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Schizotypy and Risk-Taking Behaviour: the Contribution of Urgency

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Abstract

The Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE) defines schizotypy as a multidimensional l ; psychopathology construct comprising Unusual Experiences, Cognitive Disorganisation, Impulsive Nonconformity, and Introvertive Anhedonia. Previous research indicates that schizotypy is associated with various risky behaviours .Urgency (emotional impulsivity) has a unique and clinically important effect on risk-taking. However, the interplay between schizotypy and urgency in relation to risk-taking has not received adequate consideration. A sample of 204 participants completed self-report scales measuring Schizotypy, Urgency and Risk-taking behaviour. Using structural equation modelling, a mediational model tested the degree to which O-LIFE subfactors directly and indirectly (via urgency) predicted self-reported likelihood to engage in Risk-taking behaviour. Results indicated that Cognitive Disorganisation and Introvertive Anhedonia negatively predicted engagement in Risk-taking behaviour ,whereas Impulsive Nonconformity positively predicted engagement in Risk-taking behaviour. Unusual Experiences, Cognitive Disorganisation and Impulsive Nonconformity had indirect effects on Risk-taking through Urgency. Inclusion of Urgency added explanatory power to the schizotypy-risk relationship.

Keywords Urgency · Risk-taking · Schizotypy · O-LIFE

Introduction

The present paper investigated the interaction between schizotypy, urgency (emotional impulsivity) and risk-taking behaviour. Schizotypy is a complex, multidimensional psychopathology construct, which comprises cognitive, perceptual and affective dimensions (Lenzenweger 2015). Researchers study schizotypy because it facilitates investigation of the schizophrenia-spectrum within the general population. This approach circumvents confounds associated with clinical patients, such as general decline in cognitive performance, symptom severity, medication and institutionalization (Barrantes-Vidal et al. 2015; Kwapil et al. 2013). In this context, schizotypy provides a unifying framework for comprehending the basis and development of schizophrenia and related disorders (Kwapil et al 2013).

Different theoretical positions exist on the relationship between schizotypy and psychopathology (Green et al 2008). The current article adopted the individual differences perspective (Claridge and Beech 1995). This delineates schizotypy as a personality dimension that signifies the inclination for the characteristics of psychotic states to occur in a milder form within healthy people (Claridge 1997). Specifically, features appear on a continuum between relative psychological health and schizophrenia (psychosis) (Barrantes-Vidal et al 2015). This delimitation is useful because it recognises that high levels of schizotypy exist within non-clinical populations without developing into full spectrum symptoms (Dembińska-Krajewska and Rybakowski 2014).

Consistent with the structure of schizophrenia, theorists propose that schizotypy possesses three general factors (positive, negative and disorganisation) (Cicero and Kern 2010a; Dembińska-Krajewska and Rybakowski 2014). These repre-sent various symptoms and features. The positive (psychotic-like) dimension includes unusual experiences (i.e., illusions to hallucinations), disruption of thought content (magical ideation and odd beliefs through to delusions) and suspiciousness/paranoia. The negative dimension indexes reduced affect, including flattened emotions, disinterest in the world and others, and anhedonia (inability to derive enjoyment from normally pleasurable activities). Finally, the disorganisation factor references thought (organization and expression) and behaviour

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disruptions. These encompass mild disturbances through to gross formal thought disorder and disorganised actions.

Psychometrically, the positive and negative dimensions are robustly replicated (Kwapil et al. 2012). The contents and structure of other factors, however, has generated considerable debate. Attempts to resolve theoretical abstruseness has resulted in the development of alternative four-factor models (see Compton et al. 2009; Mason et al. 2005). Illustratively, Mason et al. (2005) define schizotypy in terms of unusual experiences, cognitive disorganisation, impulsive nonconformity, and introvertive anhedonia. Unusual experiences references positive characteristics of schizotypy, introvertive anhedonia indexes negative aspects of schizotypy, cognitive disorganisation captures the disorganised features, and impulsive nonconformity designates poor emotional and impulse control (Mason et al. 2012).

The Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE) encompasses these factors. Unusual Experiences specify propensity to abnormal perceptual experiences, such as magical beliefs, hallucinations, superstitious belief and interpretation of events. Cognitive Disorganisation describes the tendency for thoughts to become detailed or tangential and difficult to gather. Introvertive Anhedonia refers to the propensity to be emotionally flat and rarely feel pleasure from social or physical stimulation. Finally, Impulsive Nonconformity incorporates inconsistent moods and behaviour, which tend to deviate from social convention and obeying rules. Collectively, these dimensions reflect the symptom clusters found in schizophrenia (Gray et al. 2002). Since the current research assessed schizotypy via the O-Life short (Mason et al. 2005), the scale's structure (subscales) informed predictions and analysis. This was important to note because the measure embraces a range of characteristics/symptoms. Hence, the authors anticipated that O-LIFE dimensions would interact with risk perception and urgency (emotional impulsivity) in distinct and nuanced ways.

The authors acknowledge also that the three most commonly used psychometric schizotypy measures (the Wisconsin Schizotypy Scales, Schizotypal Personality Questionnaire and O-LIFE) quantify and conceptualise schizotypy in different ways (Oezgen and Grant 2018). In order to assess the degree to which these scales demonstrate conceptual convergence, Oezgen and Grant (2018) compared similarities and differences in factor structure. Results indicated that structural relationships were dependent on the assessment instrument used. Differences arose from the fact that measures derive from distinct theoretical schizotypy models; this makes direct comparisons between scales problematic.

The Oezgen and Grant (2018) paper highlights that the composition of schizotypal factors diverges as a function of measurement instrument. Particularly, considerable deviation between cognitive disorganisation and odd behaviour or impulsive nonconformity is evident. This variation generally arises from differences in theoretical emphasis. Explicitly, dissimilarities between the psychosis-based perspective (psychopathology) and the schizotypy trait approach (personality). The former viewpoint for example, includes affective/motivational elements relevant to cyclothymia/bipolar disorder. The O-LIFE used within the present paper, adopted the psychosis-based perspective and accordingly possesses the characteristics of a psychosis-proneness measure.

Schizotypy and Risk

Generally, research reports associations between schizotypy and a range of risk-related (risky) behaviours (Esterberg et al. 2009). For instance, schizotypy correlates positively with cigarette (Kolliakou and Joseph 2000), alcohol and cannabis use (Nunn et al. 2001). Further examination of this relationship at the factorial level reveals a complex pattern of results. Specifically, the schizotypy-risky behaviours relationship varies across schizotypal symptom cluster (Esterberg et al. 2009). For instance, Kwapil et al.'s (2013) 10-year follow-up evaluating the predictive validity of psychometrically assessed schizotypy, reported that positive schizotypy best predicted substance abuse.

Considering dimensionality further, Nunn et al. (2001) in a sample of undergraduate students observed that alcohol use was correlated with higher delusional conviction (closely related to positive schizotypy) and lower introvertive anhedonia (negative schizotypy). Additionally, Esterberg et al. (2009) observed that higher levels of disorganised schizotypy were associated with use of nicotine, alcohol and cannabis. Higher cognitive-perceptual schizotypy was concomitant with cannabis use. The Esterberg et al. (2009) study was important because it was one of the first to demonstrate the selective effects of disorganised schizotypy on risky behaviours.

Inspection of the characteristics of impulsive nonconformity reveals that the factor comprises features likely to affect general perception of risk. Core features of impulsive nonconformity include propensity to impulsive, antisocial and eccentric forms of behaviour (Mason et al. 2005). Indeed, O-LIFE items reference violent, reckless and self-abusive behaviours (Nettle 2006). Collectively, these indicate that high impulsive nonconformity promotes lack of self-control. Congruently, studies report that impulsive nonconformity is associated with risk-related behaviours (e.g., frequency of female chatroom use, Fullwood et al. 2006; and gambling, Chiu and Storm 2010).

Despite these findings, the role of impulsive nonconformity is relatively understated. This occurs for myriad reasons. Principally, studies view schizotypy as an over-arching construct, schizotypyal factors share considerable variance, and research historically has employed a range of equivalent but different measures (e.g., Schizotypal Personality Scale, Claridge and Broks 1984; Schizotypal Personality

Questionnaire, Raine 1991). Use of different scales hinders factorial comparisons.

Conversely, general individual differences and psychopathological research identifies impulsive nonconformity as an important factor in the context of risk-taking behaviours. Classically, Chapman et al. (1984) noted that aberrantly high-scoring undergraduates (vs. controls) exhibited more manic and hypomanic symptoms, and greater propensity to antisocial personality disorder. These factors are associated with heightened engagement in risky behaviours (Brooner et al. 1990; Fletcher et al. 2013). Furthermore, hypomania and antisocial personality disorder correlate with sensation seeking, which also predicts participation in risky behaviours (Blackburn 1969). Previous work similarly outlines relationships between positive schizotypy, impulsivity and antisocial behaviour (Dinn et al. 2002).

Urgency

Urgency is a personality trait that refers to emotion-based dispositions to experience strong impulses and participate in impetuous actions (Cyders and Smith 2008a; Howard and Khalifa 2016). More precisely, urgency denotes the tendency to act 'impulsively' when highly emotional (Smith and Cyders 2016). Explicitly, the inclination to respond to strong emotions with rash actions. This can manifest as externalizing-related dysfunction (problem drinking, risky sex, etc.) (Wang and Chassin 2018). Urgency may also index the propensity to respond to strong emotions with ill-advised inaction, such as avoidance, passivity, and withdrawal (Smith et al. 2013).

Urgency varies as a function of affect. Negative urgency denotes impulsive behaviour occurring in the context of negative affect (Whiteside and Lynam 2001), whereas positive urgency designates impulsive behaviour occurring under conditions of positive affect (Lynam et al. 2006). The development of the Urgency, Premeditation (lack of), Perseverance (lack of), Sensation Seeking, Positive Urgency (UPPS-P) Impulsive Behavior Scale (Lynam et al. 2006) recognised this important distinction; the original (UPPS) (Whiteside and Lynam 2001) contained only Negative Urgency.

Several studies report that negative and positive urgency relate differentially to symptoms and behaviours (Cyders and Smith 2008a). Negative urgency uniquely predicts a range of outcomes (e.g., tobacco cravings, dependence on mobile phone use and excessive reassurance seeking) and is the best prognosticator of several other factors (i.e., psychiatric, medical, alcohol, drug, family, social, legal and employment problems) (Verdejo-García et al. 2007). Similarly, positive urgency predicts a range of problem behaviours, such as illegal drug use and risky sexual behaviour (Zapolski et al. 2009), increases in pathological gambling behaviours (Cyders and Smith 2008b), and drinking quantity (Cyders et al. 2009).

Although positive and negative urgency reflect separate dimensions, they correlate highly and conceptually can operate as a unitary construct (Few et al. 2015). Indeed, both factors relate to levels of involvement in risky/problematic behaviours and have unique and clinically important effects (Cyders and Smith 2008a).

Present Study

To date only a limited number of studies have considered the relationship between schizotypy and urgency. Few et al. (2015), in a study examining relationships between impulsivity-related traits and DSM–5 section II and III personality disorders, found that negative urgency correlated positively with schizotypy. However, Howard and Khalifa (2016) observed no significant association between negative urgency and schizotypy. These different outcomes are impossible to reconcile because the studies employed, very different, highly specialised samples.

Few et al. (2015) assessed 109 adults (70% female) who were currently receiving psychological and/or psychiatric treatment, whereas Howard and Khalifa (2016) used 100 male, forensic psychiatric patients with confirmed personality disorder and a history of serious offending. The specificity of these samples also limits extrapolations to general population samples. Howard and Khalifa's (2016) decision to exclude positive urgency derived from the supposition that the construct failed to provide any meaningful explanatory power over and above negative urgency.

Noting these issues, the present study examined relationships between schizotypy and urgency within a general population. This was necessary because characteristics evident within schizotypal factors suggested that associations with urgency would vary across dimensions. Explicitly within the present study, Urgency would relate most strongly to Impulsive Nonconformity, demonstrate significant associations with positive schizotypy (Unusual Experiences) and Cognitive Disorganisation, but not correlate with negative schizotypy (Introvertive Anhedonia).

Regarding Impulsive Nonconformity, this prediction was congruent with preceding research linking higher levels of impulsive nonconformity with lack of self-control and risk-related behaviours (Chiu and Storm 2010; Fullwood et al. 2006). Introvertive Anhedonia by virtue of emotional flattening and difficulties perceiving stimulation was unlikely to facilitate or reflect affective urgency. Evidence linking anhedonia features of schizotypy with impairments to the anterior insula cortex (AIC) (Keller et al. 2013) suggests a negative relationship between introvertive anhedonia and risk-taking. The AIC plays an important role in risk aversion (Preuschoff et al. 2008). Indeed, recent research states that the AIC

promotes risk-taking and is causally involved in risky decision-making (Ishii et al. 2012).

Given that, a conceptually important relationship exists between urgency and risk-taking (Cyders and Smith 2008a), this study considered urgency as a potential mediator in the schizotypy-risk relationship. This approach was valid because established work supports the direct effect of urgency on risk-taking and risky behaviour, when conceptualised as a mediator in relation to a range of exogenous and endogenous variables (e.g., brain activation, Cyders et al. 2014; alcohol and cannabis use, Wardell et al. 2016; risky driving, Voogt et al. 2014). Additionally, although several studies report associations between schizotypy and risky behaviour, the majority of evidence derives from specific behaviours rather than risk-taking behaviour generally. In this context, the current study examined relationships with self-reported likelihood to participate in risk-taking behaviour. General risk-taking merits consideration because perception of threat is likely to influence engagement in a range of negative behaviours (gambling, drug use, etc.), which result in health problems (Byrnes et al. 1999).

Method

Participants

The sample contained 204 participants, mean (M) age = 28.48, SD = 14.23, with 69 (34%) males (M age = 31.08, SD = 15.44) and 135 (66%) females (M age = 27.14, SD = 13.43). Participant recruitment was via the Manchester Metropolitan University (MMU) Psychology Participant Pool and opportunity sampling (other students/staff and external contacts contacted via social media). This sampling method resulted in a broad range of ages from 18 to 66. The only exclusion criteria were that participants were at least 18 years of age and had not previously undertaken similar studies on schizotypy.

Measures

The Oxford-Liverpool Inventory of Feelings and Experiences Short (O-LIFE Short) (Mason et al. 2005)

The O-LIFE short (Mason et al. 2005) is a brief, 43-item form of the original 104-item O-LIFE measure (Mason et al. 1995). Researchers use the scale to appraise schizotypal personality traits in non-clinical individuals. Studies across psychology related-disciplines have employed the O-LIFE and O-LIFE short (Mason and Claridge 2006). The O-LIFE short contains four factors, which assess different aspects of schizotypy: Unusual Experiences (12-items), Cognitive Disorganisation (11-items), Impulsive Nonconformity (10-items) and Introvertive Anhedonia (10-items). The Unusual Experiences subscale evaluates positive schizotypy, and

comprises items measuring perceptual aberrations, magical thinking and hallucinations. Cognitive Disorganisation assesses thought disorder and other disorganised aspects of psychosis (social anxiety, poor decision-making and attention/concentration). Impulsive Nonconformity evaluates lack of self-control (i.e., impulsive, anti-social, and eccentric forms of behaviour). Introvertive Anhedonia measures negative schizotypy (schizoid temperament); specifically, avoidance of intimacy and lack of enjoyment from social and physical sources of pleasure. Items appear as questions (e.g., 'Do you often have difficulties in controlling your thoughts?') and participants respond to each item on a binary scale ('Yes' or 'No'). Summation of 'yes' responses produce factor and overall totals. Higher scores reflect greater levels of schizotypy.

The O-LIFE short possesses established psychometric properties. Particularly, good test–retest reliability (Burch et al. 1998) and acceptable internal consistency (Mason et al. 2005). Furthermore, the O-Life short demonstrated good validity (discriminant and convergent) when compared with hedonic capacity and alternative schizotypy measures (Fonseca-Pedrero et al. 2015). In this study, internal reliability was acceptable for Unusual Experiences (α = 0.72) and Cognitive Disorganisation (α = 0.78). Reliability was lower for Introvertive Anhedonia (α = 0.62) and Impulsive Nonconformity (α = 0.60). However, these results were consistent with Mason et al. (2005), and Nunnally (1978) suggests 0.60 is an acceptable level of alpha reliability within psychology/social sciences.

The Risk-Taking Questionnaire-18 (RT-18) (de Haan et al. 2011)

The RT-18 (de Haan et al. 2011) assesses the degree to which individuals are likely to engage in risk-taking behaviour. The measure contains statements related to Risk Behaviour (9-items) ("I sometimes like to do things that are a little frightening") and Risk Assessment (9-items) ("I usually think about all the facts in details before I make a decision"). Participants indicate responses on a dichotomous 'Yes' or 'No' scale. Addition of 'yes' responses produces sub-scale and overall totals. The measure is psychometrically sound and demonstrates good reliability (internal and test-retest), and construct validity in comparison with an alternative measure of risk-taking (the Stimulating-Instrumental Risk Inventory) (de Haan et al. 2015; de Haan et al. 2011). Higher scores indicate greater risk-taking and less consideration of risk-taking consequences. In this study, internal reliability was good for the total scale (α = 0.85).

Urgency Subscales of the UPPS-P Impulsive Behavior Scale (Cyders et al. 2007)

The Positive and Negative Urgency subscales of the UPPS-P Impulsive Behavior Scale (Cyders et al. 2007) assessed

urgency in the present study. The Positive Urgency subscale comprises 14 items (e.g., "When I am really excited, I tend not to think of the consequences of my actions") and the Negative Urgency subscale contains 12 items (e.g., "When I feel rejected, I will often say things that I later regret"). Items appear in the form of statements and participants indicate agreement on a 4-point Likert scale ranging from 'strongly agree' to 'strongly disagree'. Totalling of scores across items produces subscale scores. Higher scores indicate greater levels of urgency. The subscales possess good internal consistency (Negative Urgency $\alpha = .87$, Positive Urgency $\alpha = .92$; Claes and Muehlenkamp 2013). Furthermore, Cyders et al. (2007) reported evidence of good convergent and discriminant validity for the Positive Urgency subscale, and Smith et al. (2007) established convergent and discriminant validity for the Negative Urgency subscale via multitrait-multimethod analyses. Internal reliability in this study was good for Negative Urgency ($\alpha = .94$) and satisfactory for Positive Urgency ($\alpha = .75$).

Procedure

Prior to implementation the study, which occurred within a Master's Programme, received ethical clearance from the Faculty of Health, Psychology and Social Care Ethics Committee at Manchester Metropolitan University. Prospective participants, prior to providing consent, read the information sheet. This outlined the nature and requirements of the study. Participants providing informed consent then received the measures in the form of a booklet (if completed face-to-face) or accessed materials via a web link. Instructions directed that participants answer questions as openly and honestly as possible, work at their own pace and complete all items. The booklet contained four sections: personal information (always completed first), O-LIFE short, RT-18 and Positive and Negative Urgency subscales of the UPPS-P (counter-balancing of measure order across participants controlled for order effects).

Analytic Strategy

Prior to path analysis, data screening ensured variables met the assumptions of normal distribution (i.e., skewness and kurtosis). Additionally, an assessment of multicollinearity, outliers, linearity and homoscedasticity was undertaken. Examination of zero-order correlations provided a preliminary indication of variable relationships. The structural equation model (created in AMOS24) tested direct and indirect effects among the variables using Maximum Likelihood (ML) estimation. Schizotypy subfactors (Unusual Experiences, Cognitive Disorganisation, Introvertive Anhedonia and Impulsive Nonconformity) were exogenous independent variables. Urgency was an endogenous independent variable. Risk-

taking was the dependent variable. Partial correlation assessed relations between factors demonstrating conceptual and measurement irregularity. Partial correlation identifies unique variance by 'partialling out' common variance shared with other factors. In this context, use of partial correlation enabled examination of inconsistencies between zero-order correlations and structural relationships. Indeed, previous research has successfully used this approach to disentangle relationships between discrete but overlapping constructs (see Muris et al. 2005).

A range of indices assessed data-model fit. Specifically, chi-square (χ^2), Comparative Fit Index (CFI), Root-Mean-Square Error of Approximation (RMSEA) and Standardized Root-Mean-Square Residual (SRMR). RMSEA utilised the 90% confidence interval. A good fitting model requires CFI > 0.90, RMSEA <0.08, and SRMR <0.08 (Browne and Cudeck 1993). CFI values of 0.86 to 0.90, and RMSEA and SRMR values of 0.08 to 0.10 indicate marginal fit (Nigg et al. 2009). Computation of bootstrapping estimates tested indirect effects (resampled 2000 times using the bias-corrected method to produce 95% confidence intervals). The Akaike Information Criterion (AIC) compared non-nested models (lower values suggest superior fit).

Results

Preliminary Analysis

Data inspection indicated that skewness and kurtosis values were within the recommended interval of −2.0 to +2.0 (Byrne 2016) (see Table 1). Tests of assumptions reported no issues with multicollinearity, all VIF values <3.0 and all Tolerance values >0.10. Residuals were greater than −3.29 and less than 3.29 (Tabachnick and Fidell 2013), and relevant plots revealed no concerns with heteroscedasticity or linearity. Mardia's coefficient value was 1.29 (critical ratio = 0.73) which is lower than the cutoff value of 3 (Yuan et al. 2002), suggesting no violation of multivariate normality. ML is therefore suitable for parameter estimation (Mindrila 2010). In comparison with Mason et al. (2005) ($N = 928$), mean scores were slightly higher for Unusual Experiences (4.23 vs. 3.28), Cognitive Disorganisation (5.51 vs. 4.36) and Impulsive Nonconformity (3.52 vs. 2.65); Introvertive Anhedonia totals were slightly lower (2.38 vs. 2.60). Positive and Negative Urgency means (26.36 and 29.68 respectively) were comparable with averages among a non-clinical sample ($N = 68$) (22.93 and 28.23 respectively) (Claes et al. 2015). The mean Risk-taking score was slightly lower (7.66 vs. 9.34) than de Haan et al. (2011) ($N = 7834$).

Inspection of zero-order correlations (Table 1) revealed significant positive relationships between all schizotypy subfactors, urgency facets and general urgency. Both

Table 1 Means, standard deviations, reliability coefficients and correlations for all study variables ($N = 204$)

Variable	M	SD	Skew	Kurt.	α	1	2	3	4	5	6	7
1. Unusual Experiences	4.23	2.64	0.27	−0.59	0.72		.54**	.21**	.51**	.54**	.53**	.34**
2. Cognitive Disorganisation	5.51	3.03	−0.03	−0.97	0.78			.40**	.48**	.54**	.56**	.18**
3. Introvertive Anhedonia	2.38	1.99	0.84	0.12	0.62				.21**	.23**	.30**	−.06
4. Impulsive Nonconformity	3.52	2.04	0.46	−0.05	0.60					.54**	.56**	.49**
5. Negative Urgency	29.68	5.84	−0.23	−0.08	0.94						.72**	.43**
6. Positive Urgency	26.36	8.72	0.35	−0.61	0.75							.42**
7. Risk-taking	7.66	4.58	0.30	−0.70	0.85							

* $p < .05$; ** $p < .001$

Positive and Negative Urgency correlated positively and significantly with Risk-taking. Unusual Experiences, Impulsive Nonconformity and Cognitive Disorganisation also demonstrated significant positive relations with Risk-taking. Introvertive Anhedonia, however, was unrelated to Risk-taking. Importantly, Positive and Negative Urgency exhibited highly similar relationships with Schizotypy and Risk-taking, and were strongly positively associated ($r = 0.72$). Henceforth, subsequent analyses used Urgency as a composite variable.

Structural Equations

Item parcelling created latent variables for schizotypy subfactors, Urgency, and Risk-taking. Analysis of the O-Life Scale employed the all-item-parcel approach, where single parcels represented each subfactor (latent variable) (Matsunaga 2008). In order to include these parcels as indicators of latent variables, parcel variance was determined by multiplying scale variance with alpha reliability (Kline 2011). To assess the unique variance of schizotypy subfactors, whilst recognising multidimensionality, permission of correlations occurred among subfactors. Urgency (Positive and Negative Urgency) and Risk-taking (Level of Risk-taking Behaviour and Risk Assessment) subscales indicated respective latent variables of Urgency and Risk-taking. For Urgency, a high correlation between facets ($r = 0.72$) supported this conceptualisation. Additionally, previous research has reported that positive and negative urgency can act as a single construct (Few et al. 2015). For Risk-taking, preceding research supports the hierarchical structure of this measure (de Haan et al. 2011). Sequential estimation of measurement and structural models occurred (Anderson and Gerbing 1988).

A test of the measurement model revealed good fit indices, χ^2 (9, $N = 204$) = 19.606, $p = 0.021$, CFI = 0.982, RMSEA = 0.076 (90% CI of 0.029 to 0.123), SRMR = 0.043. The hypothesised structural model (Model 1; see Fig. 1) demonstrated good fit on all criteria, χ^2 (9, $N = 204$) = 19.606, $p = 0.021$, CFI = 0.982, RMSEA = 0.076 (90% CI of 0.029 to 0.153), SRMR = 0.044. Fixing the non-significant path from

Introvertive Anhedonia to urgency to zero improved model fit (the initial path was $\beta = 0.06$, $p = 0.290$). Data-model fit of this constrained model (Model 2) was good, χ^2 (10, $N = 204$) = 20.708, $p = 0.023$, CFI = 0.982, RMSEA = 0.073 (90% CI of 0.029 to 0.123), SRMR = 0.043. Comparison of AIC values supported the superior fit of Model 2, revealing a lower AIC (88.708) relative to Model 1 (89.606).

Within Model 2 (Fig. 2), Unusual Experiences ($\beta = 0.27$, $p < 0.001$), Cognitive Disorganisation ($\beta = 0.33$, $p < 0.001$) and Impulsive Nonconformity ($\beta = 0.35$, $p < 0.001$) had a positive effect on Urgency. The explanatory variables accounted for 62% of variance in Urgency. Cognitive Disorganisation and Introvertive Anhedonia had a negative effect on Risk-taking ($\beta = -0.22$, $p = 0.041$ and $\beta = -0.19$, $p = 0.016$ respectively), Impulsive Nonconformity had a positive effect ($\beta = 0.42$, $p < 0.001$), whereas Unusual Experiences had a non-significant effect ($\beta = 0.02$, $p = 0.835$). Urgency positively predicted Risk-taking ($\beta = 0.61$, $p < 0.001$). The explanatory variables accounted for 66% of variance in Risk-taking. In addition, Cognitive Disorganisation (95% CI of 0.09 to 0.38, $p = 0.001$), Impulsive Nonconformity (95% CI of 0.07 to 0.32, $p = 0.001$), and Unusual Experiences (95% CI of 0.11 to 0.37, $p = 0.001$) had a significant indirect effect on risk-taking through their effect on Urgency. Relative to other schizotypy subfactors, Impulsive Nonconformity demonstrated the largest indirect (0.22) and direct (0.42) effects.

Although Cognitive Disorganisation and Introvertive Anhedonia negatively predicted Risk-taking in the structural analyses, the results were inconsistent with zero-order correlations; Cognitive Disorganisation correlated positively with Risk-taking, and the Introvertive Anhedonia relationship was non-significant. Moreover, Cognitive Disorganisation evinced a positive indirect effect through Urgency. It is difficult to interpret these results. In the case of Cognitive Disorganisation it appears inconsistent mediation occurred within Model 2 (MacKinnon et al. 2007; MacKinnon et al. 2000). Specifically, Urgency acted as a suppressor variable, inflating the Cognitive Disorganisation and Risk-taking relationship. The low total effect (−0.02) relative to the direct and indirect effect (−0.22 and 0.20 respectively) supports this.

Fig. 1 Model 1: Initial mediational model depicting putative relationships between schizotypy subfactors, Urgency and Risk-taking. *Note.* standardized regression weights and correlations between latent variables are shown. The diagram does not display standardized regression weights of the measured variables and error terms. * $p < .05$; ** $p < .001$
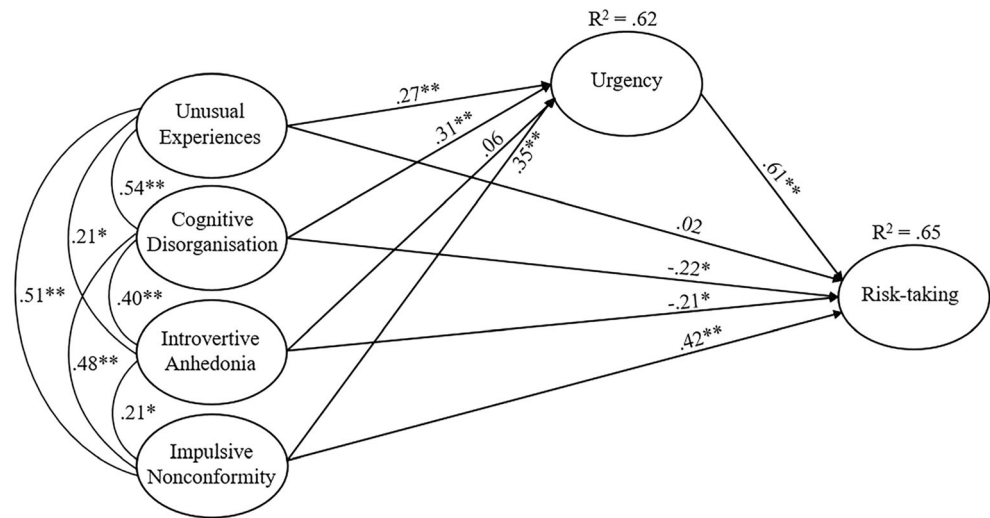
The discrepancy between the correlations and predictive relationships for Introvertive Anhedonia conflicted with the expectation that this subfactor would negatively predict Risk-taking and be unrelated to Urgency. Partial correlations enabled a test of unique variance attributable to Introvertive Anhedonia with both Risk-taking and Urgency. Consistent with the initial supposition that Introvertive Anhedonia would weakly relate to Urgency, a non-significant partial correlation occurred, partial r (198) = 0.13, $p = 0.056$. Additionally (and as initially expected), a negative relationship existed between Introvertive Anhedonia and Risk-taking, partial r (198) = −0.20, $p = 0.003$.

A test of Introvertive Anhedonia as a suppressor variable occurred by specifying two models: a model (Model 3) which comprised only schizotypy subfactors and Urgency (Introvertive Anhedonia was fixed to zero), and a model where the path from Introvertive Anhedonia to Risk-taking was fixed to zero (Model 4). Analyses found suppression did not markedly occur because exclusion of this variable did not noticeably affect the regression weights of other

predictors (Watson et al. 2013). Particularly, in Model 3, the regression weight from Unusual Experiences and Impulsive Nonconformity were identical, and the weight from Cognitive Disorganisation increased slightly from 0.31 to 0.33. In Model 4, all regression weights from schizotypy subfactors to Urgency remained the same, as did Unusual Experiences and Impulsive Nonconformity to Risk-taking. Only the weight from Cognitive Disorganisation to Risk-taking increased slightly from −0.22 to −0.26.

As the study is cross-sectional, the independent variables (i.e., schizotypy subfactors) and dependent variable (i.e., Risk-taking) were exchanged in an alternative model to examine reverse relationships to test direction amongst the variables. The reversed model demonstrated weaker data-model fit than Model 2 (the superior solution), χ^2 (10, $N = 204$) = 40.711, $p < 0.001$, CFI = 0.949, RMSEA = 0.123 (90% CI of 0.085 to 0.164), SRMR = 0.068. Also, the lower AIC of Model 2 (AIC = 88.708) confirmed better data-model fit than the reversed model (AIC = 108.711).

Fig. 2 Model 2: Constrained mediational model depicting putative relationships between schizotypy subfactors, Urgency and Risk-taking. *Note.* standardized regression weights and correlations between latent variables are shown. The diagram does not display standardized regression weights of the measured variables and error terms. * $p < .05$; ** $p < .001$
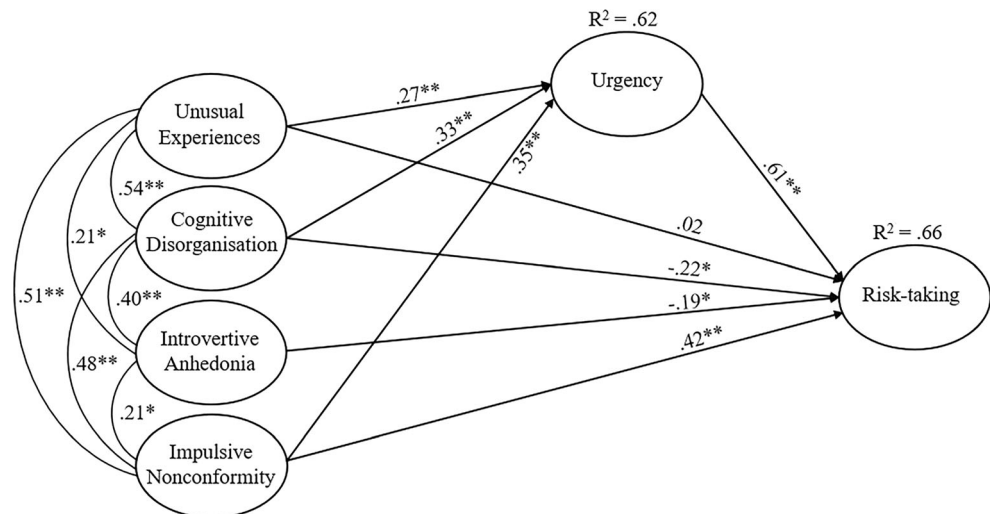
Discussion

Overall level of Schizotypy correlated positively with Urgency, a finding similar to Few et al. (2015). Consistent with study hypotheses, the tested model observed variations in predictive relationships as a function of schizotypy dimension. Specifically, positive schizotypy (Unusual Experiences), Cognitive Disorganisation and Impulsive Nonconformity predicted Urgency, whereas there was no significant association between Introvertive Anhedonia and Urgency. This pattern of results was conceptually congruent with previous work. Particularly, research reporting relationships between impulsive nonconformity and lack of self-control, impulsivity and risk-related behaviours (e.g., Chiu and Storm 2010; Fullwood et al. 2006). Furthermore, the tendency to engage in rash, impulsive acts is a defining feature of impulsive nonconformity (Mason et al. 2005). Preceding work on positive schizotypy also outlines associations with disinhibition and impulsivity (Dinn et al. 2002).

As anticipated, Introvertive Anhedonia was not predictive of Urgency. This finding supported the notion that characteristics associated with Introvertive Anhedonia, especially emotional flattening and difficulties perceiving stimulation, do not influence affective urgency. Moreover, Introvertive Anhedonia weakly negatively predicted general Risk-taking. This outcome was congruent with recent work linking anhedonia with impairments to the anterior insula cortex (AIC) (Keller et al. 2013). The AIC promotes risk-taking and is causally involved in risky decision-making (Ishii et al. 2012; Preuschoff et al. 2008).

The present study suggests that clinical findings extrapolate to the general population. However, this assumption requires cautious interpretation because the observed effect was weak, and introvertive anhedonia is a broad, complex construct. Characteristics include inclination to both anhedonia (affective; blunted emotion) and introversion (social impairments; asocial behaviour). These factors interact to reduce the ability to experience social and physical pleasure (Dembińska-Krajewska and Rybakowski 2014). Hence, it is difficult to determine the extent to which reduced risk-taking arises from affective and social factors (Dembińska-Krajewska and Rybakowski 2014).

Acknowledging this, future studies could examine the relative contribution of specific characteristics to risk aversion. This is important because anhedonia predicts problem behaviours, such as risk of substance use (i.e., onset and escalation) (Sussman and Leventhal 2014). Accordingly, identifying which features of Introvertive Anhedonia most influence risk-taking has important applications for therapeutic interventions. For instance, if both affective and social elements influence perception of risk therapy/treatment should employ holistic strategies. These would permit the individual to tolerate low levels of pleasure and enhance their capability to interact with others (Sussman and Leventhal 2014).

This approach is useful because despite possessing conceptual congruence, the relationship between anhedonia and introversion is not particularly strong. For instance, social anhedonia (reduced positive emotion in response to social stimuli) correlates only moderately with introversion (trait associated with low positive emotion and sociability) (Martin et al. 2016). The multifaceted nature of affect can produce complex interactions. Pertinent to the present paper, Michel et al. (1997) noted within women that sensation seeking via bungee jumping compensated for boredom arising from difficulty in experiencing emotions and sensations from everyday stimuli. This suggests that the effects of high introvertive anhedonia may vary because of variables such as context and gender. Further research on introvertive anhedonia and risk-taking could uncover further complex interactions.

Within the tested models, direct and mediation effects were evident. Specifically, Cognitive Disorganisation and Introvertive Anhedonia directly negatively predicted Risk-taking, and Impulsive Nonconformity, and Urgency directly positively predicted Risk-taking. Indirectly, Unusual Experiences, Cognitive Disorganisation and Impulsive Nonconformity had an effect on Risk-taking through Urgency. Furthermore, Urgency mediated the relationship between Unusual Experiences and Impulsive Nonconformity with Risk-taking, and 'suppressed' (enhanced) the Cognitive Disorganisation-Risk-taking relationship. Concerning risk-taking, this pattern of results indicates that urgency generally provides a framework for structuring characteristics of schizotypy.

From this perspective, urgency offers a potential explanation as to why individuals with higher levels of schizotypy 'actually' engage in risk-taking behaviour. Consideration of schizotypy in isolation merely indicates that individuals who possess higher levels of schizotypal traits (positive, disorganised and impulsive as in this study) are prone to being impulsive and likely to act rashly. Smyrnis et al. (2003) supports this notion by demonstrating that individuals with very high schizotypy struggled to control their impulses during an antisaccade task. Hence, level of urgency (i.e., high vs. low) may represent an 'active' feature which determines whether an individual engages in risky behaviours. Research evidence, in addition to this study, supports the notion that urgency plays a unique determining role in risk-behaviour (e.g., Cyders et al. 2014; Wardell et al. 2016). Urgency, therefore, adds conceptual coherence to the schizotypy-risk relationship.

It is difficult to interpret the specific pathways from the mediation due to an absence of previous literature on schizotypy, urgency and risk-taking. However, it is possible that Unusual Experiences predicted greater Risk-taking via Urgency due to the central role of emotions (particularly negative) with regard to Unusual Experiences. For example, Barrantes-Vidal et al. (2013) demonstrated that increased levels of negative emotion characterise positive schizotypy.

Indeed, urgency denotes the tendency to engage in rash action in response to extreme affect (Cyders and Smith 2008a). However, the urgency, affect and risk-taking relationship is complex. For instance, Cyders and Coskunpinar (2010) report that urgency predicts risky behaviour, independent of the frequency/intensity of affect. Subsequently, further work is required in order to determine why urgency mediated the relationship between Unusual Experiences and Risk-taking in the present study.

Similarly, it is possible that Impulsive Nonconformity predicted greater Risk-taking through Urgency due to being characterised by unstable mood and emotion dysregulation (McCleery et al. 2012). Emotion dysregulation relates to emotional hyperactivity because it is associated with poor executive control of impulsive behaviours, and relates to strong affect. Indeed, Impulsive Nonconformity evidenced the strongest direct and indirect effect via Urgency on Risk-taking. This result is consistent with the inherent nature of impulsive nonconformity and adds to the literature documenting strong relationships between this and urgency-related constructs (e.g., impulsivity, Chiu and Storm 2010). Thus, a strong association with affect likely characterizes impulsive nonconformity, resulting in non-specificity to valences of urgency (as evident in this study).

The finding of Cognitive Disorganisation predicting Risk-taking through Urgency can be tentatively accounted for by research demonstrating positive relationships with both emotionality (particularly intense positive affect) (Kerns 2006), and poor cognitive estimation (Cicero and Kerns 2010b). Specifically, individuals with greater levels of cognitive disorganisation may possesses deficiencies in ability to estimate the consequences of an action, leading to intentional or unintentional exposure to possible injury or loss (i.e., risk).

The current findings support the notion that positive and negative urgency do not necessarily produce differential effects in the context of schizotypy. This was evident within the intercorrelations (i.e., the association between the two urgency constructs was high, r of 0.72). Similarly, Deckman and DeWall (2011), and Derefinko et al. (2011) observed high correlations between urgency facets, and Howard and Khalifa (2016) asserted that positive urgency does not offer explanatory power above negative urgency. Accordingly, subsequent work would benefit from conceptualising the two facets as a unitary construct (Few et al. 2015).

Moreover, the influence of urgency is likely to vary as function of risky behaviour (Verdejo-García et al. 2007; Zapolski et al. 2009). It was not possible to assess this within the present paper because the RT-18 assesses likelihood to engage in general risk-taking behaviour. With regard to previous work, researchers typically assess specific risky behaviours (e.g., cigarette, Kolliakou and Joseph 2000; and cannabis use, Nunn et al. 2001) when examining relationships between schizotypy and risk. In the context of schizoptypy

and risk-taking research, the extent to which engagement in particular behaviours predicts general risk-taking requires additional consideration.

A further issue arises from the fact that the RT-18 is a self-report measure that indexes only snapshots of risk-related processes and thoughts. Hence, participant responses reflect only subjective evaluations of likelihood to engage in risk-taking. With such measures, the degree to which answers reflect real world behaviours is questionable. Salience and intensity of threat within real-world contexts may mitigate the extent to which individuals engage in actual risk-taking (Denovan et al. 2017).

A further potential limitation of the present study was the cross-sectional design. Although the social sciences often use this approach, a frequently levelled criticism of cross-sectional design is that collection of data at one point in time negates the establishment of causal links within models. In the present article, data fit indicated model strength and veracity, and supported inferences about relationships between measures (Bollen 1989).

This paper contributes to the growing body of research that acknowledges the need to integrate understanding of emotionality alongside impulsive behaviours (e.g., Cyders and Smith 2008a, b; Cyders et al. 2009). This approach is conceptually and practical important because it helps clinicians appreciate how individual dispositions effect engagement in risky behaviours. Additionally, it suggests ways to maximize treatment outcomes. Central to this is the recognition that therapeutic interventions for those who participate in risky behaviours in response to extreme emotional states should differ from those who do so to seek new stimulation. To treat effectively engagement in risky behaviours it is necessary to appreciate the potential contribution of emotions to rash actions. This requires focus on both affective state and behaviour (Cyders and Smith 2008a). Moreover, this approach is essential because is recognizes the need to develop risk theories that consider differences in individual disposition to rash actions (Cyders et al. 2009). This is consistent with previous work, which has derived from the observation that extreme emotions can deplete impulse controls (Cyders and Smith 2008b). Subsequently, successful interventions that help individuals avoid rash actions when experiencing intense negative (e.g., dialectical behaviour therapy) and positive affect are necessary (e.g., Cognitive mediation training) (Um et al. 2018).

In conclusion, the findings indicate that positive, disorganised and impulsive facets of schizotypy (Unusual Experiences, Cognitive Disorganisation, and Impulsive Nonconformity) predicted Urgency to a similar extent. Unusual Experiences, Impulsive Nonconformity and Cognitive Disorganisation indirectly predicted Risk-taking through Urgency (with a suppression effect evident with the latter schizotypy subfactor). Urgency, then, potentially offers an explanatory mechanism for why individuals higher in

positive, disorganised and impulsive schizotypy engage in risk-taking behaviour. Further work to examine variants of risk-taking behaviour is necessary. Introvertive Anhedonia additionally demonstrated conceptually congruent results, explicitly non-significant or weak relations with impulsivity (Urgency) and a negative relationship with Risk-taking.

Compliance with Ethical Standards

Conflict of Interest Andrew Denovan, Neil Dagnall and Lucy Monk declare that they have no conflicts of interest.

Ethical Approval The Faculty of Health, Psychology and Social Care Ethics Committee at Manchester Metropolitan University. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Experiment Participants All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Individual participants provided informed consent.

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