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An anti-social personality for an anti-social habit?: The relationship between multi-dimensional schizotypy, "normal" personality, and cigarette smoking

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ABSTRACT. The association between psychoticism (asocial-schizotypy) and cigarette smoking appears to be well established in the literature. However, findings from research examining the relationship between smoking and positive-schizotypy is less consistent, with some studies reporting higher positive-schizotypy in smokers, and other studies reporting no differences. This may be somewhat surprising given that individuals diagnosed with schizophrenia are known to smoke considerably more cigarettes than is typical of the general population, and that positive-schizotypy is phenotypically more closely linked to schizophrenia than asocial-schizotypy. This paper describes necessary further analysis into the relationship between cigarette smoking and multi-dimensional schizotypy (as measured by the Oxford-Liverpool Inventory of Feelings and Experiences), with the additional benefit of "normal" personality data included in the analysis. Personality (both schizotypal and normal) and cigarette smoking data from 182 participants were collated and analysed. Results found that the personality variables associated with asocial-schizotypy were the only reliable predictors of smoking status.

KEYWORDS. Asocial-schizotypy. EPQ. NEO. O-LIFE. Positive-schizotypy. Psychoticism. Schizophrenia. Empirical quantitative study.

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RESUMEN. La asociación entre psicoticismo (esquizotipia asocial) y fumar cigarrillos parece estar bien documentada. Sin embargo, las conclusiones de investigación que examinan la relación entre fumar y esquizotipia positiva son menos consistentes, con algunos estudios que encuentran la esquizotipia positiva más elevada en fumadores, y otros estudios que no encuentran diferencias. Esto puede sorprender, pues se sabe que los individuos diagnosticados con esquizofrenia fuman considerablemente más cigarrillos de lo que es habitual en la población general, y que la esquizotipia positiva está más estrechamente vinculada a la esquizofrenia que la esquizotipia asocial. Este trabajo aborda el análisis de la relación entre fumar cigarrillos y esquizotipia multidimensional (como es medida por la *Oxford-Liverpool Inventory of Feelings and Experiences*), con el beneficio adicional de los datos de personalidad'"normal" que han sido incluidos. Los datos sobre consumo de cigarrillos y personalidad (tanto esquizotípica como normal) procedentes de 182 participantes fueron cotejados y analizados. Los resultados mostraron que solo las variables de personalidad asociadas con esquizotipia asocial pronosticaron de forma fiable el estatus de fumador.

PALABRAS CLAVE. Esquizotipia asocial. *EPQ. NEO. O-LIFE*. Esquizotipia positiva. Psicoticismo. Esquizofrenia. Estudio empírico cuantitativo.

The relationship between cigarette smoking and schizotypal personality (schizotypy) is of interest to schizophrenia spectrum researchers; with this interest primarily being motivated by two related findings: a) the relationship between smoking and schizophrenia, and b) the effects of nicotine in schizophrenia (*e.g*., Kumari and Postma, 2005; León and Díaz, 2005). Schizotypy is regarded as being phenotypically related to schizophrenia (Kumari and Postma, 2005), and has been defined by Vollema and Van den Bosch (1995; p. 19) as, "the predisposition to schizophrenia at the level of the organization of the personality", in other words, schizotypal personality is a continuum (of "normal" personality) between "normality" and schizophrenia/psychosis, characterised by increasingly eccentric and strange behaviours.

The majority of the studies investigating the relationship between smoking and schizotypy over the past three decades have tended to employ the Eysencks' Psychoticism scale (Eysenck and Eysenck, 1975; Eysenck and Eysenck, 1991; Eysenck, Eysenck, and Barrett, 1985), and have generally found a positive relationship between smoking and psychoticism (*e.g*., Eysenck and Eaves, 1980; Golding, Harpur, and Brent-Smith, 1983; Wakefield, 1989; Williams *et al*., 1996). While empirically robust, the theoretical significance of this finding remains unclear. Although studies employing other measures of schizotypy, such as the STA Schizotypy scale (Claridge and Broks, 1984), have found a similar relationship with smoking behaviors (*e.g*., Williams *et al*., 1996), the diversity of findings is more marked. For example, Allan *et al*. (1995) found that although psychoticism scores correlated with the number of cigarettes smoked per day, STA scores did not; whilst Della Casa, Höfer, Weiner, and Feldon (1999) found no significant differences on STA scores across smoking status. These findings may reflect the fact that the various measures of schizotypy are not measuring the same underlying construct of schizotypy –itself suggesting that schizotypy may be multi-dimensional– and that the primary relationship between smoking and schizotypy specifically relates

to the psychoticism component, regarded as a measure of impulsiveness and anti-social behavior. There is indeed growing evidence in support of the multi-dimensional nature of schizotypy with results from factor analytic studies (generally) revealing four distinct factors: (a) positive-schizotypy, reflecting the positive symptomatology of schizophrenia (measured for instance, by the STA); (b) negative-schizotypy, reflecting the negative symptomatology of schizophrenia; (c) asocial-schizotypy, reflecting anti-social and tough-minded behavior; and (d) cognitive disorganization/social anxiety, reflecting a difficulty with decision-making (*e.g*., Bentall, Claridge, and Slade, 1989; Claridge *et al*., 1996; Williams, 1994) (see Table 1). Whilst Eysenck (1993) suggested that psychoticism is the true measure of psychosis-proneness, Claridge (1993) suggested that psychoticism does not generally load onto the factor now recognised to be the component of schizotypy most related to psychosis-proneness, *i.e*., that of positive-schizotypy. Positive-schizotypy is regarded as being theoretically more closely linked to schizophrenia (see Mason, Claridge, and Williams, 1997).

TABLE 1. Components of schizotypal personality (Claridge *et al.*, 1996; Mason *et al*., 1997).

Components of schizotypal personality	Characterised by:
Positive-Schizotypy	Unusual perceptual experiences; heightened awareness of one's visual world; hypersensitivity to smells and sounds; 'pseudo-hallucinations'; magical beliefs and unusual/strange ideas.
Negative-Schizotypy	Social withdrawal; flattened affect; and a lack of interest in life or living.
Asocial-Schizotypy	Impulsiveness; antisocial behavior; tough-minded behavior; and thoughts of harming oneself and other people.
Cognitive Disorganisation	Difficulty in concentration and decision-making; thought blocking; and social anxiety.

In response to the recognised multi-dimensionality of schizotypy, the Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE; Mason, Claridge, and Jackson, 1995), a multi-dimensional questionnaire measure of schizotypal personality was developed. The O-LIFE is comprised of four scales, with each scale tapping one of the four schizotypy dimensions: the Unusual Experiences scale measures positive-schizotypy; the Cognitive Disorganization scale measures disorganized-schizotypy/social anxiety; the Introvertive Anhedonia scale measures negative-schizotypy; and the Impulsive Nonconformity scale measures asocial-schizotypy. It is important to note that the Impulsive Nonconformity factor is most akin to the Eysencks' Psychoticism scale (some of the Impulsive Non-Conformity scale items are taken from the Psychoticism scale). The O-LIFE demonstrates sound psychometric properties (*e.g*., Burch, Steel, and Hemsley, 1998; Mason *et al*., 1995) and has been employed widely in the schizophrenia spectrum research (*e.g*., Burch, Hemsley, and Joseph, 2004; Burch, Hemsley, Corr, and Gwyer, 2006; Gray, Fernández, Williams, Ruddle, and Snowden, 2002; Steel, Hemsley, and Jones, 1996; Steel, Hemsley, and Pickering, 2002). However, despite the growing popularity of the O-LIFE in the schizotypy research, there have only been a limited number of

studies reported that have investigated the relationship between tobacco smoking and O-LIFE scores. Of those that have, the results have presented mixed findings. For example, while López, Maldonado, and Pueyo (2001) found smokers to score higher on the Unusual Experiences and Impulsive Nonconformity scales than non-smokers, and lower on the Introvertive Anhedonia scales (of the Spanish language version of the O-LIFE), Evans, Gray and Snowden (2005) did not find any significant differences between smoking and non-smoking groups on any of the O-LIFE scales. It is apparent that there is a need to obtain further data in relation to smoking and O-LIFE scores, in an attempt to lend further understanding to the relationship between multi-dimensional schizotypy and cigarette smoking.

In addition to the literature describing the relationship between schizotypal personality and smoking, there is also a developed literature regarding "normal" personality and smoking, which is of particular interest to health and personality psychologists who are concerned to understand the nature of the relationship between personality and risky health behaviors (*e.g*.,Vollrath and Torgersen, 2002). Much of the research investigating this relationship has employed the Eysenck Personality Questionnaire (EPQ, Eysenck and Eysenck, 1975; EPQ-R, Eysenck and Eysenck, 1991), which contains not only the Psychoticism scale, but also scales of Neuroticism and Extraversion. As discussed in the previous section, whilst psychoticism scores have been found to be consistently higher in smokers, research on the other dimensions has demonstrated mixed findings. For example, while some studies report smokers to score higher on the Extraversion and Neuroticism scales than non-smokers (*e.g*., Patton, Barnes, and Murray,1993), other studies have found no relationship between smoking and Extraversion or Neuroticism scores (*e.g*., Gilbert, 1988; Wakefield, 1989). In addition to these findings, given the current general acceptance of the robustness and generalizability of the Big-Five personality factors: neuroticism (N), extraversion (E), openness to experience (O), agreeableness (A), and conscientiousness (C) (although not without criticism, see for example, Hough and Ones, 2001), it is of interest to consider the relationship between smoking and the Five Factor Model (FFM) of personality.

A number of studies have been carried out investigating the relationship between the FFM and behaviors associated with smoking, although not always with consistent findings (see Shadel, Cervone, Niaura, and Abrams, 2004). For example, Paunonen (2003) found that Agreeableness was negatively related to tobacco consumption, whilst Shadel *et al*. (2004) found no relationship between any of the Big-Five and smoking variables (*e.g*., nicotine dependence, smoking rate, age at first cigarette) and cessation variables (*e.g*., self-efficacy to quit, motivation to quit, number of prior quit attempts, length of most recent quit). Meanwhile, Vollrath and Torgersen (2002) constructed a typology using the Neuroticism, Extraversion and Conscientiousness scales of the NEO (a questionnaire measure of the FFM; Costa and McCrae, 1992), and found that participants with a configuration of low conscientiousness, and either high extraversion or high neuroticism engaged in a range of "risky health behaviors", including those associated with cigarette smoking. However, in a recent meta-analysis, Malouff, Thorsteinsson, and Schutte (2006) showed that smoking was related to low conscientiousness, low agreeableness, and high neuroticism. These findings in particular are consistent with

the literature describing a positive relationship between psychoticism and smoking (psychoticism has consistently been found to correlate negatively with conscientiousness and agreeableness –*e.g*., Digman, 1990; McCrae, 1987; Wuthrich and Bates, 2001–, while Hough and Ones (2001) classified N(+), A(-) and C(-) as a compound variable measuring psychoticism), and suggests that more impulsive nonconformist personalities are associated with cigarette smoking. Whilst this may account for the observed relationship between asocial-schizotypy and smoking, it does not help us to understand the (inconsistent) findings in the relationship between positive-schizotypy (as measured by the STA and Unusual Experiences scale of the O-LIFE), which is typically found to relate to openness to experience (*e.g*., Rawlings and Freeman, 1997).

In the light of the inconsistency in the relationship between multi-dimensional schizotypy and cigarette smoking, the aim of the current empirical quantitative study (Montero and León, 2007; Ramos-Álvarez, Valdés-Conroy, and Catena, 2006) was to further investigate this relationship, and in particular, consider the nature of the relationship between positive-schizotypy and asocial-schizotypy with cigarette smoking. Additionally, "normal" personality data were available for each participant and were also included in the analyses to provide a more comprehensive picture of the personality of smokers than has typically been the case in the schizotypy and smoking research.

Method

Participants

Smoking data from 182 participants were analysed. These data had been collected from a number of previous studies investigating the cognitive mechanisms underlying schizotypy conducted by the authors (the smoking data had not been previously published). Participants were postgraduate and undergraduate students (124 female, 58 male; mean age = 22.7 years, *SD* = 4.99). 124 of the sample reported being non-smokers (84 females; 40 males) and 58 reported being daily cigarette smokers (40 female; 18 male). Of the sample who reported being a daily smoker the mean number of cigarettes smoked per day = 7.81 (*SD* = 6.32; range from 1 to 25).

Instruments

- The Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE; Mason *et al*, 1995). The O-LIFE has been shown to be a valid and reliable measure of multi-dimensional schizotypy (see, for example, Burch *et al*., 1998; Mason *et al*., 1995), and is made up of four scales: Unusual Experiences (measuring positive-schizotypy, *e.g*., "Are the sounds you hear in your daydreams usually clear and distinct?"); Impulsive Nonconformity (measuring asocial-schizotypy, *e.g*., "Do you at times have an urge to do something harmful or shocking?"); Cognitive Disorganisation (measuring disorganised-schziotypy, *e.g*., "No matter how hard you concentrate, do unrelated thoughts always creep into your mind?"); and Introvertive Anhedonia (measuring negative-schzizotypy, *e.g*., "Do you like mixing with people?").
- The NEO-FFI (Costa and McCrae, 1992); it is a well established measure of the FFM, and has been shown to be a reliable and valid short-form version of the

NEO PI-R (Costa and McCrae, 1992). The questionnaire contains 60 items, comprising scales of Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness. Neuroticism is characterized by anxiety, worrying, guilt, and sadness; Extraversion by high levels of sociability and activity, an outgoing nature and assertiveness; Openness by an openness to new and novel ideas, originality, imagination, and an intellectual curiosity; Agreeableness by altruism, a concern to help others, trust and cooperation; and Conscientiousness by ambition, achievement striving, energy, and perseverance.

– The Eysenck Personality Questionnaire Revised (EPQ-R; Eysenck and Eysenck, 1991). The latest version of Eysenck's questionnaire is the end product of an evolutionary process that began with the development of the Maudsley Medical Questionnaire back in the 1950s (Eysenck, 1952), which set out to measure neuroticism. Since that time, the questionnaire has passed through a number of different forms, with each reflecting either the addition of new scales or improvements in the measure's psychometric robustness. The most recent version of the questionnaire is the EPQ-R which is comprised of scales of Neuroticism, Extraversion, and Psychoticism.

Procedure

Data were obtained from a number of studies conducted by one of the authors concerned with the cognitive mechanisms underlying schziotypy. Participants in these studies were required to complete the O-LIFE, NEO-FFI and EQP-R. Biographical data were also collected during the experimental sessions, including information regarding smoking frequency (*i.e*., whether participants smoked cigarettes, and if so, how many per day) consistent with other schizotypy and smoking studies (*e.g*., Williams *et al*., 1996). The smoking data had not been previously analysed or included in any other analysis.

Results

Means and standard deviations for the O-LIFE, NEO-FFI, and EPQ-R scores are shown in Table 1, along with the Pearson's correlation coefficients of the personality variables with smoking frequency (the amount of cigarettes smoked per day).

Additionally, a 2 x 2 MANOVA was performed on 12 dependent variables (Unusual Experiences, Cognitive Disorganisation, Impulsive Nonconformity, Introvertive Anhedonia, Neuroticism, Extraversion, Openness, Agreeableness, Conscientiousness, Extraversion –EPQ–, Psychoticism, and Neuroticism –EPQ–), with smoking status (smokers *vs*. non-smokers) and gender (males *vs*. females) as the independent variables. Multivariate tests revealed a main effect of smoking status ($F_{(12, 167)} = 4.82$, $p < .001$; Wilks' $\alpha = .74$), and a main effect of gender ($F_{(12, 167)} = 2.42$, $p = .006$; Wilks' $\alpha = .85$). However, no significant interaction between smoking status and gender was revealed ($F_{(12, 167)} = .76$, $p = .69$; Wilks' $\alpha = .76$). Table 3 shows the means and standard deviations of the personality variables for both smokers and non-smokers, along with tests of between-

TABLE 2. Means and standard deviations of the personality scores, and correlations between personality scores and cigarette smoking frequency.

Personality scores	*Mean*	*SD*	*r*
Unusual Experiences (O-LIFE)	12.15	7.26	.02
Cognitive Disorganisation (O-LIFE)	12.27	5.70	-.03
Impulsive Nonconformity (O-LIFE)	9.67	4.22	.20**
Introvertive Anhedonia (O-LIFE)	5.09	3.86	.10
Neuroticism (NEO)	24.03	8.98	.09
Extraversion (NEO)	30.07	6.45	-.11
Openness (NEO)	32.89	6.40	.08
Agreeableness (NEO)	30.76	5.99	-.16*
Conscientiousness (NEO)	29.57	7.78	-.31**
Extraversion (EPQ)	14.86	4.67	.02
Psychoticism (EPQ)	7.97	4.53	.36**
Neuroticism (EPQ)	13.24	5.52	-.07

*$p < .05$, **$p < .01$.

subject effects (univariate *F*) and Cohen's *d*, a measure of effect size. The *d* value expresses the difference between the groups in standard deviation units, thus negating any artefacts caused by sample size differences; in this case, 58 smokers and 124 non-smokers (*e.g*., Burch and Anderson, 2004).

TABLE 3. Means and standard deviations of O-LIFE, NEO and EPQ scores across smoking status (non-smokers and smokers), along with tests of between-subject effects (*F*) and Cohen's *d*.

Personality scores	*Non-Smokers (n = 124)*		*Smokers (n = 58)*		*F*	*p*	*d*[a]
	mean	*SD*	*mean*	*SD*			
Unusual Experiences (O-LIFE)	12.10	7.52	12.26	6.74	.05	.83	-.02
Cognitive Disorganisation (O-LIFE)	12.41	5.67	11.92	5.80	.37	.55	.09
Impulsive Nonconformity (O-LIFE)	9.08	4.29	10.93	3.80	6.62	.01*	-.46
Introvertive Anhedonia (O-LIFE)	5.30	3.85	4.64	3.88	1.37	.24	.17
Neuroticism (NEO)	23.27	8.91	25.76	8.88	1.75	.19	-.28
Extraversion (NEO)	30.34	6.38	29.50	6.62	.44	.51	.13
Openness (NEO)	32.18	6.51	34.40	5.93	1.87	.17	-.37
Agreeableness (NEO)	31.42	5.85	29.33	6.10	4.85	.03*	.35
Conscientiousness (NEO)	31.26	6.97	25.95	8.25	18.16	<.01**	.69
Extraversion (EPQ)	14.49	4.58	15.67	4.78	3.69	.06	-.25
Psychoticism (EPQ)	7.02	4.28	10.01	4.41	18.68	<.01**	-.69
Neuroticism (EPQ)	13.52	5.43	12.65	5.72	1.61	.21	.16

Notes. [a] d = (mean for non-smokers – mean for smokers/SD_{pooled}). Positive *d*-values indicate non-smokers scored higher on the personality dimensions, while negative *d*-values indicate that smokers scored higher on the personality dimensions. Effect sizes of .80 or greater can be considered to be large differences, those around .50 moderate, and those around .20 small (Cohen, 1988).

*$p < .05$, **$p < .01$.

These results show that the smoking group scored significantly higher on the Impulsive Nonconformity scale of the O-LIFE and the Psychoticism scale of the EPQ, and significantly lower on the Agreeableness and Conscientiousness scales of the NEO, than did the non-smoking group.

In order to examine these relationships further, data were entered into a principal components analysis (PCA), using direct oblimin (oblique) rotation in order to reduce the personality variables into separate factors, making them more suitable for regression analysis. Oblique rotation was chosen as there was no reason to believe that the underlying factors would not necessarily be related to each other; thus, an orthogonal solution may create an artificial solution (Rust and Golombok, 1999). Loadings of variables, eigenvalues, and variance statistics are displayed in Table 4.

TABLE 4. Oblimin rotated factor loadings with Kaiser normalisation for the four-factor solution.

Personality scores	*F1*	*F2*	*F3*	*F4*
Neuroticism (EPQ)	.91			
Cognitive Disorganization (O-LIFE)	.90			
Neuroticism (NEO)	.82			
Unusual Experiences (O-LIFE)	.64			.47
Extraversion (EPQ)		.93		
Extraversion (NEO)		.88		
Introvertive Anhedonia (O-LIFE)		-.72		
Psychoticism (EPQ)			-.84	
Impulsive Nonconformity (O-LIFE)	.45		-.76	
Conscientiousness (NEO)			.73	
Agreeableness (NEO)			.67	
Openness (NEO)				.96
eigenvalue	4.01	2.29	1.50	1.07
% of variance	33.39	19.10	12.52	8.89

Note. Only factor loading ≥ .40 are shown.

The solution extracted four distinct factors which accounted for 73.9 % of the total variance. The cut-off point for inclusion of a variable onto a factor was .40. All variables loaded at or above this level with minimal cross-loadings. The factor loadings appeared to be relatively unambiguous and made theoretical sense within our current understanding of personality, with Factor 1 representing what we have labelled "neurotic-schizotypy", Factor 2 "extraversion", Factor 3 "sociality" and Factor 4 "openness/positive-schizotypy". Factor scores from the four factors were saved using the regression method and entered as predictor variables into a direct logistic regression on smoking status as outcome. The full model was tested against a constant-only model and was found to be statistically reliable ($\chi^2_{\ 4} = 22.8$, $p < .001$). Prediction success was 91.9% for non-smokers and 32.8 for smokers, with a total percentage correct of 73.1%. Regression coefficients and Wald statistics, shown in Table 5, reveal that only the Factor 3 (sociality)

scores reliably predicted smoking status, with the negative regression coefficient (≤) indicating that a decrease in sociality factor scores increases the probably of being in the smoking group.

TABLE 5. Logistic regression analysis of smoking status as a function of the saved personality factor scores.

Personality factor scores	*β*	*Wald statistic*	*p*
F1 (neurotic-schizotypy)	-.31	2.76	.097
F2 (extraversion)	.09	.24	.627
F3 (sociality)	-.76	15.93	<.001
F4 (openness/positive-schizotypy)	.31	2.94	.087

Discussion

Initial results of the current analysis revealed that smoking frequency (*i.e*., the number of cigarettes smoked per day) was positively correlated with Psychoticism and Impulsive Nonconformity, and negatively correlated with Agreeableness and Conscientiousness. These findings are consistent with those reported in the wider literature, thereby lending further support to smoking being related to impulsive nonconformist personality (asocial-schizotypy). However, in relation to the other schizotypy dimensions, no significant correlations were revealed with smoking frequency. Subsequently, data were dichotomised by smoking status, *i.e*., smoking and non-smoking groups, with results again confirming the smoking group to score higher than the non-smoking group in Impulsive Nonconformity and Psychoticism, and lower than the non-smoking group in Agreeableness and Conscientiousness. What is of particular interest to current study is that no significant relationship between Unusual Experiences (positive-schizotypy) and smoking was revealed. This finding is consistent with that of Evans *et al*. (2005), who found no significant differences between smokers and non-smokers on any of the O-LIFE scales, and also Allan *et al*. (1995) who, while reporting a significant correlation between the number of cigarettes smoked per day and Psychoticism scores (asocial-schizotypy), found no significant correlation between the number of cigarettes smoked per day and STA scores. However, the current findings are in contrast to those that have found such a relationship, for example, Williams *et al*. (1996) who found STA scores to be higher in smokers, and López *et al*. (2001) who reported higher Unusual Experience scores in smokers. In order to investigate these relationships further, data were subjected to principal component analysis in order to reduce the personality variables down into more manageable and discrete factors, suitable for subsequent logistic regression analysis. Data reduction was carried out on all 12 scales of the O-LIFE, EPQ and NEO, with four distinct factors extracted. The four factor scores were saved and entered into a direct logistic regression with smoking status as the outcome. Results of the regression found that of the four factor scores, only Factor 3 (sociality) reliably predicted smoking status, *i.e*., as sociality decreases, this increases the probability of being in the smoking group. Again, this particular finding is consistent with both the schizotypy and normal

personality research, and confirms the role of asocial-schizotypy in the prediction of cigarette smoking status.

In relation to Unusual Experiences (positive-schizotypy), it can be seen from the principal components analysis that this was one of the few items to cross-load, with a loading of .64 onto Factor 1 and a loading of .47 onto Factor 4. The loading onto Factor 1 (along with the two neuroticism scales, and Cognitive Disorganization –measuring disorganized schizotypy/social anxiety–), highlight the relationship between positive-schizotypy and neuroticism. Whilst Eysenck (1993) suggested psychoticism to be the true measure of psychosis-proneness for the precise reason that psychoticism is orthogonal to neuroticism, others have pointed out how psychological states, such as high schizotypy, are characterised by anxiety (*e.g*., Braunsein-Bercovitz, Rammsayer, Gibbons, and Lubow, 2002). Indeed, Mason *et al*. (1997; p. 28) have suggested that "neuroticism is the undiscriminating predictor par excellence of all psychopathology and it remains to be seen how well a more specific 'psychosis-prone' trait can be isolated from it". Neuroticism is another factor that does not always demonstrate a consistent finding with smoking (*e.g*., Patton *et al*., 1993; Wakefield, 1989), this clearly warrants further investigation. Finally, in relation to Unusual Experiences, its loading onto Factor 4 along with Openness to Experience should not be too surprising as this is consistent with other findings in the literature (*e.g*., Rawlings and Freeman, 1997). This is of particular interest, as in the Malouff *et al*. (2006) meta-analysis, openness was not found to be one of the key factors associated with smoking. It is clear that the relationship between smoking and positive-schizotypy is complex and requires more investigation, yet it is of particular interest given the findings that heavy smoking and nicotine dependence have a higher incidence in smokers with schizophrenia than the general population (see León and Díaz, 2005); indeed, Kumari and Postma (2005) highlight that the rate of smoking in those diagnosed with schizophrenia could be as much as four times higher than in the general population. One suggestion for this is that cigarette smoking in those diagnosed with schizophrenia is an attempt to self-medicate, given that there is evidence that smoking may "normalize" some of the cognitive deficits associated with schizophrenia (Kumari and Postma, 2005). Given that individuals scoring highly on questionnaire measures of (positive) schizotypy are considered to be related phenotypically related to individuals diagnosed with schizophrenia (Kumari and Postma, 2005), it is not clear as to why the relationship between positive-schizotypy is not as consistent as the relationship between asocial-schizotypy and cigarette smoking. Clearly there is a need for further investigation into this relationship in order to separate out these many different issues.

To conclude, these findings are one of the first reports of combined schizotypy and general personality data in the same sample, and effectively confirm the relationship between smoking and anti-social and impulsive nonconformist behaviors, whilst failing to reveal a relationship between positive-schizotypy and smoking. Patton *et al*. (1993) suggested that the relationship between anti-social/impulsive personalities and smoking behavior is a reflection of the fact that smoking is becoming increasingly regarded as an anti-social habit; thus those who are more likely to engage in smoking behaviors are those with a propensity to impulsive nonconformist behaviors and have little respect for social norms. This does appear to be an adequate explanation for the relationship

between anti-social personality and smoking, and if this is the case, as smoking becomes increasingly regarded as anti-social, it would be expected that the findings of studies like the current one will become even more pronounced. However, in order to test this hypothesis further, cross cultural research should be carried out contrasting the personalities of smokers across nations and cultures. Much of the research reported in this paper comes from Western countries (increasingly tough smoking legalisation in these countries reflects the growing disapproval of smoking); however, there are other countries in which smoking is still regarded as socially acceptable, data should be obtained from these countries. Additionally, it may be useful to look back historically at personality and smoking data, and although there is data available over the past 25 years, it is during this period that smoking has become increasingly regarded as an "anti-social" (rather than a "social") habit.

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