizophrenia. *Journal of Psychiatric Research*, 44, 499-505.
- Johnson, D. P., Penn, D. L., Fredrickson, B. L., Kring, A. M., Meyer, P. S., Catalino, L. I., Brantley, M., 2011. A pilot study of loving-kindness meditation for the negative symptoms of schizophrenia. *Schizophrenia Research*, 129, 137-140.
- Jolley, S., Garety, P. A., Ellett, L., Kuipers, E., Freeman, D., Bebbington, P. E., Fowler, D. G., Dunn, G., 2006. A validation of a new measure of activity in psychosis. *Schizophrenia Research*, 85(1), 288-295.
- Kirkpatrick, B., 2014. Recognizing primary vs secondary negative symptoms and apathy vs expression domains. *The Journal of Clinical Psychiatry*, 75, e09-e09.

Kirkpatrick, B., Strauss, G.P., Nguyen, L., Fischer, B.A., Daniel, D.G., Cienfuegos, A., Marder, S.R., 2011. The brief negative symptom scale: psychometric properties. *Schizophrenia Bulletin*. 37, 300–305.

Kring, A.M. and Barch, D.M., 2014. The motivation and pleasure dimension of negative symptoms: neural substrates and behavioral outputs. *European Neuropsychopharmacology*, 24, 725-736.

Kring, A.M., Gur, R.E., Blanchard, J.J., Horan, W.P., Reise, S.P., 2013. The Clinical Assessment Interview for Negative Symptoms (CAINS): final development and validation. *American Journal of Psychiatry* 170, 165–172.

Lang T.J., Blackwell S. E., Harmer C. J., Davison P., Holmes E. A., 2011. Cognitive bias modification using mental imagery for depression: developing a novel computerized intervention to change negative thinking styles. *European Journal of Personality*, 26, 145-57.

Lysaker, P. H., Davis, L. W., 2004. Social function in schizophrenia and schizoaffective disorder: Associations with personality, symptoms and neurocognition. *Health and Quality of Life Outcomes*, 2, 15.

Lysaker, P. H., Lancaster, R. S., Nees, M. A., Davis, L., 2004. Attributional style and symptoms as predictors of social function in schizophrenia. *Journal of Rehabilitation Research and Development*, 41, 225-232.

Moore, D. S., McCabe, G. P., 2003. *Introduction to the Practice of Statistics* (4e). W H Freeman & Co., New York.

Nordin, S., M., Cumming, J., 2005. More than meets the eye: Investigated imagery type, direction and outcome. *The Sport Psychologist*, 19, 1-17.

Oorschot, M., Lataster, T., Thewissen, V., Lardinois, M., Wichers, M., van Os, J., Delespaul, P., Myin-Germeys, I., 2013. Emotional experience in negative symptoms of schizophrenia – no evidence for a generalised hedonic deficit. *Schizophrenia Bulletin*, 39, 217-225.

Pictet, A., Coughtrey, A. E., Mathews, A., Holmes, E. A., 2011. Fishing for happiness: The effects of generating positive imagery on mood and behaviour. *Behaviour Research and Therapy*, 49, 885-891.



Raffard, S., D'Argembeau, A., Bayard, S., Boulenger, J.P. and Van der Linden, M., 2010. Scene construction in schizophrenia. *Neuropsychology*, 24, 608.

Raffard, S., Esposito, F., Boulenger, J.P. and Van der Linden, M., 2013. Impaired ability to imagine future pleasant events is associated with apathy in schizophrenia. *Psychiatry Research*, 209, 393-400.

Rector, N. A., 2004. Dysfunctional attitudes and symptom expression in schizophrenia: differential associations with paranoid delusions and negative symptoms. *Journal of Cognitive Psychotherapy*, 18(2), 163-173.

Rector, N. A., Beck, A. T., Stolar, N., 2005. The negative symptoms of schizophrenia: a cognitive perspective. *Canadian Journal of Psychiatry. Revue canadienne de psychiatrie*, 50(5), 247-257.

Sealed Envelope. (2014). Retrieved May 14<sup>th</sup> 2014 from <http://www.sealedenvelope.com>.

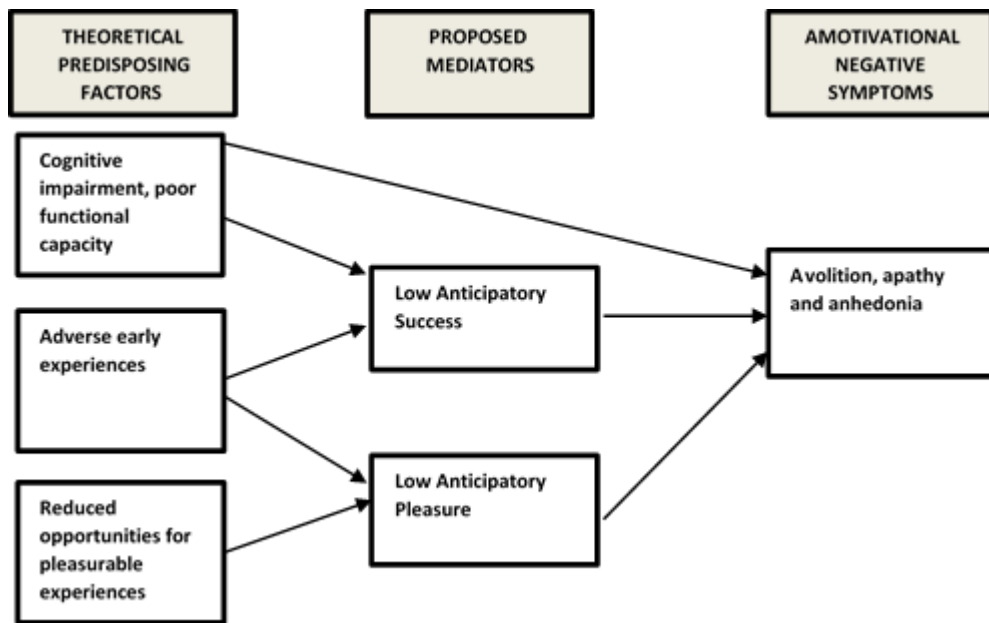
Strauss, G. P., Horan, W. P., Kirkpatrick, B., Fischer, B., Keller, W. A., Miski, P., Buchanan, R. W., Green. M. F., Carpenter, W. T., 2013. Deconstructing negative symptoms of schizophrenia: Avolition-apathy and diminished expression clusters predict clinical presentation and functional outcome. *Journal of Psychiatric Research*, 47, 783-790.

World Health Organization, 1992. The ICD-10 classification of mental and behavioural disorders: clinical descriptions and diagnostic guidelines (Vol. 1). World Health Organization.

Table 1: Participant ratings of anticipatory success and anticipatory pleasure over time (n=42)

	Timepoint (Mean, Standard Deviation)					
	Baseline		Trial 1		Trial 2	
Anticipatory success (AS)	23.62	(4.03)	31.48	(4.87)	36.65	(5.01)
Anticipatory pleasure (AP)	72.55	(6.01)	76.70	(4.78)	79.54	(4.16)

**Figure 1: Anticipatory deficit model of Negative Symptoms**



## **Appendix 1: Imagery Scripts used in the study**

### **Facilitative imagery script**

You are going to imagine doing very well next time you throw the darts.

Start with an image of the dart-throwing position, the place that you were just throwing from. Feel your body get into your throwing position. Concentrate on how your body is feeling: your body feels strong; you can feel the strength and energy surge with every breath you take. When people look at you, they see a confident dart-thrower.

Now think about how it would feel if you throw really well and feel the sense of accomplishment, the feelings of confidence and satisfaction, the feeling that you can do this with ease. Now take these feelings and intensify them, that is, feel the same positive feelings but make them stronger. Feel yourself getting more confident. You know in your mind that you can make this throw, now and in the future. Let yourself feel the success, the joy, and the happiness. The better you can let yourself feel these sensations of confidence, the more your body will want to throw this dart and do exactly what you are seeing and feeling yourself doing right now. Other people can see the confidence in you.

Continue this image; as you breathe in, feel the confidence. Focus on your body: it's comfortable, relaxed and balanced. Think about the sensations you feel when you throw the dart: you feel very confident. See the perfectly smooth trajectory of the dart flying through the air. It is looking very promising and impressive. Watch it approach the dart board. Follow it all the way, your perfect throw making it land straight in the centre of the board, right in the bull's eye. You feel proud over making such a good throw.

### **Control**

You are going to imagine how you will get on next time you throw the darts. Try and make your images as realistic as possible, based on what you think about your skills and ability at darts.

Start with an image of the dart-throwing position, the place that you were just throwing from. Feel your body get into your throwing position. Concentrate on how your body is feeling. Imagine the sensations you are experiencing. Imagine how you will be feeling. Think about how you look to other people.

Now think about how you will feel about throwing the dart. Think about how it will go. Think about the emotions you will have just before you throw the dart. Now take these feelings and intensify them, that is, feel the same feelings but make them stronger. Think about the emotions you are experiencing, the thoughts you are having about the task ahead. Continue to imagine how you will feel just before you throw the dart. Think about how these feelings will affect your performance. Imagine how you look in other people's eyes.

Continue this image; as you breathe in, imagine how you will feel. Focus on the feelings in your body. Think about the sensations you feel when you throw the dart. See the dart leaving your hand. Picture it moving through the air. Follow it all the way and notice where it lands. Imagine the feelings you will have after making such a throw.

**The above scripts were adapted for this study from original scripts used in:**

Nordin, S. M., & Cumming, J. (2005). More than meets the eye: Investigating imagery type, direction, and outcome. *The Sport Psychologist*, 19, 1-17.

**Original scripts (Nordin and Cumming, 2005):**

**Facilitative CS**

Imagine that you are standing on the floor in front of the dartboard, the same place as you were just standing in. Feel balanced as you step up to the oche on the floor.

Remember the correct stance that you practised. Stand with your feet apart, your weight mainly on your front leg. Look at your feet; see that they are slightly apart, that the outside of your front foot is against the oche.

Feel yourself in a perfect position. Feel that your upper body is upright and that your shoulders are relaxed. Feel your throwing arm bent towards your shoulder. Feel the firm grip of your throwing hand around the dart.

The image should be you, standing slightly sideways on, perfectly lined up with the dart resting in your hand. Your head is up and looking forward. Now find the imaginary trajectory that the dart will follow straight to the bull's eye. This is the line in which you are going to throw the dart. Now feel yourself pointing with the dart at the board's centre, then bringing the dart back, bringing your arm back smoothly. Feel your hand and forearm acting as a single unit and your wrist is held firm and strong.

The dart feels light. Feel your head and shoulders staying up and motionless with your eyes totally concentrated on the bull's eye. Feel your smooth and consistent movement from bent to almost straight arm. Your body stays still and relaxed, with only your arm moving.

Feel your hand beginning to move in a straight line to form a perfect trajectory toward the very centre of the dart board. Follow through the throw with your forearm. Feel yourself finish the throw: smoothly, effortlessly, a straight and consistent throw. See the point of release when the hand lets go of the dart, just at the right time.

See the perfectly smooth trajectory of the dart flying through the air. It is looking very promising. Watch it approach the dart board. Follow it all the way, your perfect throw making it land straight in the centre of the board, right in the bull's eye.

**Debilitative CS**

Imagine that you are standing on the floor in front of the dartboard, trying to find the same place as you were standing in earlier. You feel a bit awkward as you step up to the oche on the floor. You cannot quite remember the correct stance that you practised. Stand with your feet apart, your weight mainly on your front leg. The back foot is putting you slightly off-balance as the weight is not evenly distributed. Look at your feet; see that they are slightly apart, that the outside of your front foot is against the oche.

The throwing stance feels a bit incorrect. You are trying to keep your upper body upright, but your shoulders are tense. Feel your throwing arm bent towards your shoulder. Feel the tension from the firm grip of your throwing hand around the dart.

The image should be you, standing slightly sideways on, lined up with the dart held in your hand. Your head is up and looking forward. You are finding it hard to find the imaginary trajectory that the dart is supposed to follow to the board. You know this is not quite going to be the line in which you will throw the dart. Now feel yourself pointing with the dart at the board, slightly off centre, but then still bringing the dart back without correcting it. Feel your hand and forearm getting a little tired of holding the dart up, making it hard to hold your wrist firm and strong. The dart feels heavy.

Feel your head and shoulders staying up, stiff and motionless, with your eyes trying to focus on where you want to throw. Feel your movement from bent to almost straight arm, not quite matching your best throw. Your body stays still and tense, with only your arm moving.

Feel your hand beginning to move in what you hope is a straight line, to form a somewhat wobbly trajectory toward the edge of the dart board. You are not sure whether you have followed through the throw with your forearm enough. Feel yourself finish the throw: it feels a bit tense and effortful, and you don't think it is going to be a particularly straight and consistent throw. See the point of release when the hand lets go of the dart.

You are not quite sure whether it was at the right time or not. See the trajectory of the dart flying through the air. It is not looking very promising. Watch it approach the outer edge of the dart board. Follow it all the way. Unfortunately, your somewhat inaccurate throw has made it land outside the dart board, and it will fall to the floor.

#### Facilitative MG-M

Start with an image of the dart-throwing position, the place that you were just throwing from. See yourself walking toward the oche. Feel your body get into your throwing position. Concentrate on how your body is feeling: your body feels strong; you can feel the strength and energy surge with every breath you take. When people look at you, they see a confident dart-thrower. Now think about how it would feel if you throw really well and feel the sense of accomplishment, the feelings of confidence and satisfaction, the feeling that you can do this with ease. Now take these feelings and intensify them, that is, feel the same positive feelings but make them stronger. Feel yourself getting more confident. You know in your mind that you can make this throw, now and in the future. Let yourself feel the success, the joy, and the happiness. The better you can let yourself feel these sensations of confidence, the more your body will want to throw this dart and do exactly what you are seeing and feeling yourself doing right now. Other people can see the confidence in you.

Continue this image; as you breathe in, feel the confidence. Focus on your body: it's comfortable, relaxed and balanced. Think about the sensations you feel when you throw the dart: you feel very confident.

See the perfectly smooth trajectory of the dart flying through the air. It is looking very promising and impressive. Watch it approach the dart board. Follow it all the way, your perfect throw making it land straight in the centre of the board, right in the bull's eye. You feel proud over making such a good throw.

#### Debilitative MG-M

Start with an image of the dart-throwing position, the place that you were just throwing from. See yourself walking toward the oche. Feel your body get into your

throwing position. Concentrate on how your body is feeling: your body feels weak, as you can feel the strength and energy being a bit lower than on previous throws. When people look at you, they do not see a confident dart-thrower. Now think about the last time you made the throw really poorly and feel the sense of embarrassment, the feelings of your confidence decreasing and the feelings of dissatisfaction, the feeling that you can not do this with ease. Now take these feelings and intensify them, that is, feel the same negative feelings but make them stronger. Feel yourself getting less confident. You know in your mind that you can not make this throw, now or in the future. Let yourself feel the failure, the shame, and the unhappiness. The better you can let yourself feel these sensations of lowered confidence, the more your body will resist throwing this dart. It will do exactly what you are seeing and feeling yourself doing right now. Other people can see the low confidence in you. Continue this image; as you breathe in, feel the confidence leave you. Focus on your body: it's uncomfortable, tense and off-balance. Think about the sensations you feel when you throw the dart: you feel very unconfident.

See the trajectory of the dart flying through the air. It is not looking very promising, and so it is not very impressive. Watch it approach the outer edge of the dart board. Follow it all the way. Unfortunately, your somewhat inaccurate throw has made it land outside the dart board, and it will fall to the floor. You feel a bit embarrassed over making such a poor throw.