The hierarchical structure in schizotypy and the five-factor model of personality

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Schizotypal personality traits (schizotypy) might be seen as on a continuum with schizophrenia. However, controversy remains with regard to whether this continuum is quasi-dimensional, applying only to people with schizophrenia and schizotypy, or fully dimensional, applying to all people. If the fully dimensional model is accurate, schizotypy could be described by the same personality theories as are applied to people in general. We examined the relationship between schizotypy and the five-factor model of personality (FFM), which is arguably the most established contemporary personality theory. When we assumed a hierarchic structure of schizotypy factors, we found that the FFM scales could explain schizotypy fairly well regardless of the questionnaires used, suggesting that schizotypy might represent a variation better understood by reference to typical dimensions of personality, though it might still indicate a predisposition to schizophrenia. This article discusses this conclusion in relation to each of the five personality factors. A perspective that situates schizophrenia on a continuum with general personality variations implies that this disorder constitutes a potential risk for everyone and, thus, helps to promote understanding and correct misunderstandings that contribute to prejudice.

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1. Introduction

Individual differences on measures of schizotypal personality (schizotypy) have commonly been explored as a means of examining the nature and structure of schizophrenia symptoms. Research on schizotypal personality in the general population may provide an important opportunity to study the biological and cognitive markers of vulnerability to schizophrenia without the confounding effects of long-term hospitalization, medication, and severe psychotic symptoms (Raine et al., 1995). Relatives of patients with schizophrenia score significantly higher on measures of schizotypal personality (Vollema et al., 2002), though the results might depend on the questionnaire used (e.g., Clementz et al., 1991). This suggests that, within the spectrum of schizophrenia and related disorders, there is a range that includes schizotypal traits and that this range is at least partly genetic (Lenzenweger, 2006).

Patients with schizophrenia are impaired in perceptual as well as cognitive functions. In the past dozen years, several theoretical models of schizophrenia symptoms have been proposed, often inspired by advances in cognitive neuroscience. It was recently suggested that these models of schizophrenia may also apply to schizotypal personality traits (Asai et al., 2008; Asai and Tanno, 2007, 2008, 2009). Cyhlarova and Claridge (2005) indicated that people with schizotypal traits, identified by questionnaires or semi-structured interviews, might have a predisposition to schizophrenia. Although people with schizotypal traits might experience schizophrenic-like experiences, many live normal lives. The traits of schizophrenia are generally considered to span a continuum. However, controversy remains regarding whether this continuum is quasi-dimensional, applying only to those people with schizophrenia and schizotypy who have schizophrenic genes, or fully dimensional, applying to all people (Claridge and Davis, 2003). According to the former perspective, only those with high scores on measures of schizotypy exhibit schizotypal traits. According to the latter perspective, all people have schizophrenic genes and thus might exhibit schizotypal personality traits to some extent; those who have strong schizotypal traits might develop schizophrenia. Correlations between cognitive dysfunctions and schizotypal scores in the general population (e.g., Asai et al., 2008; Lenzenweger and Maher, 2002: suggesting a negative correlation between visuo-motor performance and schizotypy scores) provide support for the fully dimensional model of schizotypy, although some previous studies support the quasi-dimensional model (e.g., Smyrnis et al., 2007: suggesting that highly schizotypal people performed more poorly than did the total sample in an eye-tracking task, but no correlation was found between schizotypy scores and performance). According to these studies, the linear relationship between schizotypic scores and other measures indicating schizophrenic vulnerability might support a fully dimensional model, whereas the fact that only high scorers performed differently might support a quasi-dimensional model.

Aside from these experimental studies, questionnaire-based studies have also contributed to this discussion. For example, the similarity in the factor structure between schizophrenia and
schizotypy has been suggested as indicating a continuum linking the two (see for the review, Mason et al., 1997). As to schizophrenia, the classical two-factor model (Positive and Negative symptoms; Crow, 1980) has developed into a three-factor model with the addition of Disorganized symptoms (Liddle 1987; Liddle and Barnes 1990), largely as a result of clinical observations. With regard to schizotypy, it is well known that the Schizotypal Personality Questionnaire (SPQ; Raine, 1991), which was developed to assess schizotypal personality disorder as defined in DSM-III-R (American Psychiatric Association, 1987), has a three-factor structure similar to that for schizophrenia, with Cognitive (Positive), Interpersonal (Negative), and Disorganization (Disorganized Schizotypy) factors (Chen et al., 1997; Dumas et al., 2000; Fossati et al., 2003; Gruzelier et al., 1995; Gruzelier 1996; Raine et al., 1994; Reynolds et al., 2000; Rossi and Daneluzzo, 2002), though some studies have suggested a four-factor structure in SPQ (e.g., Stefanis et al., 2004).

In addition, more recently, Mason et al. (1995) developed a new schizotypy scale, the Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE) based on factor analysis using the existing questionnaires related to schizotypy (Bentall et al., 1989; Claridge et al., 1996). O-LIFE has a four-factor structure: Unusual Experiences corresponding to Positive, Introvertive Anhedonia corresponding to Negative, Cognitive Disorganization corresponding to Disorganized, and Impulsive Conformity. The last factor, which refers to antisocial behaviors (disinhibited, violent, self-abusive, and reckless), emerges only in O-LIFE-measured schizotypy. This result might occur because the O-LIFE treats schizotypy as a personality quality present in the general population, because this measure was developed using standard personality measures (Claridge et al., 1996) including the Eysenck Personality Questionnaire (EPQ: Eysenck and Eysenck, 1975), whereas the SPQ treats schizotypy as a predisposition to schizophrenia. According to Vollema and Bosch (1995), schizotypy measures might be divided into two categories: measures for symptoms and measures for traits. Whereas the SPQ is considered to belong to the former category (Vollema and Bosch, 1995), the O-LIFE seems to belong in the latter. Although these two questionnaires both provide comprehensive measures of schizotypy, they are based on differing perspectives on schizotypy. Because both have actually been used to measure schizotypy and vulnerability markers for schizophrenia, it is important to consider the differences in their origins. Whereas the SPQ was developed based on schizophrenic symptoms and criteria for diagnosis and thereby reflects the perspective of the quasi-dimensional model (i.e., with or without schizophrenic genes “schizotaxia”; Meehl, 1962, 1990), the O-LIFE incorporated previous personality theories and thus reflects the perspective of the fully dimensional model (i.e., “healthy schizotypy”; McCreery and Claridge, 2002).

No study has examined the relationship between SPQ and O-LIFE. Therefore, in Study 1, we administered SPQ and O-LIFE simultaneously to examine their relationship.

If schizotypy is present in all people and is one expression of typical personality structure (the fully dimensional model), schizotypy might be described by standard personality theory (e.g., Widiger and Frances, 2002). Some studies have examined the relationship between schizotypy and the Five-Factor Model of personality (FFM), arguably the most well-accepted contemporary personality theory, which explains human personality in terms of five factors: N (Neuroticism), E (Extraversion), O (Openness to Experiences), A (Agreeableness), and C (Conscientiousness) (for a review, see O'Connor, 2002). Although many studies have examined the relationship between schizotypy and FFM (Ball et al., 1997; Blais, 1997; Costa and McCrae, 1990; Coolidge et al., 1994; Duijsens and Diekstra, 1996; Dyce and O'Connor, 1998; Haigler and Duijsens, 2001; Hyer et al., 1994; Ross et al., 2002; Soldz et al., 1993; Tien et al., 1992; Trust, 1992; Yang et al., 2002; Yeung et al., 1993; West, 1999; Wiggins and Pincus, 1989), they have either examined only some aspects of schizotypy or have treated schizotypy not as a multi-factorial structure but as a unitary phenomenon. Because it is well established that schizotypy can be understood as multi-faceted, as can personality in general, both should be examined simultaneously. In Study 2, we used SPQ and O-LIFE to examine the relationship between each factor of schizotypy and the factors included in FFM.

2. Study 1

We examined the relationship between the two schizotypy questionnaires (SPQ and O-LIFE) for the first time. Both measure schizotypy comprehensively, but the two have different assumptions and different factorial structures. With regard to schizophrenia symptoms, the two scales seem to have three factors in common: Positive, Negative, and Disorganized Schizotypy. O-LIFE has an additional factor: Impulsive Nonconformity (ImNo). However, Mason et al. (1997) assumed that the Interpersonal factor of SPQ corresponds to Cognitive Disorganization in O-LIFE, and that Disorganization as assessed by SPQ corresponds to Impulsive Nonconformity as measured by O-LIFE. We constructed path models and examined these relationships. We hypothesized that the three factors in the SPQ and O-LIFE would correspond with the respective factor in the other, and that the relationships proposed by Mason et al. (1997) would emerge.

2.1. Method

We administered the SPQ and the O-LIFE to 270 university students (group 0; aged 18–24 years, mean 19.8, standard deviation (S.D.) 1.04; 181 men, 89 women) from an introductory psychology class. The SPQ (Raine, 1991) is a 74-item true/false self-report questionnaire based on the DSM-III-R diagnostic criteria for Schizotypal Personality Disorder (American Psychiatric Association, 1987). The SPQ has a three-factor structure (Cognitive (Cog), Interpersonal (Int), and Disorganization (Dis)). The O-LIFE (Mason et al., 1995) is a newly developed 104-item true/false self-report questionnaire based on the results of a massive factor analysis of existing schizotypy-related scales (Bentall et al., 1989; Claridge et al., 1996). The O-LIFE has a four-factor structure (Unusual Experiences (UnEx), Introvertive Anhedonia (InAn), Cognitive Disorganization (CoDi), and Impulsive Nonconformity (ImNo)). Both questionnaires have been translated from English into Japanese using a standard process including back-translations, and their validities and reliabilities have been confirmed. We used SPSS 17.0 and Amos 17.0 for the statistical analysis. We conducted a correlation analysis, a multi regression analysis, and a path analysis, which can treat many-to-many relationships as one model, progressively. In path analysis, generally the most fitted model is explored based on the a priori hypothesis. The constructed models can be evaluated using multiple measures: the χ² test, GFI (goodness-of-fit index), AGFI (adjusted GFI), NFI (Normed fit index), CFI (comparative fit index), RMSEA (root mean square error of approximation), and AIC (Akaike information criterion). If the P values resulting from the χ² test is greater than 0.05, the model is thought to have good fit. If the values of GFI, AGFI, NFI, CFI are greater than 0.90 or 0.95 in a more stringent analysis, the model is thought to have good fit (e.g., Bentler and Bonnet, 1980; Hu and Bentler, 1999). If the value of RMSEA is less than 0.10 (or 0.05 in a more stringent analysis), the model is thought to have good fit (e.g., Browne and Cudeck, 1993). Generally speaking, when the model has more than two good scores, including RMSEA and one other, the model is considered to have good fit. AIC is a comparative measure to compare two models with good fit; a smaller value indicates good fit.

2.2. Results and discussion

We calculated each factor score for SPQ and O-LIFE for the following analyses. First, we calculated Pearson’s correlation between each SPQ and each O-LIFE factor (Table 1). Except for one pair (InAn in O-LIFE and Cog in SPQ), all factors were positively correlated. In

<table>
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<th>Table 1</th>
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<tr>
<td>Intercorrelations between O-LIFE and SPQ (Group 0).</td>
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<tr>
<td>SPQ</td>
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<td>O-LIFE</td>
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** P<0.01
particular, UnEx in O-LIFE and Cog in SPQ, InAn in O-LIFE and Int in SPQ, and CoDi in O-LIFE and Int in SPQ were strongly correlated. Total SPQ was significantly correlated with total O-LIFE ($r = 0.81$). In the multiple regression analysis, three factors in SPQ significantly explained the total O-LIFE ($R^2 = 0.657$) and four factors in O-LIFE also significantly explained total SPQ ($R^2 = 0.687$). Second, to fully understand the relationship between SPQ and O-LIFE, we constructed two path models (SPQ explains O-LIFE or O-LIFE explains SPQ) and examined the fitness of each model. We found that the former path, in which SPQ explains O-LIFE, resulted in a well-fitted model ($\chi^2 = 14.5$, $df = 8$, $P = 0.069$, $GFI = 0.99$, $AGFI = 0.95$, $NFI = 0.98$, $CFI = 0.99$, $RMSEA = 0.055$ and $AIC = 54.5$), as shown in Fig. S1 as Supplemental Material. As to the relationship among O-LIFE factors, the best fit was achieved by assuming directions from UnEx, InAn, and CoDi to ImNo. The second path, in which O-LIFE explains SPQ, also yielded a well-fitted model as shown in Fig. S2 as Supplemental Material ($\chi^2 = 9.42$, $df = 7$, $P = 0.22$, $GFI = 0.99$, $AGFI = 0.96$, $NFI = 0.99$, $CFI = 1.00$, $RMSEA = 0.036$ and $AIC = 51.4$) when assuming a direction from Cog to Int, Cog to Dis, and Int to Dis. These two models are very similar. In depicting the relationship between SPQ and O-LIFE, the significant paths were almost same in both models (five paths were common to both models; Fig. 1). In particular, several pairs, including Cog-UnEx, Int-InAn, and Dis-CoDi, were related as predicted; in addition, Int-CoDi and Dis-ImNo were also related, as Mason et al. (1997) assumed. In summary, though the mixed theory, as we hypothesized, might explain the relationship between SPQ and O-LIFE (or between three- and four-factor theories of schizotypy), the path coefficients support the general assumption (e.g., Cog-UnEx, Int-InAn, and Dis-CoDi), other than the finding that Int-CoDi showed a stronger correlation than did Dis-CoDi. Importantly, both models had good fit, indicating that combinations of each factor in SPQ can explain each factor in O-LIFE, and vice versa. SPQ and O-LIFE have different theoretical underpinnings and therefore might have different factor structures, but these results indicate that they measure very nearly the same concept of schizotypy. It is unlikely that the scales would apply to a quasi- or fully dimensional model of schizotypy, even given their differing theoretical underpinnings.

As to the relationship among schizotypy factors within each model, when we assumed a hierarchic structure, the models achieved good fit. Although the precise nature of this structure is unclear, the following is suggested from these findings: positive $\rightarrow$ negative $\rightarrow$ disorganized ($\rightarrow$ Impulsive Nonconformity). We examined this issue further in Study 2.

3. Study 2

We examined the relationship between the schizotypy and the FFM of personality to show that schizotypy could be explained by personality theory in a general population. FFM factors include Neuroticism (N), Extraversion (E), Openness to Experiences (O), Agreeableness (A), and Conscientiousness (C). Two comprehensive schizotypy scales were described in Study 1, and FFM scales have also been developed. We administered four questionnaire surveys and explored a model shared between schizotypy and FFM. According to previous studies using the limited available schizotypy questionnaires, West (1999) showed that positive schizotypy is related to N, and Ross et al. (2002) showed that O is positively correlated with positive schizotypy but is negatively correlated with negative schizotypy. Following previous studies, we hypothesized that N would explain positive factors in schizotypy and O would explain positive and negative factors in schizotypy in the path models. We also explored relationships that have not been explored in previous studies, particularly relationships with disorganized and asocial (Impulsive Nonconformity) schizotypy.

3.1. Method

We assessed four groups of university students (groups 1–4) using schizotypy and FFM scales (Table 2). As measures of schizotypy, we used SPQ and O-LIFE as in Study 1 but added the Schizotypy Personality Questionnaire-Brief (SPQB; Raine and Benishay, 1995), a 22-item true/false self-report questionnaire, with items selected from the 74-item SPQ. SPQB has the same three-factor structure as SPQ (e.g., Compton et al., 2009). As FFM scales, we used two questionnaires: the Big Five Scale (BFS; Wada, 1996) and the NEO-Five Factor Inventory (NEO-FFI; Costa and McCrae, 1992), which is a shortened version of the NEO Personality Inventory-Revised (NEO-PI-R; Costa and McCrae, 1992). Although both have the same five-factor structure (N, A, C, O, and E), they have different theoretical backgrounds and different items. The NEO-FFI is a well-known 60-item (sentence) self-report questionnaire with responses based on a five-point Likert system. The BFS was developed in Japan based on the Adjective Check List (ACL; Gough and Heilbrun, 1983). It is a 60-item (adjective) self-report questionnaire with responses based on a seven-point Likert system. The Western-culture based questionnaires were translated from English into Japanese using a standard process, including back-translations, and their validities and reliabilities have been confirmed. Group 1 (N = 209, male: 145, female: 64, mean age $= 19.1$, $SD = 0.98$) completed O-LIFE and BFS. Group 2 (N = 235, male: 76, female: 159, mean age $= 19.8$, $SD = 1.04$) completed SPQ and BFS. Group 3 (N = 120, male: 40, female: 80, mean age $= 18.6$, $SD = 1.13$) completed SPQB and BFS. Group 4 (N = 140, male: 111, female: 29, mean age $= 19.0$, $SD = 0.86$) completed SPQB and NEO-FFI.

3.2. Results and discussion

We calculated each factor score for schizotypy and for FFM for the following analyses. First, we performed a step-wise multiple regression analysis to assess the relationship between FFM and schizotypy. In all groups, FFM significantly explained the total schizotypy score regardless of the questionnaires used. In particular, N was positively and E was negatively related to total schizotypy scores in all groups, and A was negatively and O was positively related to total schizotypy scores in three groups. These relationships are all comparable to findings of Ross et al. (2002), who measured total schizotypy by MIS (Magical Ideation Scale; Eckblad and Chapman, 1983), PAS (Perceptual Aberration Scale; Chapman et al., 1978), and ReSoA (Social Anhedonia Scale Revised; Eckblad et al., 1982). Furthermore, Widiger et al. (2002) attempted to describe personality disorders with FFM and predicted that N and O might be positively correlated with schizotypal personality disorder, whereas E and A might be negatively related to schizotypal personality disorder. Given that schizotypal personality disorder could be understood as an extension of schizotypy, these findings are congruent with Widiger’s prediction. However, C cannot be ignored because it was also related to total schizotypy in two groups. Therefore, we next examined each factor level.

To examine the relationships between schizotypy and FFM at each factor level, we constructed path models (Figs. S3–S6 as Supplemental Material). When we assumed the hierarchic structure of schizotypy, as in Study 1, these models achieved good fit, regardless of the questionnaires used ($\chi^2 = 11.3$, $df = 12$, $P = 0.50$, $GFI = 0.99$, $AGFI = 0.96$, $NFI = 0.98$, $CFI = 1.00$, $RMSEA = 0.00$, $AIC = 77.3$ in group 1, $\chi^2 = 22.8$, $df = 13$, $P = 0.044$, $GFI = 0.98$, $AGFI = 0.94$, $NFI = 0.98$, $CFI = 0.99$, $RMSEA = 0.055$ in group 2, $\chi^2 = 9.42$, $df = 7$, $P = 0.22$, $GFI = 0.99$, $AGFI = 0.96$, $NFI = 0.99$, $CFI = 1.00$, $RMSEA = 0.036$ in group 3, and $\chi^2 = 14.5$, $df = 8$, $P = 0.069$, $GFI = 0.99$, $AGFI = 0.95$, $NFI = 0.98$, $CFI = 0.99$, $RMSEA = 0.055$ in group 4).

Fig. 1. The shared relationships between O-LIFE and SPQ (group 0).
The present study showed that the relationship between SPQ and O-LIFE (Study 1), the only two comprehensive schizotypy scales available, and that the schizotypic qualities that these scales measure, could be explained by the FFM of personality (Study 2). Given that SPQ could explain O-LIFE and vice versa, it is suggested that the two

<table>
<thead>
<tr>
<th>Dependent variable (total schizotypy score)</th>
<th>R</th>
<th>Adj.R²</th>
<th>N</th>
<th>A</th>
<th>C</th>
<th>O</th>
<th>E *</th>
<th>Independent variable (each big five scores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group1 O-LIFE</td>
<td>0.65</td>
<td>0.41</td>
<td>0.43**</td>
<td>-0.25**</td>
<td>-0.15*</td>
<td>0.25**</td>
<td>-0.23**</td>
<td>BFS</td>
</tr>
<tr>
<td>Group2 SPQ</td>
<td>0.65</td>
<td>0.42</td>
<td>0.42**</td>
<td>-0.13*</td>
<td>0.25**</td>
<td>-0.34**</td>
<td>-0.15*</td>
<td>BFS</td>
</tr>
<tr>
<td>Group3 SPQB</td>
<td>0.60</td>
<td>0.34</td>
<td>0.30**</td>
<td>-0.18*</td>
<td>0.32**</td>
<td>-0.42**</td>
<td>-0.16*</td>
<td>NEO-FFI</td>
</tr>
<tr>
<td>Group4 SPQB</td>
<td>0.53</td>
<td>0.26</td>
<td>0.40**</td>
<td>-0.15*</td>
<td>-0.16*</td>
<td>-0.16*</td>
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*p<0.05. **p<0.01.

NFI = 0.97, CFI = 0.99, RMSEA = 0.057, AIC = 68.8 in group 2, \( \chi^2 = 18.2, df = 15, \ p = 0.25, GFI = 0.96, AGFI = 0.91, NFI = 0.89, CFI = 0.98, RMSEA = 0.042, AIC = 60.2 in group 3, and \( \chi^2 = 14.1, df = 12, \ p = 0.30, GFI = 0.98, AGFI = 0.93, NFI = 0.93, CFI = 0.99, RMSEA = 0.036, AIC = 62.1 \) in group 4). Although their similarities are not obvious, results indicated that they shared many paths. These findings are summarized in Fig. 2, which describes the shared paths among the groups. We assumed that positive corresponds to Cog and UnEx; negative, to Int and InAn; and disorganized, to Dis and CoDi schizotypy, as we discussed in Study 1. We omitted ImNo in Fig. 2, and will return to this factor later.

As to the relationship among FFM factors, the pairs N–E and O–E were related in all four groups, and A–C, A–E, and C–E were related in three groups. According to personality theory, if the FFM is a basic dimension in human personality, it is desirable for each factor of FFM to be independent of each other (Wada, 1996), and many previous studies have assumed that each factor of FFM is independent of or orthogonal to the others (e.g., McCrae and Costa, 1997). Previous studies, however, have reported indications of relationships among the five factors (e.g., Wada, 1996), perhaps reflecting complicated indirect relationships. Though this question awaits future resolution by FFM researchers, we retained significant relationships among these factors in our models.

With regard to the relationship between FFM and schizotypy, the paths N → positive schizotypy (positively) and E → negative schizotypy (negatively) were observed in all groups. N → negative (positively), O → positive (positively), and C → disorganized (negatively) were observed in three groups. Of these paths, N → positive has previously been suggested by West (1999); O → positive, by Ross et al. (2002) and Rawlings and Freeman (1997); and E → negative, by Rawlings and Freeman (1997). Because a high score for N might reflect vulnerability to mental distress (Costa and Widiger, 2002), N may explain the positive and negative schizotypy directly and disorganized schizotypy remotely. A low score for E indicates an introverted or withdrawn personality, which may extend to anhedonia or autosynnoia in schizotypy. It should be noted that O is related to positive schizotypy. A high score for O includes a creative personality, and O has been suggested as the link between schizotypy and creativity (O’Reilly et al., 2001). This suggests potential strengths associated with some schizotypal characteristics. In some fields, the talents of schizophrenic or schizotypal patients, including creativity, may compensate for schizophrenia in terms of natural selection (for a review, see Pearson and Foley, 2007). Because the previous studies did not examine disorganized schizotypy, this is the first report of the relationship between C and disorganized schizotypy. A low score for C means uncontrolled or disordered personality. Rawlings and Freeman (1997) suggested a relevant finding. They conducted a factor analysis on the combined data from O-LIFE, NEO-PI-R (Costa and McCrae, 1992), and the Paranoia/Suspiciousness Scale (PSQ; Rawlings and Freeman, 1997); in terms of O-LIFE factors, they found that the pairs UnEx-O, InAn-E, CoDi-N, and ImNo-A or -C were related. Though these relationships were also observed in our results (see Fig. S3 as Supplemental Material), the pair CoDi-C was also identified as related here. The relationship between C and schizotypy needs further research, but it appears that C might be related to disorganized schizotypy or Impulsive Nonconformity. When we focused on a three-factor model of schizotypy, it seems that A was not related to any schizotypic factor (Fig. 2). A low score for A indicates an anharmonic personality. ImNo in O-LIFE, however, might be related to A (Fig. S3 as Supplemental Material; see also Rawlings and Freeman, 1997). Although we administered O-LIFE to only one group, it is possible that these concepts are similar.

As to the hierarchic structure of schizotypy, when we assumed the direct or indirect directions of positive → negative → disorganized (→ ImNo), the models gained good fit as in Study 1, although some relationships were not significant. According to Fig. 2, positive and negative factors might be foundational, and they might cause Disorganized schizotypy (and Impulsive Nonconformity; see Figs. S1 and S3 as Supplemental Material). Classically, these two basic symptoms have been understood as major schizophrenic symptoms, and the third (or the fourth, only in schizotypy) factor has been added later. Furthermore, researchers have conducted cluster analyses of general population responses to schizotypy scales and have reported that clusters related to positive or negative schizotypy were often observed (e.g., Suhr and Spitznagel, 2001a; Williams, 1994, 1995). However, the pure cluster of disorganized schizotypy has not emerged, even when O-LIFE or SPQ was used (Goulding, 2004; Loughland and Williams, 1997; Suhr and Spitznagel, 2001a,b). This suggests that a disorganized factor may be accompanied by positive and negative factors, as indicated in Fig. 2. This issue should be examined further as one important to an understanding of schizophrenic or schizotypic personality.

4. General discussion

The present study showed that the relationship between SPQ and O-LIFE (Study 1), the only two comprehensive schizotypy scales available, and that the schizotypic qualities that these scales measure, could be explained by the FFM of personality (Study 2). Given that SPQ could explain O-LIFE and vice versa, it is suggested that the two
scales reflect virtually the same concept of schizotypy. According to Fig. 1, Int and Dis in SPQ might be shared with InAn, CoDi, and ImNo in O-LIFE. This may reflect the fact that items related to Social Anxiety are part of Int in SPQ but are included in CoDi in O-LIFE. The third (Disorganized or Cognitive Disorganized) and fourth factors (Impulsive Nonconformity) of schizotypy are controversial (e.g., Venables and Rector, 2000) and should be examined by further research.

If schizotypy belongs to the range of personality differences (fully dimensional model), rather than simply indicating a predisposition to schizophrenia (quasi-dimensional model), schizotypy should be explained by general personality theory, for example by FFM, the best established of such models. Our results suggest a linear relationship between FFM and schizotypy. That is, as a specific factor in FFM (N or E) gets stronger, schizotypal traits also tend to increase, indicating a continuum between the normal personality dimension and schizotypal traits and congruence with a fully dimensional model rather than with a quasi-dimensional model. If qualitative differences in schizotypal traits were present in our sample, FFM might not predict schizotypy linearly in a model. Even so, it cannot be denied that a schizotypal personality might be associated with a predisposition to schizophrenia. However, normal elements of personality that a schizotypal personality might be associated with a predisposition to schizophrenia. However, normal elements of personality that may be shared by everyone could be emphasized in schizotypy. When we assumed a hierarchic structure for schizotypy, as suggested by Study 1, FFM could explain schizotypy well, regardless of the schizotypy and FFM questionnaires used. This suggests that schizotypy can be described as a variation in personality. For example, it has been suggested that O-LIFE can be regarded as a general personality scale (Rawlings and Freeman, 1997). Though Study 1 showed SPQ and O-LIFE measure almost the same concept of schizotypy, O-LIFE, which derives from general personality theory, might be closer to FFM than is SPQ (see Figs. S3 and S4 as Supplemental Material for the fitness values of both scales).

Generally, the idea of a continuum in disorders has prevailed. Not only mental disorders, but some other disorders such as high blood pressure or diabetes mellitus, could also be assumed to lie on a continuum were it not for diagnostic practices that require doctors to classify them categorically (Rose and Barker, 1978). Though schizotypy might reflect a vulnerability to mental distress, it may also have advantages, including creativity (Pearson and Folley, 2007). The fully dimensional model that views schizotypy as lying on a continuum that includes general personality structures might help us understand its pathology and, furthermore, help in promoting understanding and correcting misunderstandings that contribute to prejudice.

This study had some methodological limitations and may have neglected another potential aspect in the dimensionality of schizotypy. Our subjects were all university students enrolled in introductory psychology classes. Our results might be limited by the ages of the students. In addition, psychology classes might attract a specific type of person, although our samples did not appear to differ from previous normative data used in studies of schizotypy and FFM (e.g., Asai et al., 2008; Asai and Tanno, 2009; Saito et al., 2001). Nevertheless, studies in larger communities would also be important to assess dimensionality. With regard to the dimensionality of schizotypy, the variability might be considerable. Though the scores of each schizotypy scales used in Studies 1 and 2 were not distributed normally (Kolmogorov–Smirnov’s test: P < 0.05 in O-LIFE, SPQ, and SPQB), this research did not reveal any quantitative boundaries seemingly (Fig. 3), suggesting a fully dimensional model. Some previous studies have conducted taxometric analyses, which can reveal quantitative boundaries in distribution, and those have yielded mixed results. For example, Rawlings et al. (2008) recently re-evaluated previous taxonic conclusions about the latent structure of schizotypy. In addition to these analyses, an examination of the continuum between personality dimensions and schizotypy, in the focus of the present study, would help to clarify schizotypal dimensionality.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.ipsych.2009.07.018.

References


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Figure S1. The path model from SPQ to O-LIFE (Group 0 in Study 1)

\[\chi^2 = 14.5, \text{ df}=8, p = 0.069\]
\[\text{GFI} = 0.99\]
\[\text{AGFI} = 0.95\]
\[\text{NFI} = 0.98\]
\[\text{CFI} = 0.99\]
\[\text{RMSEA} = 0.055\]
\[\text{AIC} = 54.5\]

Figure S2. The path model from O-LIFE to SPQ (Group 0 in Study 1)

\[\chi^2 = 9.42, \text{ df}=7, p = 0.22\]
\[\text{GFI} = 0.99\]
\[\text{AGFI} = 0.96\]
\[\text{NFI} = 0.99\]
\[\text{CFI} = 1.00\]
\[\text{RMSEA} = 0.036\]
\[\text{AIC} = 51.4\]
Figure S3. The path model from FFM to schizotypy (Group1 in Study 2)

χ²=11.3, df=12, p=.50
GFI=.99
AGFI=.96
NFI=.98
CFI=1.00
RMSEA=.00
AIC=77.3

Figure S4. The path model from FFM to schizotypy (Group2 in Study 2)

χ²=22.8, df=13, p=.044
GFI=.98
AGFI=.94
NFI=.97
CFI=.99
RMSEA=.057
AIC=68.8

* p<.05, ** p<.01
Figure S5. The path model from FFM to schizotypy (Group3 in Study 2)

Figure S6. The path model from FFM to schizotypy (Group4 in Study 2)