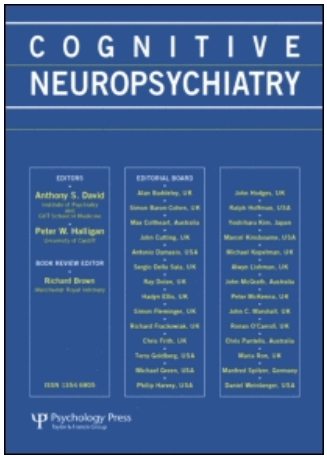
This article was downloaded by:[University of Liege]
On: 3 November 2007
Access Details: [subscription number 776300030]
Publisher: Psychology Press
Informa Ltd Registered in England and Wales Registered Number: 1072954
Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Cognitive Neuropsychiatry
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713659088

Face recognition failures in schizotypy

Frank Larøi [a]; Arnaud D'Argembeau [a]; Serge Brédart [b]; Martial van der Linden [ac]
[a] Cognitive Psychopathology Unit, University of Liège, Liège, Belgium
[b] Cognitive Psychology Unit, University of Liège, Liège, Belgium
[c] University of Geneva, Geneva, Switzerland

Online Publication Date: 01 November 2007
To cite this Article: Larøi, Frank, D'Argembeau, Arnaud, Brédart, Serge and van der Linden, Martial (2007) 'Face recognition failures in schizotypy', Cognitive Neuropsychiatry, 12:6, 554 - 571
To link to this article: DOI: 10.1080/13546800701707223
URL: http://dx.doi.org/10.1080/13546800701707223

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: http://www.informaworld.com/terms-and-conditions-of-access.pdf

This article maybe used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

COGNITIVE NEUROPSYCHIATRY
2007, 12 (6), 554–571

Psychology Press
Taylor & Francis Group

Downloaded By: [University of Liege] At: 12:15 3 November 2007

Face recognition failures in schizotypy

Frank Larøi and Arnaud D'Argembeau

Cognitive Psychopathology Unit, University of Liège, Liège, Belgium

Serge Brédart

Cognitive Psychology Unit, University of Liège, Liège, Belgium

Martial van der Linden

Cognitive Psychopathology Units, University of Liège, Liège, Belgium, and University of Geneva, Geneva, Switzerland

Introduction. Studies suggest an important role of disturbances of self in schizophrenia and in schizotypy. Based on findings from a previous study (Brédart & Young, 2004), we developed a questionnaire assessing self-face recognition failures in everyday life (Self-Face Recognition Questionnaire; SFRQ) to investigate the relations between dimensions of schizotypy (cognitive-perceptual, interpersonal, disorganised) and self-face recognition disturbances.
Methods. A sample of nonclinical participants ($n = 170$) completed the SFRQ and the Schizotypal Personality Questionnaire.
Results. Factor analysis of SFRQ items revealed a clear three-factor structure consisting of: (1) self-face recognition difficulties, (2) unusual perception of own or other faces, and (3) other-face recognition difficulties. Correlational analyses between schizotypy dimensions and the SFRQ revealed that only the cognitive-perceptual and disorganised schizotypy dimensions correlated significantly with the SFRQ. By contrast, the interpersonal schizotypy dimension was not associated with the SFRQ.
Conclusions. Findings provide further support that positive (cognitive-perceptual) and negative (interpersonal) schizotypy represent discrete neurobehavioural dimensions. The theoretical implications of these findings are discussed.

Correspondence should be addressed to Frank Larøi, Cognitive Psychopathology Unit, Department of Cognitive Sciences, University of Liège, Bd. du Rectorat (B33), B-4000 Liège, Belgium. E-mail: flaroi@ulg.ac.be

This study was supported from a grant from La Communauté Française de Belgique direction de la recherche scientifique, Action de la Recherche Concertée, Convention 06/11-340. Arnaud D'Argembeau is a Postdoctoral Researcher at the Belgian National Fund for Scientific Research (FNRS).

© 2007 Psychology Press, an imprint of the Taylor & Francis Group, an Informa business
http://www.psypress.com/cogneuropsychiatry DOI: 10.1080/13546800701707223

Downloaded By: [University of Liege] At: 12:15 3 November 2007

There has been a recent interest in viewing schizophrenia as a self-disorder (Kircher & David, 2003) or as a disturbance in "the experiential sense of being a vital and self-identical subject of experience or first person perspective on the world" (Sass & Parnas, 2003, p. 429). Studies have found that some of these disturbances manifest themselves long before the appearance of the disease (Møller & Husby, 2000; Parnas, 2003; Parnas & Handest, 2003; Parnas, Jansson, Sass, & Handest, 1998) and may aggravate significantly during the illness' course (Parnas, Handest, Sæbye, & Jansson, 2003). Furthermore, florid psychotic symptoms such as hallucinations, delusions, and passivity experiences, may stem from anomalies of the experience of self in schizophrenia (Parnas, 2003; Sass & Parnas, 2003). Experimental studies have also found evidence of disturbances of the self in schizophrenia, such as disturbances in self-agency, self/source-monitoring, and autonoetic consciousness (cf. Blakemore & Frith, 2003; Brébion et al., 2000; Danion, Rizzo, & Bruant, 1999).

A number of studies have also reported evidence suggesting relations between anomalies of the experience of self and schizotypy. For instance, studies by Platek and colleagues have shown that the expression of high levels of schizotypy impacts aspects related to self-processing (Platek & Gallup, 2002; Platek, Myers, Critton, & Gallup, 2003). In particular, Platek et al. (2003) found that normal, nonschizotypal individuals showed a left-hand advantage (i.e., responded faster) for self-descriptive adjectives (suggesting right hemisphere involvement), whereas individuals scoring high on a schizotypal measure did not show this left-hand advantage. In a similar study, albeit using self-face and other-face (i.e., strangers) images, Platek and Gallup (2002) found that normal, non schizotypal individuals showed a left-hand advantage (i.e., responded faster) for self-face identification, whereas schizotypal individuals showed increased response latencies to self-face images when using the left-hand. In both studies, although the findings suggest that schizotypal individuals may process self-related information differently from nonschizotypal individuals (i.e., involving little or no involvement of the right hemisphere, which is suggested to play a major role in self-face processing; cf. Keenan, Wheeler, Gallup, & Pascual-Leone, 2000), they do not provide us with indications as to *how* schizotypal individuals process this information differently, nor do the studies necessarily demonstrate that self-processing is disturbed in any way in schizotypal individuals.

Studies on delusional misidentification syndromes may also provide indications regarding underlying cognitive processes related to self-processing abnormalities in schizophrenia and schizotypy, as these syndromes may occur in schizophrenia and schizophreniform disorders (Cutting, 1994; Joseph, 1994; Kirov, Jones, & Lewis, 1994). A large number of misidentification syndromes have been described in the literature (cf. Joseph, 1986)—the most pertinent in this context being those involving the misidentification of

Downloaded By: [University of Liege] At: 12:15 3 November 2007

people (especially faces) such as Capgras syndrome (a familiar person replaced by a physically similar double), Fregoli syndrome (an unfamiliar person replaced by a physically similar familiar person), and the inter-metamorphosis syndrome (another person is replaced by someone with physical characteristics and an identity familiar to the subject) (Phillips & David, 1995). For instance, delusional misidentifications have been related to a dissociation between recognition and identification processes, which is furthermore associated with defects in the right hemispheric function and/or interhemispheric transmission (Phillips & David, 1995). Indeed, certain authors have argued for a role for hemispheric imbalance in schizophrenia (Cutting, 1990, 1994; Gruzelier, 1991) and schizotypy (Gruzelier, Burgess, Stygall, Irving, & Raine, 1995). Thus, one consequence of hemispheric asymmetry (in both schizophrenia and schizotypy) could be difficulties in recognition and identification processes, leading to the development of self-processing abnormalities. A possible mechanism underlying this could be a dissociation between the two processes, leading to a diminished involvement of the right hemisphere or a hemispheric imbalance, and finally ensuing in disturbances in (self) face processing.

In that various anomalies of the experience of self have been observed in both clinical (e.g., schizophrenia patients) and nonclinical (e.g., schizotypal individuals) populations, one might consider (some of) these anomalies from a dimensional/continuum view. This view maintains that features of a pathological condition such as schizophrenia lie on a continuum with normal behaviour and experience, and that schizotypy (viewed as an attenuated form or phenotype of schizophrenia) lies somewhere between these two extremes. Indeed, a large body of evidence examining, for example, cognitive and psychological mechanisms, symptom dimensions, social and genetic factors, and demographic risk factors provide evidence for such a claim (cf. Cuesta, Ugarte, Goicoa, Eraso, & Peralta, 2007; Johns & van Os, 2001). Thus, based on this, including nonclinical individuals who vary in their degree of schizotypy may advance our understanding of the mechanisms that also underlie schizophrenic phenomena. Furthermore, such an approach elucidates which features may reflect pathology (e.g., in cases where the feature is present in clinical groups, but not in nonclinical groups) or, on the other hand, features that do not necessarily reflect pathology (e.g., in cases where there are similarities between clinical and nonclinical groups).

Brédart and Young (2004) have recently examined self-face recognition difficulties in nonclinical individuals. They asked 70 young adult participants (average age was 23.2 years) to recall an incident involving difficulties in self-face recognition that they had encountered in the past. The incident had to have occurred while they were at least 16 years of age and which involved a representation of themselves (e.g., a picture, film, etc.) at the age of at least

Downloaded By: [University of Liege] At: 12:15 3 November 2007

12 years. Participants were given 72 hours to complete the assignment. A total of 51 valid incidents were collected and analysed. The result showed that there was a tendency towards three types of categories of reports: (1) misidentifications (i.e., the participants misidentified his/her own face as being that of another familiar person, $n = 5$), (2) recognition failures (i.e., the participant judged that his/her own face was that of an unfamiliar person, $n = 20$), and (3) perception of unusual aspects (i.e., the participant confidently recognised his/her own face but found that the seen face did not fit well with the representations s/he had of his/her own face, $n = 26$). Interestingly, these recognition failures and anomalies by and large corresponded with certain forms of pathological misrecognition. For instance, examples of failing to recognise oneself is seen in prosopagnosia, failure to recognise one's mirror reflection is observed in mirrored-self misidentifications, and strange feelings triggered by seeing one's own face is seen in Capgras delusions.

In order to examine self-face recognition failures in schizotypy, we adapted the retrospective diary method used in Brédart and Young (2004), resulting in the Self-Face Recognition Questionnaire (SFRQ). The SFRQ consists of six items—three of which concern recognition failures or anomalies concerning oneself (or self-face recognition difficulties), and three of which concern recognition failures or anomalies of other, familiar people (or other-face recognition difficulties). Furthermore, within these two categories, each of the three types of recognition failures and anomalies identified in Brédart and Young are represented. That is, one item concerns misidentifications, one item concerns recognition failures, and finally one item concerns perception of unusual aspects. For each item, responders are first asked to determine whether or not they have already experienced this type of recognition failure or anomaly. Furthermore, when participants answer affirmatively ("Yes") to an item, they are required to answer (on a 4-point scale) three supplementary questions concerning: (1) the frequency ("This type of experience happens to me: very rarely, rarely, often, very often"), (2) the degree of stress ("When this type of experience occurred: I was not stressed at all, a little stressed, quite stressed, very stressed"), and (3) the degree of tiredness/absent-mindedness ("When this type of experience occurred: I was not at all tired/absent-minded, a little tired/absent-minded, quite tired/absent-minded, very tired/absent-minded"). The (back-translated) items of the SFRQ are presented in Table 2.

The goals of the present study were two-fold. First, we wished to examine various psychometric properties of the SFRQ. Second, we wished to look at relations between dimensions of schizotypy, and self-face recognition failures and anomalies.

Downloaded By: [University of Liege] At: 12:15 3 November 2007

METHOD

Participants

The sample consisted of 170 nonclinical participants who were recruited from the local community. Participants were approached for their cooperation, which was voluntary. No incentive was offered for participation. An exclusion criterion for all participants was that they had never been referred for a psychiatric or neurological disorder nor have ever received a psychiatric or neurological diagnosis. Average age was 32.12 years ($SD = 11.4$; range = 18–57 years). Average years of education for participants was 14.16 years ($SD = 2.5$). The sample consisted of 85 women and 85 men.

Materials

In order to assess schizotypy, participants were asked to complete the Schizotypal Personality Questionnaire (SPQ; Raine, 1991). The SPQ is a 74-item self-report scale modelled on DSM-III-R criteria for Schizotypal Personality Disorder (SPD). The SPQ includes nine subscales to reflect the nine traits of SPD listed in both the DSM-III-R and DSM-IV. This French version of the SPQ has been translated and validated (Dumas, Rosenfeld, Saoud, Dalery, & d'Amato, 1999; Dumas et al., 2000). A confirmatory factor analysis of these nine scales (Raine et al., 1994) revealed three main subfactors: (1) cognitive-perceptual (made up of "ideas of reference", "magical thinking", "unusual perceptual experiences", "paranoid ideation"), (2) interpersonal ("social anxiety", "no close friends", "blunted affect", "paranoid ideation"), and (3) disorganisation ("odd behaviour", "odd speech").

All participants also completed the SFRQ (described above). Upon completion of the SFRQ, participants were required to rate the degree of difficulty in completing the questionnaire on a 4-point scale (1 = not at all difficult; 2 = a little difficult; 3 = quite difficult; 4 = very difficult). The mean score on the difficulty dimension was 1.70 ($SD = 0.77$). Only four participants (i.e., 2% of the sample) rated it as "very difficult" to complete. For both questionnaires, participants were explicitly asked to report experiences within the last 5 years and were asked *not* to report experiences when under the influence of alcohol and/or narcotic substances.

RESULTS

Descriptive statistics

Mean scores for the whole population for SFRQ variables (i.e., all six SFRQ items and the total SFRQ score) and for SPQ variables (i.e., the three SPQ

Downloaded By: [University of Liege] At: 12:15 3 November 2007

TABLE 1
Mean scores for SFRQ and SPQ variables for the entire population, and according to sex

	Mean for total sample (SD)	*Mean for females (SD)*	*Mean for males (SD)*	*t*	*dl*
SFRQ 1	0.21 (0.41)	0.24 (0.43)	0.19 (0.39)	0.74	168
SFRQ 2	0.26 (0.44)	0.39 (0.49)	0.14 (0.35)	3.78*	168
SFRQ 3	0.48 (0.50)	0.53 (0.50)	0.42 (0.50)	1.38	168
SFRQ 4	0.55 (0.50)	0.49 (0.50)	0.60 (0.49)	−1.39	168
SFRQ 5	0.48 (0.50)	0.49 (0.50)	0.46 (0.50)	0.46	168
SFRQ 6	0.49 (0.50)	0.48 (0.50)	0.49 (0.50)	−0.15	168
SFRQ total	2.47 (1.55)	2.62 (1.65)	2.31 (1.45)	1.34	168
Cognitive-perceptual	8.43 (5.37)	8.73 (4.9)	8.13 (5.8)	0.71	162
Interpersonal	8.7 (6.1)	8.31 (5.71)	9.08 (6.45)	−0.82	165
Disorganisation	5.1 (3.4)	5.06 (3.51)	5.06 (3.31)	0.003	166
SPQ total	22.14 (12.23)	22.10 (11.31)	22.17 (13.12)	−0.04	159

*$p < .001$.

factors and the total SPQ score) are presented in Table 1. Furthermore, *t*-tests were performed comparing female and male participants for these variables, which are also presented in Table 1. This did not reveal any significant differences for any of the variables, except for item 2 of the SFRQ (higher in females).

Descriptive statistics summarising percentage responses for the six SFRQ items are presented in Table 2. The least frequent was the item regarding self-misidentification difficulties (21.2%), and the most frequent item was item assessing other-misidentification difficulties (54.7%).

Factor analysis of SFRQ items

In order to examine the internal structure of the SFRQ, factor structure of the six items was examined by principal component analysis (PCA).[1] A Varimax rotation (with normalisation) was then performed. Additional factor analyses were performed in order to confirm factor loadings. Principal components analysis revealed three factors which accounted for 69% of the variance. Criteria for defining the factors were as follows: items were required to load above 0.6 on a factor to contribute to it, and furthermore, if an item loaded over 0.6 on both factors it only contributed to the factor it loaded highest on. Eigenvalues and percentage of variance accounted for by the three-factor solution are presented in Table 3.

[1] Please note that since this was an exploratory study, no factor solution was suggested a priori to the factor analysis.

Downloaded By: [University of Liege] At: 12:15 3 November 2007

TABLE 2
Percentage responses for the SFRQ items and their factor loadings

Item	*% yes*	*1*	*2*	*3*
When looking at myself in a mirror, a window, a video, or on a photo, I have sometimes mistaken my face for someone else's face	21.2	**0.89**	−0.07	0.03
When looking at myself in a mirror, a window, a video, or on a photo, I have sometimes not recognised myself, even though I did not confuse my face with someone else's face	26.5	**0.65**	0.38	0.13
When looking at myself in a mirror, a window, a video, or on a photo, I have sometimes found my face to be strange or unusual, even though I was aware that it was my own face	47.6	0.08	**0.84**	−0.00
I have sometimes found the face of someone I know to be strange or unusual, even though I was aware that it was this person's face	48.8	0.07	**0.74**	0.04
I have sometimes mistaken the face of someone I know with someone else's face	54.7	0.18	−0.25	**0.81**
I have sometimes not recognised the face of someone I know, even though I did not mistake this face for someone else's face	47.6	−0.04	0.36	**0.77**

Loadings >0.6 are shown in bold.

Table 2 shows loadings on the three factors, which can be characterised as representing items related to: (1) self-face recognition difficulties, (2) unusual perception of own or other faces, and (3) other-face recognition difficulties.

Frequency ratings for the three SFRQ factors are also presented in Table 3. The most frequently endorsed items were those contained in factor 3 (other-face recognition difficulties), followed by factor 2 (unusual perception), with factor 1 (self-face recognition difficulties) containing the lowest mean.

TABLE 3
Eigenvalues, percentage of variance, and mean frequency ratings for the three SFRQ factors

	Eigenvalue	*Percentage of variance*	*Mean (SD)*
Factor 1	1.84	31%	0.24 (0.34)
Factor 2	1.28	21%	0.48 (0.42)
Factor 3	1.02	17%	0.51 (0.40)

Downloaded By: [University of Liege] At: 12:15 3 November 2007

TABLE 4
Correlations between the three SFRQ factors

	Factor 1	*Factor 2*	*Factor 3*
Factor 1	–	0.23*	0.20*
Factor 2	0.23*	–	0.10
Factor 3	0.20*	0.10	–

*$p < .01$.

Demographic statistics and recognition difficulties

The total SFRQ score did not correlate with years of education, but there was found a moderate negative correlation ($r = -.20$, $p < .01$) with age. When the three SFRQ factors were included in the correlational analyses, only the SFRQ factor 1 (self-face recognition difficulties) was negatively correlated with age ($r = -.21$, $p < .01$). That is, the younger the participant, the more likely it was that self-face recognition failures would be endorsed. A t-test did not reveal significant differences in terms of sex for the total SFRQ score, $t(168) = 1.34$, $p = .1836$, nor for factor 2 (unusual perception), $t(168) = 0.73$, $p = .47$, and factor 3 (other-face recognition difficulties), $t(168) = -0.57$, $p = .57$, but there was found a significant difference (higher in females) for factor 1 (self-face recognition difficulties), $t(168) = 2.87$, $p < .01$.

We then performed correlational analyses between the three SFRQ factors. This revealed significant correlations between factor 1 (self-face recognition difficulties) and factor 2 (unusual perception), and between factor 1 (self-face recognition difficulties) and factor 3 (other-face recognition difficulties). These results are presented in Table 4. In addition, we grouped all items concerning self (i.e., items 1, 2, 3) into one variable, and those items concerning others (i.e., items 4, 5, 6) into another variable and performed a correlational analysis between these two variables. This revealed a significant correlation ($r = 0.33$, $p < .001$).

Supplementary questions

The mean ratings of stress and tiredness/absent-mindedness as a function of the type of incident are presented in Table 5.

SFRQ and SPQ

Independent t-tests were carried out comparing those participants with scores in the lowest quartile on the SPQ (i.e., scores equal to or lower than

Downloaded By: [University of Liege] At: 12:15 3 November 2007

TABLE 5
Mean ratings of stress and tiredness/absent-mindedness as a function of the type of incident

	Self			*Other*		
	Misidentification (n = 36)	*Recognition failure (n = 45)*	*Unusual (n = 81)*	*Misidentification (n = 93)*	*Recognition failure (n = 81)*	*Unusual (n = 83)*
Stress	1.58 (0.77)	1.53 (0.66)	1.53 (0.71)	1.40 (0.65)	1.27 (0.45)	1.36 (0.58)
Tiredness/absent-mindedness	2.33 (0.89)	2.07 (0.86)	2.07 (0.98)	1.90 (0.93)	1.77 (0.88)	1.61 (0.75)

Standard deviations are in parentheses.

Downloaded By: [University of Liege] At: 12:15 3 November 2007

TABLE 6
Correlational analyses between SFRQ and SPQ scores

	Cognitive-perceptual	*Interpersonal*	*Disorganisation*
SFRQ total	0.38**	0.12	0.32**
Self-face (factor 1)	0.26**	0.10	0.20*
Unusual perception (factor 2)	0.31**	0.08	0.25**
Other-face (factor 3)	0.20*	0.06	0.19*

*$p < .05$, **$p < .001$.

14; $n = 47$) with those with scores in the highest quartile (i.e., scores equal to or higher than 28; $n = 44$) on the SFRQ total score. This revealed significant differences between the two groups, $t(89) = -2.79$, $p < .01$ (i.e., high schizotypy scorers revealed higher scores on the SFRQ). The same analyses were performed for scores on the three SFRQ factors (self-face recognition difficulties, unusual perception, other-face recognition difficulties). This revealed significant differences between the two groups for all three factors: self-face recognition difficulties, $t(89) = -2.27$, $p < .05$; unusual perception, $t(89) = -2.72$, $p < .01$; and other-face recognition difficulties, $t(89) = -2.26$, $p < .05$.

Correlations between the SFRQ total score and the three SPQ dimensions (cognitive-perceptual; interpersonal; disorganisation) revealed that only the cognitive-perceptual and disorganised schizotypy dimensions correlated significantly with the SFRQ total score (see Table 6). No significant correlations with interpersonal schizotypy were found. Similarly, only the cognitive-perceptual and disorganised schizotypy dimensions correlated significantly with SFRQ factors 1 (self-face recognition difficulties), 2 (unusual perception), and 3 (other-face recognition difficulties). There were no correlations between the interpersonal schizotypy dimension and the SFRQ factors 1, 2, and 3. These findings are presented in Table 6.

In that one item of the SPQ (i.e., item 22: "When you look at a person or yourself in a mirror, have you ever seen the face change right before your eyes?") is very similar to certain items included in the SFRQ, we carried out the same analyses, albeit without this item. This revealed the exact same pattern of results. In addition, scores on item 22 of the SPQ did not correlate significantly with any of the six items contained in the SFRQ.

DISCUSSION

The present study had two goals. First, we examined the internal structure of the SFRQ. This revealed a clear three-factor structure consisting of: (1) self-face recognition difficulties, (2) unusual perception of own and other faces,

Downloaded By: [University of Liege] At: 12:15 3 November 2007

and (3) other-face recognition difficulties. Among these factors, the most frequently endorsed items were those contained in the other-recognition difficulties factor, followed by those in the factor concerning unusual perception, and finally the least endorsed items were those contained in the self-face recognition difficulties factor. Finally, correlational analyses revealed that the self-face recognition difficulties factor and the other-face recognition difficulties factor were significantly correlated with each other.

Although there was evidence that they were relatively independent (i.e., based on factor analysis), self-face recognition failures and other-face recognition failures were nonetheless also found to be associated with each other (i.e., based on correlations between these two factors). This could be interpreted as indicating common mechanisms between self-face and other-face recognition. Indeed, studies suggest that basic face recognition processes (i.e., featural, configural, and holistic processing of a facial pattern; Bruce & Young, 1998) are presumably the same for recognising one's own face and recognising other familiar faces (Brédart & Devue, 2006; Kircher et al., 2001).

Findings from the present study can be related to those reported in Brédart and Young (2004). For instance, differences in prevalence rates for the three analogous items were similar in both studies. In Brédart and Young, misidentifications were the least prevalent (10% of participants reported having this experience), followed by recognition failures (39%), and finally unusual aspects (51%). In the present study, item 1 (misidentifications) was the least prevalent (21% reported having had such an experience), followed by item 2 (recognition failures; 27%) and item 3 (unusual perception; 48%). Therefore, the relative proportions of the three kinds of self-face recognition failures were broadly similar in both studies, with unusual perception of one's own face being the most frequent experience.

The second goal of the present study involved an examination of relations between dimensions of schizotypy and the SFRQ. High and low schizotypy groups differed significantly on the SFRQ total score, and on all three SFRQ factors (self-face recognition difficulties, unusual perception, other-face recognition difficulties). Moreover, the cognitive-perceptual and disorganised schizotypy dimensions correlated significantly with the SFRQ total score. By contrast, the interpersonal schizotypy dimension was not associated with the SFRQ total score or with any of the SFRQ factors.

Furthermore, the cognitive-perceptual and disorganised schizotypy dimensions correlated significantly with the three SFRQ factors. This relation is generally in line with research suggesting a relation between disturbances of the experience of self in schizophrenia (Møller & Husby, 2000; Parnas, 2003; Parnas & Handest, 2003; Parnas et al., 1998, 2003) and in schizotypy (Platek & Gallup, 2002; Platek et al., 2003). The finding that self-face and other-face recognition difficulties were specifically related to certain schizotypy

Downloaded By: [University of Liege] At: 12:15 3 November 2007

dimensions (i.e., cognitive-perceptual and disorganised) has never been reported before in the literature. This is due to the fact that previous studies have not directly examined specific schizotypy dimensions in relation to disturbances in self (for an exception see Pickup, 2006). On a theoretical level, Sass and Parnas (2003) have maintained that cognitive-perceptual (or positive) symptoms and disorganisation symptoms are particularly associated with anomalies of the experience of self, but this had never been examined empirically.

The observed association between recognition difficulties and cognitive-perceptual schizotypy merits further discussion. The use of both contextual information and decision processes play an important role when identifying faces, including one's own face (Young, Hay, & Ellis, 1985). That is, in both self-face recognition and other-face recognition, the individual is required to seek out and collect a certain amount of contextual information (e.g., what the person is wearing or doing, or noticing where the person is), and then to decide whether or not this information is sufficient in order to correctly infer the identity of the person in question, or alternatively, to come to a decision that the person just looks like someone. Concerning the first stage, there is evidence of an inability in encoding contextual information in both schizophrenic patients and in schizotypal individuals (e.g., Barch, Mitropoulou, Harvey, New, Silverman, & Siever, 2004; Waters, Maybery, Badcock, & Michie, 2004). Indeed, some studies suggest that this may be specifically related to cognitive-perceptual symptoms such as auditory hallucinations (Waters, Badcock, Michie, & Maybery, 2006). Important to note, however, is that this supposition has yet to be examined for other cognitive-perceptual symptoms such as delusions. In addition, concerning the second step (i.e., decision processes), studies show that decision processes are also affected in individuals with cognitive-perceptual symptoms such as delusions and hallucinations (Moritz & Woodward, 2006). In particular, cognitive-perceptual symptoms have been found to be associated with a tendency to attach a high confidence rating to their responses or a so-called reduced confidence gap (i.e., overconfidence in errors combined with underconfidence in correct responses). In practical terms, this involves making decisions relatively quickly and making them based on little information (a form of the so-called "jumping to conclusion" data-gathering bias). Therefore, when in a (self or other) face recognition situation, cognitive-perceptual schizotypal individuals might be poorly encoding contextual information that helps identify a person and/or might be making hasty decisions as to the identity of the person. Future studies should examine the relative contributions of these two processes (impaired context encoding and decision processes) in face recognition in (cognitive-perceptual) schizotypy. In addition, future research should attempt to identify other cognitive processes involved in face recognition failures in schizotypy,

Downloaded By: [University of Liege] At: 12:15 3 November 2007

such as inhibition. Indeed, previous studies suggest that inhibition is associated with cognitive-perceptual symptoms in clinical and non clinical individuals (Dinn, Harris, Aycicegi, Greene, & Andover, 2002; Waters, Badcock, Maybery, & Michie, 2003; Waters et al., 2006). The presence of disturbances in inhibition may aggravate difficulties in context encoding and decision processes, and thereby increase the prevalence of face recognition failures in individuals scoring high on cognitive-perceptual schizotypy.

The finding of a lack of an association between recognition difficulties and interpersonal (or negative) schizotypy also merits further discussion. Studies suggest that positive (cognitive-perceptual) and negative (interpersonal) schizotypy represent discrete neurobehavioural dimensions. For instance, Siever (1995) posits that negative schizotypy is related to prefrontal hypodopaminergia, whereas positive schizotypy is related to hyperdopaminergia in subcortical mesolimbic structures. Furthermore, negative symptoms in schizotypy have been associated with frontal executive dysfunction, increased social anxiety, obsessive-compulsive phenomena (Dinn et al., 2002), and with deficits in emotional expression (e.g., alexithymia, and in particular, with difficulties verbalising and identifying emotions; Larøi, van der Linden, & Aleman, 2007). Since such (cognitive and emotional) processes are not implicated in recognition difficulties as measured by the SFRQ, this might explain why there was no association with the interpersonal schizotypy dimension.

The fact that the disorganisation dimension was associated with recognition difficulties is more difficult to interpret as studies have not adequately examined relations between disturbances of self and the disorganisation dimension. As previously mentioned, Sass and Parnas (2003) have argued that disorganisation symptoms may be associated with anomalies of the experience of self. In particular, they suggest that hyperreflexivity (or exaggerated self-consciousness resulting in self-alienation) and diminished self-affection (diminished intensity or vitality of one's own subjective self-presence) are related to abnormalities in the organisation of thought, speech, and attention. It may therefore be that diminished self-affection and hyperreflexivity are, at least in part, responsible for the observed relations between disorganised symptoms and recognition difficulties. These assumptions merit further study. Another explanation as to why the disorganisation dimension was associated with recognition difficulties may be related to the fact that cognitive disorganisation has been shown to overlap with positive schizotypy (cf. Bentall, Claridge, & Slade, 1989; Loughland & Williams, 1997; Mason & Claridge, 2006; Raine et al., 1994). Furthermore, a similar overlap between positive symptoms and cognitive disorganisation has also been observed in patients with schizophrenia (Arndt, Alliger, & Andreasen, 1991; Liddle, 1987; Thompson & Meltzer, 1993).

Downloaded By: [University of Liege] At: 12:15 3 November 2007

In general, the findings from the present study reveal that anomalies of self are also present in the normal, nonclinical population—in particular, in individuals with high scores on a schizotypy measure. This suggests that these (self-reported) recognition failures reflect a trait along the schizophrenia spectrum and furthermore may be considered as independent of acute psychopathology. Thus, the presence of these anomalies is not enough for them to be considered pathological. Indeed, this may be more clearly understood from a continuum-threshold perspective concerning the relationship between psychosis-proneness and clinical disorder (Johns & van Os, 2001; Siever & Davies, 2004). This view maintains that the relationship between symptoms and clinical disorder is continuous and proportional, but that beyond a certain threshold the risk for a clinical disorder (or the risk for becoming a clinical case) increases disproportionally. Studies suggest that such a threshold may be associated with the exposure to a series of genetic and environmental risk factors. For instance, in a number of (general population) studies, Krabbendam and collaborators have found that, in nonclinical individuals with self-reported hallucinatory experiences, the risk for onset of psychotic disorder is mediated by the presence of delusional ideation and the development of depressed mood (Krabbendam, Myin-Germeys, Bak, & van Os, J., 2005; Krabbendam et al., 2004, Krabbendam, Myin-Germeys, Hanssen, et al., 2005; Krabbendam & van Os, 2005). According to the authors, the relations between hallucinations and depression and anxiety may be mediated by people's interpretations of the voices. For instance, in those who perceive the voice as omnipresent and omnipotent (resulting in feeling overwhelmed or powerless), this may lead to depressed mood. On the other hand, in those who might feel threatened or humiliated by the voice, the development of delusional ideation may be an outcome. Based on findings in the present study, the presence of self-reported recognition failures does not necessarily distinguish between nonclinical and clinical individuals, but that additional features may be needed such as exposure to a series of genetic and environmental risk factors, the development of emotional reactions to the anomalies, the coexistence of other anomalous experiences, and how the individual interprets or attributes the experiences.

The present study has a number of limitations. Results are based on data from a questionnaire, which does not make allowances for controlling the conditions in which the errors occurred (e.g., lighting, quality of photos or videos). Future studies using experimental tasks are required in order to control for such variables. Also, important to mention is that an alternative explanation of the results from the present study (especially since questionnaires were utilised) may be related to the presence of an affirmative response bias or response style in participants scoring high on the schizotypy measure. In particular, it may be that participants who endorsed unusual or

Downloaded By: [University of Liege] At: 12:15 3 November 2007

anomalous experiences (e.g., those related to schizotypy) also endorsed other similarly unusual or anomalous experiences (e.g., self-face or other-face recognition anomalies), which furthermore may or may not have occurred. Indeed, studies conducted by French and collaborators have shown that individuals with paranormal beliefs and/or who have a tendency to report paranormal experiences (fantasy-proneness, hypnotic suggestibility, dissociativity, absorption, vividness of visual imagery) are more susceptible to false memories (for reviews see French, 2003; French & Wilson, 2006). It is important to note, however, that this line of research has not examined the degree of false memory susceptibility in schizotypal, compared to non-schizotypal, individuals.

Although no sex differences were observed for the total SFRQ score, the unusual perception factor or the other-face recognition difficulties factor, there was found a significant difference (higher in females) for the self-face recognition difficulties factor. The nature of this latter sex difference merits examination. Finally, an additional issue that needs to be elucidated in future studies concerns a possible relation between dissociation and self-face recognition failures. Studies have shown that dissociation and schizotypy are strongly associated (for a recent study see Merckelbach & Giesbrecht, 2006). It may well be that self-face recognition failures and anomalies are more strongly related to dissociation than schizotypy. Indeed, typical dissociative symptoms (e.g., feelings of derealisation and depersonalisation) are experiences that strongly resemble self-face recognition failures or anomalies. To the best of our knowledge, no studies have examined this important issue.

Manuscript received 20 April 2006
Manuscript accepted 9 August 2007

REFERENCES

Arndt, S., Alliger, R. J., & Andreasen, N. C. (1991). The distinction of positive and negative symptoms: The failure of a two-dimensional model. *British Journal of Psychiatry*, *158*, 317–322.

Barch, D. M., Mitropoulou, V., Harvey, P. D., New, A. S., Silverman, J. M., & Siever, L. J. (2004). Context-processing deficits in schizotypal personality disorder. *Journal of Abnormal Psychology*, *113*, 556–568.

Bentall, R.P., Claridge, G. S., & Slade, P. D. (1989). The multidimensional nature of schizotypal traits: A factor analytic study with normal subjects. *British Journal of Clinical Psychology*, *28*, 363–375.

Blakemore, S.-J., & Frith, C. (2003). Disorders of self-monitoring and the symptoms of schizophrenia. In T. Kircher & A. David (Eds.), *The self in neuroscience and psychiatry* (pp. 407–424). Cambridge, UK: Cambridge University Press.

Brébion, G., Amador, X., David, A., Malaspina, D., Sharif, Z., & Gorman, J. M. (2000). Positive symptomatology and source monitoring failure in schizophrenia: An analysis of symptom-specific effects. *Psychiatry Research*, *95*, 119–131.

Downloaded By: [University of Liege] At: 12:15 3 November 2007

Brédart, S., & Devue, C. (2006). The accuracy of memory for personally known individuals' faces. *Perception*, *35*, 101–106.

Brédart, S., & Young, A. W. (2004). Self-recognition in everyday life. *Cognitive Neuropsychiatry*, *9*, 183–197.

Bruce, V., & Young, A. (1998). *In the eye of the beholder: The science of face perception*. Oxford, UK: Oxford University Press.

Cuesta, M. J., Ugarte, M. D., Goicoa, T., Eraso, S., & Peralta, V. (2007). A taxometric analysis of schizophrenia symptoms. *Psychiatry Research*, *150*, 245–253.

Cutting, J. (1990). *The right hemisphere and psychiatric disorders*. Oxford, UK: Oxford University Press.

Cutting, J. C. (1994). Evidence for right hemisphere dysfunction in schizophrenia. In A. S. David & J. C. Cutting (Eds.), *The neuropsychology of schizophrenia* (pp. 231–242). Hove, UK: Psychology Press.

Danion, J.-M., Rizzo, L., & Bruant, A. (1999). Functional mechanisms underlying impaired recognition memory and conscious awareness in patients with schizophrenia. *Archives of General Psychiatry*, *56*, 639–644.

Dinn, W. M., Harris, C. L., Aycicegi, A., Greene, P., & Andover, M. S. (2002). Positive and negative schizotypy in a student sample: Neurocognitive and clinical correlates. *Schizophrenia Research*, *56*, 171–185.

Dumas, P., Bouafia, S., Gutknecht, C., Saoud, M., Dalery, J., & d'Amato, T. (2000). Validation de la version française du questionnaire de personnalité schizotypique en population étudiante saine. *L'Encéphale*, *26*, 23–29.

Dumas, P., Rosenfeld, F., Saoud, M., Dalery, J., & d'Amato, T. (1999). Traduction et adaptation française du questionnaire de personnalité schizotypique de Raine (SPQ). *L'Encéphale*, *15*, 315–322.

French, C. C. (2003). Fantastic memories: The relevance of research into eyewitness testimony and false memories for reports of anomalous experiences. *Journal of Consciousness Studies*, *10*, 153–174.

French, C. C., & Wilson, K. (2006). Incredible memories—How accurate are reports of anomalous events? *European Journal of Parapsychology*, *21*, 166–181.

Gruzelier, J. H. (1991). Hemispheric imbalance: Syndromes of schizophrenia, premorbid personality, and neurodevelopmental influences. In S. Steinhauer, J. Gruzelier, & J. Zubin (Eds.), *Handbook of schizophrenia: Vol. IV. Experimental psychopathology, neuropsychology and psychophysiology* (pp. 599–650). Amsterdam: Elsevier.

Gruzelier, J. H., Burgess, A., Stygall, J., Irving, G., & Raine, A. (1995). Patterns of cognitive asymmetry and syndromes of schizotypal personality. *Psychiatry Research*, *56*, 71–79.

Johns, L., & van Os, J. (2001). The continuity of psychotic experiences in the general population. *Clinical Psychology Review*, *21*, 1125–1141.

Joseph, A. B. (1986). Focal central nervous system abnormalities in patients with misidentification syndromes. *Bibliotheca Psychiatrica*, *164*, 68–79.

Joseph, A. B. (1994). Observations on the epidemiology of the delusional misidentification syndromes in the Boston metropolitan area: April 1983–June 1984. *Psychopathology*, *27*, 150–153.

Keenan, J. P., Wheeler, M. A., Gallup, G. G., & Pascual-Leone, A. (2000). Self-recognition and the right prefrontal cortex. *Trends in Cognitive Sciences*, *4*, 338–344.

Kircher, T., & David, A. (2003). *The self in neuroscience and psychiatry*. Cambridge, UK: Cambridge University Press.

Kircher, T. T. J., Senior, C., Phillips, M. L., Rabe-Hesketh, S., Benson, P. J., Bullmore, E. T., et al. (2001). Recognizing one's own face. *Cognition*, *78*, B1–B15.

Kirov, G., Jones, P., & Lewis, S. W. (1994). Prevalence of delusional misidentification syndromes. *Psychopathology*, *27*, 148–149.

Downloaded By: [University of Liege] At: 12:15 3 November 2007

Krabbendam, L., Myin-Germeys, I., Bak, M., & van Os, J. (2005). Explaining transitions over the hypothesized psychosis continuum. *Australian and New Zealand Journal of Psychiatry*, *39*, 180–186.

Krabbendam, L., Myin-Germeys, I., Hanssen, M., Bijl, R. V., de Graaf, R., Vollebergh, W., et al. (2004). Hallucinatory experiences and onset of psychotic disorder: Evidence that the risk is mediated by delusion formation. *Acta Psychiatrica Scandinavica*, *110*, 264–272.

Krabbendam, L., Myin-Germeys, I., Hanssen, M., de Graaf, R., Vollebergh, W., Bak, M., & van Os, J. (2005). Development of depressed mood predicts onset of psychotic disorder in individuals who report hallucinatory experiences. *British Journal of Clinical Psychology*, *44*, 113–125.

Krabbendam, L., & van Os, J. (2005). Affective processes in the onset and persistence of psychosis. *European Archives of Psychiatry and Clinical Neuroscience*, *255*, 185–189.

Larøi, F., van der Linden, M., & Aleman, A. (2007). Associations between dimensions of alexithymia and psychometric schizotypy in non-clinical participants. *Manuscript submitted for publication*.

Liddle, P. F. (1987). The symptoms of chronic schizophrenia: A re-examination of the positive-negative dichotomy. *British Journal of Psychiatry*, *151*, 145–151.

Loughland, C. M., & Williams, L. M. (1997). A cluster analytic study of schizotypal trait dimensions. *Personality and Individual Differences*, *23*, 877–883.

Mason, O., & Claridge, G. (2006). The Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE): Further description and extended norms. *Schizophrenia Research*, *82*, 203–211.

Merckelbach, H., & Giesbrecht, T. (2006). Subclinical dissociation, schizotypy, and traumatic distress. *Personality and Individual Differences*, *40*, 365–374.

Moritz, S., & Woodward, T. S. (2006). The contribution of metamemory deficits to schizophrenia. *Journal of Abnormal Psychology*, *155*, 15–25.

Møller, P., & Husby, R. (2000). The initial prodrome in schizophrenia: Searching for naturalistic core dimensions of experience and behaviour. *Schizophrenia Bulletin*, *26*, 217–232.

Parnas, J. (2003). Self and schizophrenia: A phenomenological perspective. In T. Kircher & A. David (Eds.), *The self in neuroscience and psychiatry* (pp. 217–241). Cambridge, UK: Cambridge University Press.

Parnas, J., & Handest, P. (2003). Phenomenology of anomalous self-experience in early schizophrenia. *Comprehensive Psychiatry*, *44*, 121–134.

Parnas, J., Handest, P., Sæbye, D., & Jansson, L. (2003). Anomalies of subjective experience in schizophrenia and psychotic bipolar illness. *Acta Psychiatrica Scandinavica*, *108*, 126–133.

Parnas, J., Jansson, L., Sass, L. A., & Handest, P. (1998). Self-experience in the prodromal phases of schizophrenia: A pilot study of first admissions . *Neurology, Psychiatry, Brain Research*, *6*, 97–106.

Phillips, M. L., & David, A. S. (1995). Facial processing in schizophrenia and delusional misidentification: Cognitive neuropsychiatric approaches. *Schizophrenia Research*, *17*, 109–114.

Pickup, G. J. (2006). Theory of mind and its relation to schizotypy. *Cognitive Neuropsychiatry*, *11*, 177–192.

Platek, S. M., & Gallup, G. G. (2002). Self-face recognition is affected by schizotypal personality traits. *Schizophrenia Research*, *57*, 311–315.

Platek, S. M., Myers, T. E., Critton, S. R., & Gallup, G. G. (2003). A left-hand advantage for self-description and the effects of schizotypal personality traits. *Schizophrenia Research*, *65*, 147–151.

Raine, A. (1991). The SPQ: A scale for the assessment of schizotypal personality based on DSM-III-R criteria. *Schizophrenia Bulletin*, *17*, 555–564.

Downloaded By: [University of Liege] At: 12:15 3 November 2007

Raine, A., Reynolds, C., Lencz, T., Scerbo, A., Triphon, N., & Kim, D. (1994). Cognitive perceptual, interpersonal and disorganized features of schizotypal personality. *Schizophrenia Bulletin*, *20*, 191–202.

Sass, L. A., & Parnas, J. (2003). Schizophrenia, consciousness, and the self. *Schizophrenia Bulletin*, *29*, 427–444.

Siever, L. J. (1995). Brain structure/function and the dopamine system in schizotypal personality disorder. In A. Raine, T. Lencz, & S. A. Mednick (Eds.), *Schizotypal personality* (pp. 272–286). New York: Cambridge University Press.

Siever, L. J., & Davies, K. L. (2004). The pathophysiology of schizophrenia disorders: Perspectives from the spectrum. *American Journal of Psychiatry*, *161*, 398–413.

Thompson, P. A., & Meltzer, H. Y. (1993). Positive, negative, and disorganisation factors from the Schedule for Affective Disorders and Schizophrenia and the Present State Examination. *British Journal of Psychiatry*, *163*, 344–351.

Waters, F. A. V., Badcock, J. C., Maybery, M. T., & Michie, P. T. (2003). Inhibition in schizophrenia: Association with auditory hallucinations. *Schizophrenia Research*, *62*, 275–280.

Waters, F. A. V., Badcock, J. C., Michie, P. T., & Maybery, M. T. (2006). Auditory hallucinations in schizophrenia: Intrusive thoughts and forgotten memories. *Cognitive Neuropsychiatry*, *11*, 65–83.

Waters, F. A. V., Maybery, M. T., Badcock, J. C., & Michie, P. T. (2004). Context memory and binding in schizophrenia. *Schizophrenia Research*, *68*, 119–125.

Young, A. W., Hay, D. C., & Ellis, A. W. (1985). The faces that launched a thousand ships: Everyday difficulties and errors in recognising people. *British Journal of Psychology*, *76*, 495–523.