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Schizotypal traits and their relation to rejection sensitivity in the general population:
the mediation by quality of life, agreeableness and neuroticism

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Abstract

Schizotypal traits are a cluster of personality styles suggesting a potential liability for schizophrenia-spectrum disorders. Rejection sensitivity is evident all along this continuum. This study aimed to determine whether the relation between schizotypy and rejection sensitivity was mediated by psychosocial quality of life (QOL), neuroticism and agreeableness. Three hundred and eighteen participants from a predominantly University student population completed an online survey measuring schizotypy, rejection sensitivity, quality of life, and the five-factor personality traits. A regression analysis determined the prediction of rejection sensitivity by the facets of the other variables. Analyses examined the mediation of the relation between interpersonal schizotypy and rejection sensitivity by psychological QOL, social QOL, neuroticism, and agreeableness. Interpersonal schizotypal traits were cognitive disorganisation which includes social anxiety, and introverted anhedonia which includes a lack of pleasure in social activities. Interpersonal schizotypy predicted greater rejection sensitivity. Psychological QOL, social QOL, neuroticism, and agreeableness mediated the relation between interpersonal schizotypy and rejection sensitivity. To conclude, a higher level of interpersonal schizotypy relates to greater rejection sensitivity. This association is mediated by psychosocial factors that lower one's ability to have positive feelings and trusting relationships, and personality traits that increase worrying and lower prosocial behaviour.

Key words: interpersonal schizotypy; mediation; personality; quality of life

1 Introduction

Schizotypy is a latent personality organisation reflecting a putative liability for schizophrenia-spectrum disorders (Meehl, 1962). Schizotypy has several possible phenotypic expressions, namely schizotypal traits (at a behavioural level), schizotypal personality disorder, and psychosis (at sub-clinical and clinical levels, respectively) that are inter-related, but not necessarily interchangeable (Lenzenweger, 2010; Linscott et al., in press). According to this definition, schizotypy represents a theoretical construct and aetiological model of psychosis (Fonseca-Pedrero et al., 2018). Most people with schizotypy do not make the transition to psychosis (Kwapil et al., 2012; Rössler et al., 2013). Nonetheless, people with psychosis score highly on schizotypal questionnaires, and some people with schizotypy experience sub-clinical manifestations of psychosis (Brosey and Woodward, 2015; Cochrane et al., 2010; Kwapil et al., 2008). People who score highly on the Schizotypal Personality Questionnaire have schizotypal personality disorder (Raine, 1991). Schizotypal traits being on a continuum with the schizophrenia spectrum, could help to detect individuals at risk for psychosis (Ettinger et al., 2014; Fonseca-Pedrero et al., 2018). A further similarity between schizotypy and psychosis is the presence of positive and negative dimensions (Kendler, 1991; Liddle, 1987). Positive schizotypy includes magical ideation and perceptual aberrations, and negative schizotypy consists of social avoidance and physical anhedonia (Kendler, 1991).

Schizotypy is a multidimensional construct, which means that some dimensions, such as social isolation, could contribute to the risk for psychosis more than others (Flückiger et al., 2016). Positive schizotypy predicts a greater likelihood of having a psychotic disorder, while negative and positive schizotypal traits predict a greater likelihood of schizophrenia-

spectrum disorders (Kwapil et al., 2013). Social anxiety is another schizotypal dimension denoting an intense fear of being rejected, embarrassed, and humiliated in social and performance situations (American Psychiatric Association, 2000; Fonseca-Pedrero et al., 2018). Social anxiety could contribute to paranoia in psychosis if paranoid beliefs contained beliefs that others will harm you (Green and Phillips, 2004; Lysaker et al., 2010). People with moderate paranoia feel more threatened by unfamiliar people than by familiar people (Collip et al., 2011).

Interpersonal schizotypy combines social anxiety and social isolation (Fonseca-Pedrero et al., 2017; Raine et al., 1991). In a valid self-report measure of schizotypal traits called the Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE, Mason et al., 1995), cognitive disorganisation measures social anxiety, moodiness, and difficulty concentrating, and introverted anhedonia measures social avoidance and loneliness. Interpersonal schizotypy may relate to rejection sensitivity (RS). RS is a type of social anxiety where the person expects others to reject or exclude them in ambiguous interpersonal situations (Downey and Feldman, 1996), and such people have a rejection attribution bias (Park et al., 2016). Rejection sensitive individuals in close relationships perceive and express relationship insecurity (Langens and Schuler, 2005; Lemay and Clark, 2008). RS can also relate to anxious solitude, where social fears can make the person to avoid social situations (Rubin and Coplan, 2010; Zlomke et al., 2016). RS may denote vulnerability to psychosis, because it occurs all along the psychosis continuum (Grant and Beck, 2009; Kwapil et al., 2012; Morrison, 2006; Torgersen et al., 2002). A history of being rejected as a child, such as being emotionally neglected and bullied, relates to having more schizotypal traits in adulthood (Velikonja et al., 2015). Having been bullied as an adolescent is associated with paranoia and auditory hallucinations, and bullying denotes rejection (Campbell and

Morrison, 2007). When viewing scenes depicting rejection, the dorsal anterior cingulate cortex (a brain region involved in feeling emotional pain from rejection) is activated less in people with schizotypy than in healthy controls, which could suggest that people with schizotypy have difficulty dealing with the emotional pain of rejection (Premkumar et al., 2012).

Social quality of life (QOL) could explain the relation between schizotypy and RS. Social QOL denotes social functioning, and is an ability to perform and feel satisfied about social activities, such as having close relationships and employment, performing household duties, and performing other daily routines (Burns and Patrick, 2007; Trompenaars et al., 2007). Social dysfunction consists of social avoidance, friendship dissatisfaction, and perceiving social conflict (Wang et al., 2017). Having less social satisfaction and less perceived social support relate to greater RS in people with bipolar disorder (Ng and Johnson, 2013). Evidence linking social dysfunction to schizotypy is inconsistent. People with schizotypal traits have less-than-normal social functioning (Jahshan and Sergi, 2007; Luther et al., 2016), but better social functioning than people with schizophrenia (Rabin et al., 2014). Having greater emotionality and paranoia predict lower social functioning in people showing a longitudinal increase in schizotypal personality traits (Geng et al., 2013). Other evidence indicates that people with schizotypal traits have below-normal QOL satisfaction, even if their social functioning is normal (Cohen et al., 2014). People with schizotypal traits can have a similar level of QOL satisfaction to people with psychosis (Cohen et al., 2014). Social dysfunction could imply that certain relational provisions are not noticed, such as attachment, praise, reassurance of worth, and guidance (Cutrona, 2004; Weiss, 1974). Poor social functioning correlates with negative schizotypy, that is a lack of pleasure from social and physical activities (Rabin et al., 2014; Cohen and Davis, 2009). Lower activation of the

insula (a brain region associated with evaluating the salience of an event) during praise could suggest that people with schizotypal traits do not notice praise (Premkumar et al., 2013), which could account for less perceived social support and social QOL.

People with schizotypal traits have low psychological QOL, which is a self-evaluation of one's beliefs and emotional state; this is evidenced by a link between lower QOL and more defeatist performance beliefs, and between lower QOL and emotional distress in this population (Abplanalp et al., 2017; Luther et al., 2016). This association could be explained by certain personality traits, such as neuroticism. Cognitive disorganisation, which includes social anxiety, is associated with neuroticism (a preoccupation with negative affect) more than any other personality trait from the five-factor model (Swamih et al., 2011). Schizotypal traits denoting social avoidance, that is negative schizotypy, are associated with lower extraversion and agreeableness (Kwapil et al., 2008; Swamih et al. 2011). Neuroticism could relate to RS (Berenson et al., 2009), but also mediate the link between negative schizotypy and RS by increasing early attention to rejection scenes, as defined by the P300 event-related potential (Premkumar et al., 2015). This finding means that RS could relate to avoidance of social situations when it is accompanied by worrying about social interaction. Agreeableness is another five-factor personality trait characterised by warmth, trust, cooperativeness, and prosociality (Costa and McCrae, 1992). Lower agreeableness provokes negative reactions in others and is associated with having been victimized by peers in childhood (Buckley et al. 2004; Jensen-Campbell et al., 2002). Lower agreeableness could mediate the link between RS and social dysfunction (Wang et al., 2017). In summary, schizotypy could relate to lower social functioning and lower agreeableness, and greater neuroticism, that in turn could relate to RS.

The aim of the study was to propose and test a theoretical model of the psychosocial link between interpersonal schizotypy and RS. A theoretical model of the psychosocial link between schizotypy and RS could help to understand the social relevance of psychosis-like states. A model is proposed whereby a high level of interpersonal schizotypal traits relate to a lower quality of life (QOL), such as a poor ability to engage in personal relationships or employment and lower satisfaction with these abilities. Additionally, a high level of interpersonal schizotypal traits could relate to a high level of certain personality traits (Costa and McCrae, 1992), such as agreeableness and introversion (Swamih et al., 2011). In turn, low QOL and a high level of these personality traits could relate to greater RS (Figure 1). Low QOL could even relate to a low level of certain personality traits, such as neuroticism (Brett et al., 2012), and schizotypy might influence other personality traits, such as agreeableness and introversion independent of QOL (Swamih et al., 2011), and so increase RS. It was hypothesised that:

- (1) Greater schizotypal traits would predict greater RS;
- (2) Poor QOL would incrementally predict RS beyond the variance explained by the relation between schizotypy and RS; and personality would incrementally predict greater RS beyond the variance explained by the relation between schizotypy and QOL, and
- (3) Lower psychosocial functioning (i.e. lower levels of psychological QOL, social QOL, and agreeableness, and higher neuroticism) would mediate the relation between interpersonal schizotypal traits and RS.

*** Insert Figure 1 about here ***

2 Method

2.1 Participants

Participants ($n=318$) were predominantly from a University student population, and were female (82%), White (77%), and single (85%, Table 1); thus, the sample was obtained by convenience. Eighty-two percent of participants were University psychology students. Participants other than psychology students at Nottingham Trent University were recruited through social networking websites, such as Facebook, thestudentroom.co.uk, and ResearchWe.com.

*** Insert Table 1 about here ***

2.2 Psychometric measures

2.2.1 Adult Rejection Sensitivity Questionnaire (ARSQ, Downey and Feldman, 1996)

The ARSQ is an 18-item scale consisting of nine hypothetical scenarios. One scenario is 'You approach a close friend to talk after doing or saying something that seriously upset him/her'. Participants rated each item in terms of how concerned they would be about that situation on a six-point Likert scale, ranging from 'Very unconcerned' to 'Very concerned', and how likely it was that they would be accepted in that situation on a six-point Likert scale, ranging from 'Very unlikely' to 'Very likely'. In the current sample, the mean score was comparable to that of a normative sample (Berenson et al., 2009). The scale had good internal reliability in the current sample (Table 1) and in another sample of British University students (Premkumar et al., 2014). Higher RS relates to greater attention interference by rejection-related words in an emotional Stroop task (Berenson et al., 2009), and signifies good construct validity. The scale has good convergent validity, as it is correlated with

another measure of interpersonal sensitivity (Berenson et al., 2009). The scale has good criterion validity, because it correlates moderately with neuroticism, social avoidance, self-esteem, attachment anxiety, attachment avoidance, and depression (Berenson et al., 2009), and with relational aggression in romantic couples (Gallier and Bentley, 2010). It has good discriminant validity, because people with borderline personality disorder score highly on RS (Berenson et al., 2009).

2.2.2 Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE, Mason et al., 1995)

The O-LIFE is a 104-item scale measuring unusual experiences, introvertive anhedonia, cognitive disorganisation, and impulsive nonconformity. The unusual experiences subscale has 30 items. It measures positive schizotypy that denotes having perceptual aberrations and magical ideation. Introvertive anhedonia has 27 items. It measures negative schizotypy that consists of social avoidance and lack of pleasure in physical activities. Cognitive disorganisation has 24 items. It measures social anxiety, moodiness, and lack of concentration. Impulsive non-conformity has 23 items. It measures aggression and lack of self-control. Participants answered each item as 'Yes' or 'No'. The mean unusual experiences score was lower in the current sample, while the means of the other subscales were higher than those of another British sample (Mason et al., 2006; Table 1). The subscales had acceptable to good internal reliability in the current sample and the normative British sample (Mason et al., 1995). The scale has good discriminant validity, as patients with schizophrenia score higher on unusual experiences, introvertive anhedonia, and cognitive disorganisation than healthy participants (Cochrane et al., 2010). The scale has convergent validity, because the unusual experiences subscale score correlates with positive

symptoms in patients with schizophrenia (Cochrane et al., 2010). Impulsive nonconformity is less relevant to the schizotypal organisation than other subscales (Mason, 2015)

2.2.3 World Health Organization Quality of Life assessment instrument (WHOQOL-100, WHOQOL Group, 1998)

The WHOQOL is a 100-item scale that measures physical, psychological, social, and environmental QOL. The questions ask about one's ability to perform an activity, for example, 'How well do you sleep?'. The questions also ask about their satisfaction with that activity, for example 'How satisfied are you with your sleep?'. The physical domain includes attributes of pain, energy, sleep, mobility, and activities of daily living (28 items). The psychological domain considers positive feelings, clarity of thought, self-esteem, body image, negative feelings, and spirituality (24 items). The social domain measures quality of personal relationships, social support, and sexual activity (12 items). The environmental domain measures quality of one's surroundings, such as physical safety, home environment, financial resources, health, and social care (32 items). Overall QOL (4 items) asks about general satisfaction with one's QOL. Participants rated each item on a five-point Likert scale. The mean psychological QOL in the current sample was comparable with that of an older global sample of clinical and healthy people, while the means of the other subscales were slightly higher (WHOQOL Group, 1998, Table 1). The subscales had good to excellent internal reliability in the current sample, and good to external internal reliability in British patients with a physical or mental illness (Skevington, 1999). Greater physical, psychological, social, and environmental QOL correlated with less anxiety and depression in patients with schizophrenia (Örsel et al., 2004), indicating the scale's criterion validity.

2.2.4 The Big Five Inventory (John et al., 1991)

The scale is a 44-item scale measuring extraversion, conscientiousness, neuroticism, agreeableness, and openness. Extraversion (8 items) measures traits, such as being outgoing, sociable, and fun-seeking. Conscientiousness (9 items) is the ability to be self-disciplined, reliable, and organised. Neuroticism (8 items) is the tendency to worry excessively and evaluate negative emotions (Goldberg, 1990). Agreeableness (9 items) is the tendency to be warm, trusting, cooperative, and prosocial. Openness refers to an interest in aesthetic experiences and creativity. Each item was rated on a five-point Likert scale from 'strongly disagree' to 'strongly agree'. The means of extraversion, neuroticism, and agreeableness in the current sample were comparable to those of a British cohort of University students, while the means of conscientiousness and openness were lower than that of a British cohort (Greven et al., 2008, Table 1). The subscales had good internal reliability in the current sample. The scale has good criterion validity as evidenced by the correlation of each scale with emotional intelligence, well-being, and emotionality (Greven et al., 2008). The scale has discriminant validity, as those who are more stressed by one's sexual minority status show higher neuroticism and lower extraversion, conscientiousness, agreeableness, and openness than those who are less stressed by one's sexual minority status (Livingston et al., 2016).

2.2.5 Procedure

Participants read an information sheet and provided consent in an online survey (Google surveys). Participants then completed an online survey consisting of the abovementioned self-report questionnaires on schizotypy, RS, quality of life, and the five-

factor personality model. Participants were debriefed and thanked. Psychology students at Nottingham Trent University were rewarded with research credits; other participants completed the study in a voluntary capacity. The study was ethically approved by the NTU College of Business, Law, and Social Sciences Research Ethics Committee (No. 2013/17).

2.3 Statistical analyses

Statistical analyses were performed in SPSS, version 24. Data were missing from 0.3% of the sample for 61 out of 266 items. Data were missing between 0.6% and 6.5% of the sample for another 90 items. Due to a procedural error, data were missing from 12% of the sample for one item from the Big Five Inventory and 35% of the sample for two items from the ARSQ. Missing data were replaced using multiple imputation based on a monotone pattern of missing data. Responses from all 318 participants were included in the statistical analyses, because no stereotypical response patterns were found. Skewness and kurtosis were examined for the normal distribution of each subscale. No subscale was excluded because of data not being normally distributed (see Results, section 3.1). Pearson correlation tests were performed between RS, age, gender, schizotypal subscales, QOL subscales, and five-factor personality subscales, for exploratory purposes. To test the first two hypotheses, a hierarchical regression analysis was performed with RS as the outcome variable. The predictor variables were entered in the following steps: Step 1: age and gender (control variables); Step 2: schizotypal subscales; Step 3: QOL subscales, and Step 4: the five-factor personality subscales. A hierarchical regression helped to determine which subscales for each scale relate to RS, and whether each step contributed incrementally to RS. Multicollinearity was estimated.

The third hypothesis and the theoretical model (Figure 1) were tested by performing a mediation analysis using Haye's (2013) Process Macro, version 2.16.3. O-LIFE subscales corresponding to interpersonal schizotypal traits, namely cognitive disorganisation and introverted anhedonia, were entered as independent variables in separate models. Psychological QOL, social QOL, neuroticism, and agreeableness were mediators, and RS was the outcome variable. Confidence intervals were calculated based on 5,000 bootstrap samples, and were bias corrected.

To further explore the effect of psychosocial functioning on the schizotypy-RS relation, a composite psychosocial functioning score was calculated (Bobko et al., 2007) from the sum of the standardized scores of psychological QOL, social QOL, neuroticism, and agreeableness. A median split of the composite psychosocial functioning score was performed, and participants were categorised into high or low psychosocial functioning groups. The strength of the correlation between schizotypy and RS was compared between high and low psychosocial functioning groups and statistically tested using Fisher's *r*-to-*z* transformation.

3 Results

3.1 Participant characteristics

Skewness and kurtosis values were < 1.0 for each scale's subscale, suggesting that the data were normally distributed (Table 1). Only 11% ($n=36$) of the sample had high positive schizotypy, that is they scored above the 90th percentile of the O-LIFE unusual experiences subscale, suggesting that the sample largely comprised schizotypal traits in the normal range. Five percent ($n=16$) had low social QOL, that is they scored below the 10th

percentile of WHOQOL social domain, again suggesting that the sample predominantly had normal social functioning. Out of thirty-six people with high positive schizotypy, 19% ($n=7$, 43% of the total number of low social QOL scores) had low social QOL, suggesting a small likelihood of participants having low social QOL and high positive schizotypy.

3.2 Predictors of rejection sensitivity

RS correlated highly ($p<0.001$) with all schizotypal, psychosocial, and personality variables, except openness where the correlation was significant, but small (Table 2). The multicollinearity estimates (variance inflation factor) were below 4, indicating that multicollinearity assumptions were met for a hierarchical regression analysis. This moderate multicollinearity arose due to the large correlation between O-LIFE cognitive disorganisation and WHOQOL-psychological ($r=-0.72$, $p<0.001$), and between O-LIFE cognitive disorganisation and neuroticism ($r=0.71$, $p<0.001$). The hierarchical regression model was significant (Table 3). At step 1, age and gender were not significant predictors of RS. In Step 2, the O-LIFE accounted for 31% of the variance in RS, and this change in the amount of variance explained was significant, $p<0.001$. Cognitive disorganisation and introverted anhedonia were significant predictors at this step. In step 3, QOL accounted for a further 10% of the variance in RS, and this change in the amount of variance explained was significant, $p<0.001$. Psychological QOL and social QOL were significant predictors in addition to cognitive disorganisation and introverted anhedonia. In step 3, the five-factor model accounted for a further 3% of the variance in RS, and this change in the amount of variance explained was significant, $p<0.001$. Neuroticism and agreeableness were significant predictors in addition to introverted anhedonia, psychological QOL and social QOL.

*** Insert Tables 2 and 3 about here ***

3.3 Mediators of the relation between interpersonal schizotypy and rejection sensitivity

3.3.1 Mediators between cognitive disorganisation and RS

Psychological QOL, social QOL, neuroticism, and agreeableness fully mediated the relation between cognitive disorganisation and RS, $R=0.65$, $F(5,312)=44.85$, $p<0.001$ (Figure 2a). Cognitive disorganisation and the mediators together explained 42% of the variance in RS. Cognitive disorganisation on its own explained 25% of the variance in RS. Cognitive disorganisation significantly predicted each mediator, and accounted for 51%, 18%, 50% and 9% of the variance in psychological QOL, social QOL, neuroticism, and agreeableness, respectively. In turn, each mediator significantly predicted RS. The direct effect, c' , of cognitive disorganisation on RS was not significant ($p=.27$), which suggests that the mediators fully explained the cognitive disorganisation-RS relationship. Each mediator had a significant indirect effect of cognitive disorganisation on RS as follows: psychological QOL, indirect effect=0.13, 95% C.I.=0.06 to 0.20; social QOL, indirect effect =0.06, 95% C.I., 0.02 to 0.09; neuroticism, indirect effect=0.07, 95% C.I.=0.01 to 0.13; and agreeableness, indirect effect=0.02, 95% C.I.=0.003 to 0.04. Psychological QOL had a greater indirect effect on RS than agreeableness did, bias corrected 95% C.I.=0.03 to 0.19.

3.3.2 Mediators between introvertive anhedonia and RS

Psychological QOL, social QOL, neuroticism, and agreeableness partially mediated the relation between introvertive anhedonia and RS, $R=0.65$, $F(5,312)=46.19$, $p<0.001$.

Introvertive anhedonia and the mediators together explained 42% of the variance in RS (Figure 2b). Introvertive anhedonia on its own explained 25% of the variance in RS. Introvertive anhedonia significantly predicted each mediator, and explained 19%, 11%, 22%, and 6% of the variance in psychological QOL, social QOL, neuroticism, and agreeableness, respectively. In turn, each mediator significantly predicted RS. The direct effect, c' , of introvertive anhedonia on RS was significant after controlling for the mediators, which suggests that the mediators partially explained the association between introvertive anhedonia and RS. Each mediator had a significant indirect effect of cognitive disorganisation on RS as follows: psychological QOL, indirect effect=0.11, 95% C.I.=0.05 to 0.17; social QOL, indirect effect =0.07, 95% C.I., 0.02 to 0.12; neuroticism, indirect effect=0.05, 95% C.I.=0.02 to 0.10; and agreeableness, indirect effect=0.02, 95% C.I.=0.001 to 0.05. Psychological QOL had a greater special indirect effect on RS than agreeableness did, bias corrected 95% C.I.=0.03-0.15.

To test the combined effect of the psychosocial QOL and personality mediators on the schizotypy-RS association, a composite score of the four psychosocial mediators was calculated. The sample was divided into high ($n=159$) and low psychosocial functioning groups ($n=159$) using a median split. The association between cognitive disorganisation and RS was significant in the high psychosocial functioning group ($r=0.32$, $p<0.001$, 10% of variance explained) and the low psychosocial functioning group ($r=0.47$, $p<0.001$, 23% of variance explained). The strength of the association between cognitive disorganisation and RS did not differ between the high and low psychosocial functioning groups, $z=1.65$, $p=0.1$ (Figure 3a). The association between introvertive anhedonia and RS was significant in the low psychosocial functioning group ($r=0.36$, $p<0.001$, 23% of variance explained), and reached significance in the high psychosocial functioning group ($r=0.16$, $p=0.05$, 2% of

variance explained). The strength of the association between introvertive anhedonia and RS was higher in the low, than high, psychosocial functioning group, $z=1.97$, $p=0.049$ (Figure 3b).

*** Insert Figures 2 and 3 about here ***

4 Discussion

The study aimed to test a psychosocial model of the link between schizotypy and RS. As hypothesized, schizotypal traits predicted RS, and psychological QOL, social QOL, agreeableness, and neuroticism mediated the relation between interpersonal schizotypal traits and RS, such that the four psychosocial mediators fully explained the relation between cognitive disorganisation and RS. The psychosocial mediators only partially explained the relation between introvertive anhedonia and RS.

The findings suggest that interpersonal schizotypy relates to RS, and this relation could be explained by poor psychosocial QOL, low agreeableness and high neuroticism. Improving psychosocial functioning could limit the progress to more severe psychosis-like states (Rabin et al., 2014). The findings emphasise the need for people with schizotypal traits to have more social support and inclusion to overcome social anxiety and social avoidance. Some people with schizotypal traits have families who express criticism and hostility (Premkumar et al., 2015) and communicate poorly (Zborowski and Garske, 1993). Improving communication style may be important for those who lack close interpersonal relations and have a greater risk of developing psychosis (Salokangas et al., 2013). The current study's findings emphasise that people with schizotypal traits might improve their

QOL and self-esteem by being prepared to engage in prosocial and pleasurable activities. Many therapeutic strategies emphasise such issues (Schippers et al., 2001).

The comparison of high and low psychosocial functioning groups revealed a key distinction between the link between introvertive anhedonia and RS, and the link between cognitive disorganisation and RS. The association between introvertive anhedonia and RS was stronger in the low psychosocial functioning group than the high psychosocial functioning group. The finding suggests that low psychosocial functioning is likely to affect the link between high schizotypal traits of social withdrawal and RS, more than high psychosocial functioning. This difference between high and low psychosocial functioning groups was not apparent for the relation between cognitive disorganisation and RS. Furthermore, social avoidance related more strongly to social QOL relative to other mediators. This finding suggests that loneliness and isolation predict poor social functioning, in terms of having poor intimacy, not being satisfied with personal relationships, and not being able to love and support others. In turn, poor social functioning relates to RS. This finding is consistent with evidence that people at the prodrome of psychosis lack social support (Gayer-Anderson and Morgan, 2013). A person with an avoidant personality disorder avoids social interaction and perceives more rejection than normal (Winarick and Bornstein, 2015). Poor communication by people with schizotypal traits could make others to feel anxious, which may then link to people with schizotypal traits perceiving rejection (Zborowski and Garske, 1993). Such individuals might benefit from receiving intensive psychotherapy to improve their access to and ability to give social support. Such psychotherapy may give people with schizotypal traits opportunities for social integration and nurturance, which allow for fulfilling relational bonds (Cutrona, 2004; Weiss, 1974). Cognitive disorganisation, one aspect of which is social anxiety, related more strongly to

psychological factors, such as neuroticism and psychological QOL, rather than to social factors. Thus, schizotypal traits concerned with feeling socially anxious could relate to turning one's thoughts to negative emotions, rather than psychological QOL, that is positive appraisal of one's life, abilities, and appearance, being curious, and taking part in pleasurable activities (Kashdan, 2002; Kashdan and Steger, 2006).

In both mediation models, psychological QOL explained the interpersonal schizotypy-RS association better than agreeableness did. Thus, the link between interpersonal schizotypy and RS could follow two independent routes, namely poorly psychology QOL and low agreeableness, of which agreeableness has a weaker influence (Cuadadro et al., 2015). Having positive feelings, clarity of thought, and good self-esteem could be more important to reduce the link between interpersonal schizotypy and RS, than being agreeable. Receiving social support could reinforce positive thoughts and self-esteem, and so lower social anxiety and avoidance. To a lesser extent, being prosocial could relate to a lesser likelihood of having negative communication and, in turn, relate to less RS among people with schizotypal traits (Wang et al., 2017).

Positive schizotypy did not predict RS, which suggests that having magical ideation, perceptual aberrations, and other such paranormal beliefs, does not affect RS. These findings support previous evidence that negative schizotypy, but not positive schizotypy, relates to social distance (Kwapil et al., 2012). In a study of patients with first-episode psychosis, social anxiety did not relate to positive symptoms (Michail and Birchwood, 2009). However, earlier neuroimaging studies found a relation between positive schizotypy and lower early attention to rejection scenes (P300 amplitude, Premkumar et al., 2015). Rejection scenes under-activated the dorsal anterior cingulate cortex in people with positive schizotypal traits (Premkumar et al., 2012). Positive schizotypy may alter the neural

processing of rejection, but not self-reported RS. Other evidence indicates that social anxiety relates to positive symptoms in those at high risk of psychosis (Masillo et al., 2012). The proportion of people with positive schizotypal traits in the current sample was relatively low, meaning that positive schizotypy within the normal range may not contribute much to self-reported RS. This study's findings suggest that self-reported RS is not an epiphenomenon of positive schizotypy, but is more affiliated with interpersonal schizotypy.

4.1 Study limitations and future research

A methodological limitation was the cross-sectional nature of the study design, making it difficult to draw inferences about the direction of the effect from schizotypy to psychosocial functioning and RS. Major limitations were that the sample size was small and comprised mostly females who were predominantly from a single University. The clinical and medication status of the sample was not ascertained. Thus, the findings may not generalise to other populations, such as those with a history of mental disorder and men, because men at the early stage of psychosis have poorer psychosocial functioning than women (Thorup et al., 2014). A small number of participants had a high level of schizotypal traits and low QOL, which might limit the conclusions that could be drawn about schizotypy. The study did not use an infrequency scale to detect random, pseudorandom, or dishonest responses. The regression model explained only forty-four percent of the variance in RS. Future studies could test the mediation of the schizotypy-RS association by the ability to understand other people's mental states, current mood, family expressed emotion, and the amount of social support received. Social avoidance, social anxiety and neuroticism may be implicit in social and psychological QOL. A measure of psychopathology, or depression could

determine whether these associations are part of a complex of negative affect and poor quality of life. Besides self-report questionnaires, the model could include behavioural and neurophysiological (e.g. event-related potentials) responses to an experimental manipulation of social rejection.

4.2 Conclusion

The findings confirm the relation between schizotypy and RS. A unique contribution of this study was its proposed theoretical model of the route from interpersonal schizotypal traits to RS. The path from social anxiety, in the context of cognitive disorganisation, to RS comprises psychological factors, such as worrying excessively and poor clarity of thought. The path from social avoidance schizotypal traits to RS comprises social factors, such as the need for close relationships. Positive self-appraisal and better social functioning could reduce the likelihood of RS.

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Figure legend

Figure 1. A psychosocial model of the relation between schizotypy and rejection sensitivity.

Figure 2. Regression path from (a) the cognitive disorganisation subscale of schizotypy to rejection sensitivity, and (b) the introvertive anhedonia subscale of schizotypy to rejection sensitivity, mediated by psychological quality of life, social quality of life, neuroticism, and agreeableness. a_n is the standardized regression coefficient between the predictor (cognitive disorganisation or introvertive anhedonia) and the mediator; b_n is the standardized regression coefficient between the mediator and rejection sensitivity while holding cognitive disorganisation constant; c is the total effect of the predictor on rejection sensitivity, c' is the direct effect of the predictor on rejection sensitivity; a_1 and b_1 psychological QOL is the mediator, a_2 and b_2 social QOL is the mediator, a_3 and b_3 neuroticism is the mediator, a_4 and b_4 agreeableness is the mediator; * $p < 0.05$; ** $p < 0.001$

Figure 3. Plot of (a) the cognitive disorganisation subscale of schizotypy and rejection sensitivity, and (b) the introvertive anhedonia subscale of schizotypy and rejection sensitivity in low ($n=159$) and high ($n=159$) psychosocial functioning groups

Table 1. Sample descriptive statistics

	Mean (S.D.) or percentage	Range	Skewness	Kurtosis	Normative sample mean (S.D.)	Internal reliability (Cronbach's alpha)
Age in years, mean (S.D.)	24.6 (7.88)	19-66	3.07	10.41		
Gender (female, %)	82					
Ethnicity (White – UK/ White other/ Asian/ Afro-Caribbean heritage/ Other, %)	70/6.6/15.7/4 /3					
Educational level (A-level or equivalent/BA or similar/MA or similar/PhD/ missing, %)	20/5/4/1/70					
ARSQ ^a	9.48 (3.94)	1.39-23.44	0.6	0.37	8.61 (3.61)	0.81
O-LIFE ^b						
Unusual experiences	7.67 (5.55)	0-26	0.68	0.09	8.82 (6.61)	0.85
Cognitive disorganisation	13.31 (6.01)	0-24	-0.19	-0.86	10.73 (5.87)	0.88

Table 1 continued

	Mean (S.D.) or percentage	Range	Skewness	Kurtosis	Normative sample mean (S.D.)	Internal reliability (Cronbach's alpha)
Introvertive anhedonia	7.39 (4.55)	0-23	0.85	0.21	6.63 (4.49)	0.77
Impulsive non-conformity	9.81 (3.34)	3-20	0.31	-0.09	7.69 (4.12)	0.62
WHOQOL ^c						
Physical	15.59 (2.11)	8.14-19.57	-0.87	0.74	13.85 (1.58)	0.81
Psychological	13.26 (2.51)	6.17-19.33	-0.21	-0.41	13.80 (0.58)	0.81
Social	15.23 (2.63)	5.67-20.0	-0.42	-0.1	14.20 (0.40)	0.87
Environmental	14.95 (1.92)	10.13-19.63	-0.03	-0.37	13.60 (0.40)	0.91
Big Five Inventory ^d						
Extraversion	25.35 (6.06)	9-39	-0.15	-0.54	25.77 (6.95)	0.88
Neuroticism	25.16 (5.93)	8-39	-0.19	-0.48	24.66 (7.09)	0.84
Conscientiousness	30.27 (5.48)	15-44	0.14	-0.14	31.42 (6.57)	0.81

Table 1 continued

	Mean (S.D.) or percentage	Range	Skewness	Kurtosis	Normative sample mean (S.D.)	Internal reliability (Cronbach's alpha)
Agreeableness	33.26 (5.08)	13-45	-0.36	-0.64	34.06 (5.70)	0.75
Openness	33.44 (5.58)	17-50	0.01	0.22	38.51 (6.16)	0.78

ARSQ: Adult Rejection Sensitivity scale, O-LIFE: Oxford-Liverpool Inventory of Feelings and Experiences, WHOQOL: World Health Organisation Quality of Life; ^anormative scores based on a sample of young adults in North America ($n=685$, Berenson et al., 2011); ^bnormative scores based on a sample of healthy adults in Britain ($n=1,962$; Mason et al., 2006); ^cnormative scores of a multicultural sample of ill and well people adjusted for age, gender, and illness status ($n=4,802$, WHOQOL Group, 1998); ^dnormative scores based on a sample of University students in Britain ($n=1,038$; Greven et al., 2008).

Table 2. Pearson correlations between rejection sensitivity, schizotypy, quality of life and the five-factor personality model

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Rejection sensitivity	1.000															
2. age	-0.011	1.000														
3. Gender†	0.038	-0.109*	1.000													
4. Unusual experiences	0.188***	-0.123*	0.134**	1.000												
5. Cognitive disorganisation	0.502***	-0.161**	0.118*	0.494***	1.000											
6. Introverted anhedonia	0.402***	0.090	0.021	0.233***	0.378***	1.000										
7. Impulsive non-conformity	0.186***	-0.122*	-0.026	0.478***	0.444***	0.121*	1.000									
8. QOL - Physical	-0.362***	-0.016	-0.014	-0.471***	-0.536***	-0.361***	-0.321***	1.000								
9. QOL - Psychological	-0.587***	0.172***	-0.125*	-0.285***	-0.718***	-0.433***	-0.292***	0.576***	1.000							
10. QOL – Social	-0.496***	-0.113*	0.029	-0.236***	-0.427***	-0.466***	-0.210***	0.475***	0.585***	1.000						
11. QOL- Environmental	-0.382***	0.120*	-0.031	-0.444***	-0.484***	-0.304***	-0.305***	0.551***	0.599***	0.493***	1.000					
12. Extraversion	-0.332***	0.063	0.059	-0.082	-0.459***	-0.570***	-0.037	0.235***	0.472***	0.348***	0.226***	1.000				

Table 2 continued

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
13. Neuroticism	0.516***	-0.150**	0.114*	0.318***	0.707***	0.332***	0.305***	-0.470***	-0.683***	-0.387***	-0.443***	-0.387***	1.000			
14. Conscientiousness	-0.242***	0.214***	0.072	-0.255***	-0.459***	-0.140**	-0.328***	0.370***	0.474***	0.287***	0.319***	0.281***	-0.303***	1.000		
15. Agreeableness	-0.341***	-0.015	0.054	-0.242***	-0.296***	-0.251***	-0.415***	0.284***	0.284***	0.356***	0.319***	0.093*	-0.379***	0.263***	1.000	
16. Openness	-0.118*	0.163**	-0.122**	0.147**	-0.094*	-0.191***	0.055	-0.054	0.241***	0.024	0.136**	0.322***	-0.112*	0.178***	0.040	1.000

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$; † gender was coded as 1=male and 2=female

Table 3. Hierarchical regression between schizotypy, QOL, personality (predictors) and rejection sensitivity (outcome variable)

Predictor	Unstandardised beta (S.E.)	Standardised beta	<i>t</i> (<i>p</i> -value)	<i>R</i>	<i>R</i> -square change	<i>F</i> -change (<i>p</i> -value)
Step 1				0.04	0.002	0.24 (0.787)
Age	-0.003 (0.03)	-0.01	-0.12 (0.903)			
Gender	0.39 (0.58)	0.04	0.66 (0.507)			
Step 2				0.56	0.31	35.11 (<0.001)
Age	0.01 (0.02)	0.03	0.59 (0.552)			
Gender	-0.06 (0.50)	-0.01	-0.11 (0.909)			
Unusual experiences	-0.06 (0.04)	-0.09	-1.58 (0.115)			
Cognitive disorganisation	0.30 (0.04)	0.46	7.64 (<0.001)			
Introvertive anhedonia	0.21 (0.04)	0.25	4.76 (<0.001)			
Impulsive non-conformity	-0.001 (0.07)	-0.001	-0.02 (0.987)			

Table 3 continued

Predictor	Unstandardised beta (S.E.)	Standardised beta	<i>t</i> (<i>p</i> -value)	<i>R</i>	<i>R</i> -square change	<i>F</i> -change (<i>p</i> -value)
Step 3				0.64	0.10	12.56 (<0.001)
Age	0.02 (0.02)	0.04	0.81 (0.419)			
Gender	-0.12 (0.47)	-0.01	-0.26 (0.791)			
Unusual experiences	-0.03 (0.04)	-0.05	-0.78 (0.437)			
Cognitive disorganisation	0.13 (0.05)	0.20	2.72 (0.007)			
Introvertive anhedonia	0.10 (0.04)	0.12	2.95 (0.022)			
Impulsive non-conformity	-0.02 (0.07)	-0.01	-0.27 (0.790)			
Physical QOL	0.09 (0.11)	0.05	0.77 (0.440)			
Psychological QOL	-0.51 (0.13)	-0.32	-4.02 (<0.001)			
Social QOL	-0.28 (0.09)	-0.19	-3.15 (0.002)			
Environmental QOL	-0.04 (0.13)	-0.02	-0.31 (0.759)			

Table 3 continued

Predictor	Unstandardised beta (S.E.)	Standardised beta	<i>t</i> (<i>p</i> -value)	<i>R</i>	<i>R</i> -square change	<i>F</i> -change (<i>p</i> -value)
Step 4				0.66	0.03	3.25 (0.007)
Age	0.01 (0.02)	0.03	0.58 (0.561)			
Gender	-0.23 (0.48)	-0.02	-0.48 (0.627)			
Unusual experiences	-0.03 (0.04)	-0.04	-0.67 (0.504)			
Cognitive disorganisation	0.10 (0.05)	0.15	1.93 (0.054)			
Introvertive anhedonia	0.10 (0.05)	0.12	2.00 (0.046)			
Impulsive non-conformity	-0.07 (0.06)	-0.06	-1.11 (0.269)			
Physical QOL	0.10 (0.12)	0.05	0.89 (0.372)			
Psychological QOL	-0.48 (0.13)	-0.31	-3.55 (<0.001)			
Social QOL	-0.26 (0.09)	-0.17	-2.79 (0.006)			
Environmental QOL	0.01 (0.13)	0.004	0.07 (0.946)			
Extraversion	0.03 (0.04)	0.04	0.70 (0.482)			

Table 3 continued

Predictor	Unstandardised beta (S.E.)	Standardised beta	<i>t</i> (<i>p</i> -value)	<i>R</i>	<i>R</i> -square change	<i>F</i> -change (<i>p</i> -value)
Neuroticism	0.09 (0.05)	0.14	2.01 (0.045)			
Conscientiousness	0.03 (0.04)	0.05	0.89 (0.371)			
Agreeableness	-0.10 (0.04)	-0.13	-2.50 (0.013)			
Openness	<0.001 (0.04)	<0.001	0.004 (0.997)			

Values in bold, $p \leq 0.05$; QOL: Quality of life