Published in final edited form as:

Psychiatry Res. 2012 March 30; 196(1): 109–114. doi:10.1016/j.psychres.2011.08.012.

Relationship between Personality Disorder Dimensions and Verbal Memory Functioning in a Community Population

Subin Park^a, Jin Pyo Hong^a, Hochang B. Lee^b, Jack Samuels^b, O. Joseph Bienvenu^b, Hye Yoon Chung^a, William W. Eaton^c, Paul T. Costa Jr^d, and Gerald Nestadt^b

^aDepartment of Psychiatry, Asan Medical Center, School of Medicine, Ulsan University, Seoul, Korea

^bDepartment of Psychiatry and Behavioral Sciences, School of Medicine, The Johns Hopkins University, Baltimore, MD, USA

^cDepartment of Mental Health, The Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA

^dGerontology Research Center, National Institute on Aging, Baltimore, MD, USA

1. Introduction

Individuals diagnosed with personality disorders (PDs) tend to have enduring patterns of difficulties in cognition, affect, interpersonal functioning, and impulse control (American Psychiatric Association., 2000). Symptoms of borderline, schizotypal, and antisocial PDs, such as impulsivity, poor planning, dissociation, questionable judgment, and aggression, have suggested that individuals with PDs may have impaired neuropsychological function. The literature on several PD abounds with reports of memory difficulties (Voglmaier et al., 1997; Korfine and Hooley, 2000; Monarch et al., 2004; Mitropoulou et al., 2005), perceptual distortions (George and Soloff, 1986; Sundbom et al., 1989; Stevens et al., 2004), and impaired executive function (Gorenstein, 1982; Malloy et al., 1990; Burgess, 1992; Voglmaier et al., 1997; Stevens et al., 2004).

Individuals with PD seen by medical personnel often report lowered cognitive functions, especially those related to memory. Subjective memory complaints may be related to real memory deficits, or may be associated with personality characteristics such as feelings of poor mastery, low perceived self-efficacy, and high neuroticism (Vermeulen et al., 1993; Hanninen et al., 1994; Comijs et al., 2002). Subject self-ratings about everyday functioning have been reported to be much more strongly correlated with scores on a personality inventory than with results of neuropsychological tests (Heaton and Pendleton, 1981).

Previous studies of cognition in PD patients have focused mainly on schizotypal (Voglmaier et al., 1997; Bergman et al., 1998; Mitropoulou et al., 2005; Noguchi et al., 2008), borderline (Burgess, 1992; Korfine and Hooley, 2000; Monarch et al., 2004; Stevens et al., 2004), and antisocial (Gorenstein, 1982; Malloy et al., 1990; Burgess, 1992) PDs, and there

© 2012 Elsevier Ireland Ltd. All rights reserved.

Please address reprint requests to Dr. Gerald Nestadt, Meyer 131, 600 N Wolfe St., Baltimore, Maryland, 21287. gnestadt@jhmi.edu, Tel 410-955-4838 Fax 410-614-5913.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

have not been comprehensive reports that have included all DSM-IV PDs. In addition, previous studies generally measured objective cognitive function, with only one report assessing subjective memory function in individuals with schizotypal PD (Chan et al., 2008). We therefore examined the relationships between personality score for each DSM-IV PD, measured dimensionally, and subjective appraisals and objective measures of memory function.

Individuals can suffer simultaneously from an Axis I condition as well as a PD, making it difficult to differentiate the effects of PD and the Axis I condition on memory function and complaint in such subjects. Thus, several studies have excluded PD patients with comorbid Axis I conditions (Voglmaier et al., 1997; Mitropoulou et al., 2002; Stevens et al., 2004; Noguchi et al., 2008). However, personality and Axis I disorders may share genetic (Stein et al., 2002; Siever and Davis, 2004), neurophysiological (Siever and Davis, 2004; Kiang and Kutas, 2005), neuropsychological (Spaulding et al., 1989; Siever and Davis, 2004), and neuroimaging (Dickey et al., 2002) abnormalities, making it difficult to completely separate these disorders. For example, schizotypal PD may be related to schizophrenia (Siever and Davis, 2004), and avoidant personality disorder and social phobia may be overlapping constructs, with slight differences in severity (Widiger, 1992). We therefore assessed the relationship between memory functioning and specific personality disorder dimensions, both with and without adjusting for Axis I disorders. An important strength of this study is that these participants were community-residing individuals not selected for treatment.

The main research questions we addressed were:

1. Are scores on personality disorder dimensions related only to subjective, self-reported memory decline, or are they also related to objectively-measured memory functioning?
2. Do scores on personality disorder dimensions have effects on memory, independent of the effects of Axis I disorders?

Based on the results of previous studies, we hypothesized that 1) personality disorder dimensions are associated with memory dysfunction; 2) some personality disorder dimensions are associated with subjective appraisal, but not objective measures, of memory function; and, 3) other personality disorder dimensions are associated with both objective measures and subjective appraisals of memory function.

2. Methods

2.1. Sample

The Hopkins Epidemiology of Personality Disorder Study (HEPS) has been described in detail elsewhere (Samuels et al., 2002). Individuals in the HEPS were sampled from the Baltimore Epidemiologic Catchment Area (ECA) follow-up survey, which has also been described previously (Eaton et al., 1997; Samuels et al., 2002). In the original Baltimore ECA study, 3,481 adult residents of households in east Baltimore were sampled probabilistically and were interviewed using the Diagnostic Interview Schedule (DIS); 810 of these subjects were also examined by psychiatrists as part of a Clinical Reappraisal (Anthony et al., 1985).

In the early 1990s the Baltimore ECA follow-up study re-interviewed participants from the original Baltimore ECA sample. Of those known to be alive at the time of follow-up, 1,920 individuals (73%) were re-interviewed using the DIS and the Schedule for Clinical Assessment in Neuropsychiatry (SCAN, version 1.5). From these 1,920 subjects, we selected all those who were examined by psychiatrists in 1981 (n=443), as well as all

subjects who were identified by the DIS as having a lifetime diagnosis of mania, depression, panic disorder, obsessive-compulsive disorder, alcohol use disorders, or drug use disorders, at follow-up (n=593). In addition, a random sample (222/884; 25%) was selected from the remaining subjects.

Of the 1,258 subjects selected using these criteria, 516 could not be interviewed because they (a) could not be traced (n=144); (b) refused participation (n=134); (c) were deceased (n=103); or, (d) were too ill or elderly to participate (n=92); another 43 subjects had interviews pending when data collection was terminated for budgetary reasons at the end of 1999. A total of 742 subjects completed personality examinations between 1997 and 1999, and 736 subjects were included in the present study after excluding 6 subjects who had been diagnosed with dementia. The gender and ethnic distributions of these subjects were similar to those of the 516 subjects who were not interviewed; however, the interviewed subjects were younger (mean age 51 years) than non-interviewed subjects (mean age 61 years). The gender and ethnic distributions of the study subjects were also similar to those of the 3,481 subjects examined in 1981, although the study subjects were younger.

2.2. Personality assessment

The personality assessments were conducted by four masters-level clinical psychologists. Informed consent was obtained from each subject prior to the interview. Personality disorder dimensions were assessed using the International Personality Disorder Examination (IPDE) (Loranger et al., 1994), a semi-structured instrument designed to be administered by clinicians to detect all relevant criteria for diagnosis of all DSM-IV or ICD-10 PDs. The psychologists were directed to evaluate abnormal personality traits manifested by subjects over their entire adult lives. Each criterion was rated „0? (absent), „1? (accentuated or exaggerated), „2? (criterion level or pathological), or „9? (missing or unknown). A dimensional score was calculated for each of the 10 DSM-IV PDs by summing the scores for each constituent feature of the specific disorder.

In 40 jointly rated interviews, the intra-class correlation coefficients for number of DSM-IV PD traits rated present („1? or „2?) were: schizoid (0.81); schizotypal (0.58); paranoid (0.63); antisocial (0.80); borderline (0.76); histrionic (0.62); narcissistic (0.62); avoidant (0.89); dependent (0.76); and obsessive-compulsive (0.70).

During the informed consent procedure, the subject was asked to provide the names of three individuals who knew him/her well over most of his/her adult life. Following the interview, the examiners interviewed at least one of these informants by telephone, using questions from the IPDE, scored as above. The examiners were required to evaluate more than half of the criteria for each of the PDs, and they were also encouraged to ask the informant about additional criteria. The required criteria were those that occurred most frequently, based on prior studies in eastern Baltimore (Samuels et al., 1994). The total personality assessment (subject and informant) took an average of about 3 hours to complete. After each interview, the psychologist formulated a final rating for each criterion based on clinical judgment of both subject and informant reports, and completed a case summary describing the personality of each subject. This assessment has been described previously (Samuels et al., 1994).

2.3. Assessment of Axis I Disorders

Lifetime psychiatric diagnoses were made by board-certified psychiatrists who examined participants using the SCAN (Wing et al., 1990) for psychiatric disorders according to DSM-III-R criteria (American Psychiatric Association., 1987). The DSM-III-R disorders assessed in this study included alcohol use disorders; substance use disorders other than

alcohol; major depressive disorder; bipolar disorder; psychotic disorders including schizophrenia, delusional disorder, and psychotic disorders not elsewhere classified; and anxiety disorders, including obsessive-compulsive disorder, panic disorder, agoraphobia, and social phobia. We were unable to divide psychotic disorders and anxiety disorders into subcategories because of the low prevalence of these conditions, which would have decreased statistical power.

2.4. Memory assessment

During the ECA follow-up study of the original Baltimore ECA cohort between 1993 and 1996 (Eaton et al., 1997), each participant was asked how his/her memory compared with that of other people of the same age, rated on a 5-point scale as “excellent (1)”, “good (2)”, “fair (3)”, “poor (4)”, or “very poor (5)”. Participants also were asked whether they ever worried about forgetting things they needed to remember, and to rate the frequency of worry as “none (1)”, “occasional (2)”, and “often (3)”. To measure objective verbal memory function, modified version of Californian Verbal Learning Test (CVLT) (Delis et al., 1987) was used. Participants were told 20 words and asked to recall them immediately and again 20 minutes later (i.e., immediate and delayed recall). Participants were also asked to recognize these 20 words among a set of 40 words (i.e., recognition). Numbers of correct answer are scores of each test, therefore the higher the score is, the better memory function of participant is.

2.5. Statistical analysis

Proportion and frequency distribution of each data was presented through descriptive statistics calculation. We used multiple regression analysis employing either subjective appraisal or an objective measure of memory as the dependent variable and each IPDE personality score as an independent variable. Separate models were evaluated, with and without controls for comorbid Axis I disorders (alcohol use disorders, substance use disorders other than alcohol, major depressive disorder, bipolar disorder, psychotic disorders, and anxiety disorders). All models included age, gender, education, and marital status, as these might confound any relationship between personality trait score and memory. All statistical analyses were performed using SPSS (version 12.0; SPSS Inc., Chicago, IL), with statistical significance defined as an alpha level <0.05 .

3. Results

Table 1 shows the demographic and clinical characteristics of respondents. Mean age was 51.2 (SD: 12.6) years, and mean education level was 12.1 (SD: 2.7) years.

Table 2 shows the subjective appraisal of memory and performance on modified version of CVLT of participants. Only 3.7% of participants answered that their memory functioning were poor to very poor compared to other people of the same age, and only 5.4% of participants answered that they often worried about forgetting things they needed to remember.

Table 3 shows the results of multiple regression models with subjective appraisal of memory as the main outcome variable and each personality disorder dimension score as the principal predictor, with and without adjustment for Axis I disorders. After adjusting for age, gender, education, and marital status (model 1), schizoid, schizotypal, borderline, adulthood antisocial, avoidant, dependent, and obsessive-compulsive personality disorder dimension scores were positively correlated with lack of confidence in memory and/or increased worry about memory. Further adjustment for the presence of Axis I disorders (model 2) did not affect most of these associations, although correlations between dependent and obsessive-

compulsive personality disorder dimension scores and subjective appraisal of memory disappeared.

Table 4 displays the results of multiple regression models with objective measures of verbal memory as the main outcome variable and each personality disorder dimension score as the principal predictor, with and without adjustment for Axis I disorders. After adjusting for age, gender, education and marital status (model 1), schizoid dimension score was negatively correlated with delayed recall and recognition, and schizotypal dimension score was negatively correlated with delayed recall. Further adjustment for the presence of Axis I disorders (model 2) did not affect these associations, and showed an additional positive correlation between histrionic dimension score and immediate recall. The obsessive-compulsive dimension score was positively correlated with delayed recall after adjusting for age, gender, education and marital status (model 1), but this association disappeared after further adjustment for the presence of Axis I disorders (model 2).

4. Discussion

For most personality disorder dimensions, there are subjective claims of lowered memory, but this does not indicate an actual defect in objective memory. The occurrence of an Axis I disorders does not, in general, mediate the relationships between DSM-IV PD traits and memory dysfunction. The relationship between DSM-IV PD traits and subjective appraisal of memory may be influenced by the occurrence of Axis I disorders in the case of dependent and obsessive-compulsive disorder dimensions. However, we found that schizoid, schizotypal, borderline, antisocial, and avoidant dimension scores accounted for the variance of subjective memory on their own.

Although no study to date has investigated the association between memory complaints and the dimensional scores of DSM-IV PD, several previous reports found that memory complaints were associated with normal personality dimensions, such as low feeling of mastery, low perceived self-efficacy, high neuroticism, greater tendencies toward somatic complaints, and higher feelings of anxiety (Hanninen et al., 1994; Comijs et al., 2002). These personality characteristics are commonly seen in subjects with DSM-IV PDs (Trull and Durrett, 2005; Trull et al., 2007; Widiger and Mullins-Sweatt, 2009). For example, individuals with borderline PD show low feelings of mastery, low perceived self-efficacy, and high neuroticism, and individuals with avoidant PD show low perceived self-efficacy, high neuroticism, and greater feelings of anxiety (Goldman et al., 1994; Dyce and O'Connor, 1998; Livesley, 1998; O'Connor and Dyce, 1998; Widiger and Mullins-Sweatt, 2009). In addition, some symptoms seen in patients with DSM-IV PDs, such as dissociation in borderline PD and depersonalization or derealization in schizotypal PD, may affect their memory, in particular emotional memory (Montagne et al., 2007; Ebner-Priemer et al., 2009), and contribute to their worry about memory functioning. When working with patients complaining about subjective memory impairment, clinicians may make use of specific strategies that consider their personality traits. For example, for individuals with borderline personality traits, dissociative symptoms should be assessed, and improving self-mastery may be helpful, and for individuals with avoidant personality traits, decreasing anxiety and improving self-efficacy may be helpful.

Many studies have examined the subjective memory confidence in individuals with obsessive-compulsive disorder (Boschen and Vuksanovic, 2007; Nedeljkovic and Kyrios, 2007; Hermans et al., 2008). Doubt, checking, and rumination may decrease the confidence of such individuals in memory function. Although many studies reported executive function deficit in individuals with obsessive-compulsive PD, verbal memory impairment was seldom found in these people (Aycicegi-Dinn et al., 2009). We found, however, that the

obsessive-compulsive dimension score was positively correlated with objective verbal memory impairment (delayed recall) as well as worry about memory functioning, but only when not adjusting for the presence of axis I disorders. This may suggest that the obsessive-compulsive traits without comorbid obsessive-compulsive disorder does not greatly increase concern about memory functioning or impair verbal memory functioning. Individuals with schizoid and schizotypal traits show significant relationships to objective memory impairment, as well as to subjective memory complaints, even adjusting for the presence of Axis I disorders. These results indicate that individuals with schizophrenia spectrum disorders are vulnerable to memory dysfunction, a finding consistent with considerable prior research (Voglmaier et al., 1997; Bergman et al., 1998; Mitropoulou et al., 2005).

To our knowledge, there has been no previous reported study on memory function in individuals with schizoid PD or schizoid traits, although several reports found memory impairment in subjects with schizotypal PD and schizophrenia (Mitropoulou et al., 2005; Chan et al., 2008; Landro and Ueland, 2008). Only one study to date has examined subjective memory complaints in individuals with schizotypal PD, finding that subjective complaints of memory deficits were higher in individuals with schizotypal PD than in patients with schizophrenia, or controls (Chan et al., 2008). As patients with schizophrenia present cognitive and perceptual distortions (American Psychiatric Association., 2000), such patients may have poor estimations of their own cognitive deficits and functional capacity. In contrast, individuals with schizotypal or schizoid personality traits may not exhibit this lack of awareness, and hence may be able to report their cognitive problems more accurately.

Previous studies have reported that verbal memory function is impaired in subjects with schizotypal PD (Voglmaier et al., 1997; Bergman et al., 1998; Mitropoulou et al., 2005), but it is not impaired in those with psychometric or non-clinical schizotypal traits (Lenzenweger and Gold, 2000; Jahshan and Sergi, 2007; Noguchi et al., 2008). We found, however, that schizotypal traits affected performance on verbal memory, especially delayed recall. These discordant results may be attributable to the use of different measures of schizotypy. Thus, the earlier studies used the Schizotypal Personality Questionnaire (Raine, 1991), a self-reporting instrument with a “yes/no” response format, or the Perceptual Aberration Scale (Chapman et al., 1978), a true-false self-report measure of disturbances and distortions in perceptions of body image. In the present study, however, we used the IPDE, a semi-structured interview for DSM-IV or ICD-10 PD criteria, and examiners interviewed at least one informant who knew each participant well, in addition to the participants.

Although we found that scores on the schizotypal personality disorder dimension were associated with verbal memory impairment, there was no relationship between the schizotypal dimension and memory with the use of cues (*e.g.*, showing a normal range of recognition). Thus, clinicians may make use of cueing strategies when working with such patients. In contrast, increasing scores on the schizoid personality disorder dimension were related to impaired verbal memory, both with and without the use of cues.

Our finding that individuals with higher histrionic trait scores had good immediate recall, after adjusting for Axis I disorders, has not been previously observed. Certain characteristics of such individuals, such as attention-seeking and suggestibility (American Psychiatric Association., 2000), may be related to good immediate recall, although they may complain of memory dysfunction. Although previous studies reported neuropsychological impairment in individuals with borderline and antisocial PDs (Gorenstein, 1982; Malloy et al., 1990; Burgess, 1992; Monarch et al., 2004; Stevens et al., 2004), we did not observe any correlations between these personality traits and objective verbal memory function. It may be that these differences are found only between extremes on these dimensions (*i.e.*,

between individuals with and without personality disorders), and not in a graded fashion dimensionally. In addition, these PD are more closely associated with executive than with memory functions (Gorenstein, 1982; Malloy et al., 1990; Burgess, 1992; Monarch et al., 2004; Stevens et al., 2004).

This study had several limitations. First, not all DSM-IV disorders was included when adjusting for Axis I disorders, so it is unclear whether other Axis I disorders, such as somatoform disorder and generalized anxiety disorder, might affect the associations between personality traits and verbal memory functioning. Second, the participants did not comprise a true random sample of the population at the time of the follow-up interview. For example, the study sample over-selected for individuals identified by the DIS as having a lifetime diagnosis of a specific disorder, including mania, depression, panic disorder, obsessive-compulsive disorder, alcohol use disorder, or substance use disorder other than alcohol. However, as explained above, the gender and ethnic distributions of study subjects were similar to the 3,481 subjects of the original Baltimore ECA study, although our study subjects were significantly younger. Third, we did not adjust for current medication use, although some psychotropic and other medications might impact memory functioning (Lister et al., 1988; Spohn and Strauss, 1989; Pachet and Wisniewski, 2003; Thomasius et al., 2006; Umka et al., 2010). Finally, we studied DSM-IV personality disorder dimensions rather than DSM-IV PD diagnoses. Group differences between individuals with and without PDs might be even more pronounced than the findings of current study. Nevertheless, our dimensional approach has its own merits of being applicable to individuals with non-clinical personality traits.

In terms of clinical implication, when patient complaints about lowered memory function, clinicians should conduct a detailed personality assessment as well as neuropsychological assessment. Future studies with more detailed exploration of the presence of Axis I disorders and use of neuropsychiatric medications will provide further information on associations between personality traits and verbal memory functioning in the community.

References

- American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 3rd, Revision ed.. Washington DC: American Psychiatric Association; 1987.
- American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 4th, Text Revision ed. Washington DC: American Psychiatric Association; 2000.
- Anthony JC, Folstein M, Romanoski AJ, Von Korff MR, Nestadt GR, Chahal R, Merchant A, Brown CH, Shapiro S, Kramer M, et al. Comparison of the lay Diagnostic Interview Schedule and a standardized psychiatric diagnosis. Experience in eastern Baltimore. Archives of General Psychiatry. 1985; 42:667–675. [PubMed: 4015308]
- Aycicegi-Dinn A, Dinn WM, Caldwell-Harris CL. Obsessive-compulsive personality traits: compensatory response to executive function deficit? International Journal of Neuroscience. 2009; 119:600–608. [PubMed: 19229723]
- Bergman AJ, Harvey PD, Roitman SL, Mohs RC, Marder D, Silverman JM, Siever LJ. Verbal learning and memory in schizotypal personality disorder. Schizophrenia Bulletin. 1998; 24:635–641. [PubMed: 9853795]
- Boschen MJ, Vuksanovic D. Deteriorating memory confidence, responsibility perceptions and repeated checking: comparisons in OCD and control samples. Behaviour Research and Therapy. 2007; 45:2098–2109. [PubMed: 17459333]
- Burgess JW. Neurocognitive impairment in dramatic personalities: histrionic, narcissistic, borderline, and antisocial disorders. Psychiatry Research. 1992; 42:283–290. [PubMed: 1496059]
- Chan RC, Wang Y, Ma Z, Hong XH, Yuan Y, Yu X, Li Z, Shum D, Gong QY. Objective measures of prospective memory do not correlate with subjective complaints in schizophrenia. Schizophrenia Research. 2008; 103:229–239. [PubMed: 18420383]

- Chapman LJ, Chapman JP, Raulin ML. Body-image aberration in Schizophrenia. *J Abnormal Psychology*. 1978; 87:399–407.
- Comijs HC, Deeg DJ, Dik MG, Twisk JW, Jonker C. Memory complaints; the association with psycho-affective and health problems and the role of personality characteristics. A 6-year follow-up study. *Journal of Affective Disorders*. 2002; 72:157–165. [PubMed: 12200206]
- Delis, DC.; Kramer, JH.; Kaplan, E.; Ober, BA. The psychological corporation. New York: Harcourt Brace Jovanovich; 1987. CVLT: Californian verbal learning test.
- Dickey CC, McCarley RW, Shenton ME. The brain in schizotypal personality disorder: a review of structural MRI and CT findings. *Harvard Review of Psychiatry*. 2002; 10:1–15. [PubMed: 11751641]
- Dyce JA, O'Connor BP. Personality disorders and the five-factor model: a test of facet-level predictions. *Journal of Personality Disorders*. 1998; 12:31–45. [PubMed: 9573518]
- Eaton WW, Anthony JC, Gallo J, Cai G, Tien A, Romanoski A, Lyketsos C, Chen LS. Natural history of Diagnostic Interview Schedule/DSM-IV major depression. The Baltimore Epidemiologic Catchment Area follow-up. *Archives of General Psychiatry*. 1997; 54:993–999. [PubMed: 9366655]
- Ebner-Priemer UW, Mauchnik J, Kleindienst N, Schmahl C, Peper M, Rosenthal MZ, Flor H, Bohus M. Emotional learning during dissociative states in borderline personality disorder. *Journal of Psychiatry Neurosci*. 2009; 34:214–222.
- George A, Soloff PH. Schizotypal symptoms in patients with borderline personality disorders. *American Journal of Psychiatry*. 1986; 143:212–215. [PubMed: 3946657]
- Goldman RG, Skodol AE, McGrath PJ, Oldham JM. Relationship between the Tridimensional Personality Questionnaire and DSM-III-R personality traits. *American Journal of Psychiatry*. 1994; 151:274–276. [PubMed: 8296904]
- Gorenstein EE. Frontal lobe functions in psychopaths. *Journal of Abnormal Psychology*. 1982; 91:368–379. [PubMed: 7142574]
- Hanninen T, Reinikainen KJ, Helkala EL, Koivisto K, Mykkanen L, Laakso M, Pyorala K, Riekkinen PJ. Subjective memory complaints and personality traits in normal elderly subjects. *Journal of the American Geriatric Society*. 1994; 42:1–4.
- Heaton RK, Pendleton MG. Use of Neuropsychological tests to predict adult patients' everyday functioning. *Journal of Consulting and Clinical Psychology*. 1981; 49:807–821. [PubMed: 7309951]
- Hermans D, Engelen U, Grouwels L, Joos E, Lemmens J, Pieters G. Cognitive confidence in obsessive-compulsive disorder: distrusting perception, attention and memory. *Behaviour Research and Therapy*. 2008; 46:98–113. [PubMed: 18076865]
- Jahshan CS, Sergi MJ. Theory of mind, neurocognition, and functional status in schizotypy. *Schizophrenia Research*. 2007; 89:278–286. [PubMed: 17092692]
- Kiang M, Kutas M. Association of schizotypy with semantic processing differences: an event-related brain potential study. *Schizophrenia Research*. 2005; 77:329–342. [PubMed: 15919182]
- Korfine L, Hooley JM. Directed forgetting of emotional stimuli in borderline personality disorder. *Journal of Abnormal Psychology*. 2000; 109:214–221. [PubMed: 10895559]
- Landro NI, Ueland T. Verbal memory and verbal fluency in adolescents with schizophrenia spectrum disorders. *Psychiatry and Clinical Neuroscience*. 2008; 62:653–661.
- Lenzenweger MF, Gold JM. Auditory working memory and verbal recall memory in schizotypy. *Schizophrenia Research*. 2000; 42:101–110. [PubMed: 10742648]
- Lister RG, Weingartner H, Eckardt MJ, Linnoila M. Clinical relevance of effects of benzodiazepines on learning and memory. *Psychopharmacology Series*. 1988; 6:117–127. [PubMed: 2905802]
- Livesley WJ. Suggestions for a framework for an empirically based classification of personality disorder. *Canadian Journal of Psychiatry*. 1998; 43:137–147.
- Loranger AW, Sartorius N, Andreoli A, Berger P, Buchheim P, Channabasavanna SM, Coid B, Dahl A, Diekstra RF, Ferguson B, et al. The International Personality Disorder Examination. The World Health Organization/Alcohol, Drug Abuse, and Mental Health Administration international pilot study of personality disorders. *Archives of General Psychiatry*. 1994; 51:215–224. [PubMed: 8122958]

- Malloy P, Noel N, Longabaugh R, Beattie M. Determinants of neuropsychological impairment in antisocial substance abusers. *Addictive Behaviours*. 1990; 15:431–438.
- Mitropoulou V, Harvey PD, Maldari LA, Moriarty PJ, New AS, Silverman JM, Siever LJ. Neuropsychological performance in schizotypal personality disorder: evidence regarding diagnostic specificity. *Biological Psychiatry*. 2002; 52:1175–1182. [PubMed: 12488063]
- Mitropoulou V, Harvey PD, Zegarelli G, New AS, Silverman JM, Siever LJ. Neuropsychological performance in schizotypal personality disorder: importance of working memory. *American Journal of Psychiatry*. 2005; 162:1896–1903. [PubMed: 16199836]
- Monarch ES, Saykin AJ, Flashman LA. Neuropsychological impairment in borderline personality disorder. *Psychiatr Clinics of North America*. 2004; 27:67–82. viii-ix.
- Montagne B, Sierra M, Medford N, Hunter E, Baker D, Kessels RP, de Haan EH, David AS. Emotional memory and perception of emotional faces in patients suffering from depersonalization disorder. *British Journal of Psychology*. 2007; 98:517–527. [PubMed: 17705944]
- Nedeljkovic M, Kyrios M. Confidence in memory and other cognitive processes in obsessive-compulsive disorder. *Behaviour Research and Therapy*. 2007; 45:2899–2914.
- Noguchi H, Hori H, Kunugi H. Schizotypal traits and cognitive function in healthy adults. *Psychiatry Research*. 2008; 161:162–169. [PubMed: 18849081]
- O'Connor BP, Dyce JA. A test of models of personality disorder configuration. *J Abnormal Psychology*. 1998; 107:3–16.
- Pachet AK, Wisniewski AM. The effects of lithium on cognition: an updated review. *Psychopharmacology (Berl)*. 2003; 170:225–234. [PubMed: 14504681]
- Raine A. The SPQ: a scale for the assessment of schizotypal personality based on DSM-III-R criteria. *Schizophrenia Bulletin*. 1991; 17:555–564. [PubMed: 1805349]
- Samuels J, Eaton WW, Bienvenu OJ 3rd, Brown CH, Costa PT Jr, Nestadt G. Prevalence and correlates of personality disorders in a community sample. *British Journal of Psychiatry*. 2002; 180:536–542. [PubMed: 12042233]
- Samuels JF, Nestadt G, Romanoski AJ, Folstein MF, McHugh PR. DSM-III personality disorders in the community. *American Journal of Psychiatry*. 1994; 151:1055–1062. [PubMed: 8010364]
- Siever LJ, Davis KL. The pathophysiology of schizophrenia disorders: perspectives from the spectrum. *American Journal of Psychiatry*. 2004; 161:398–413. [PubMed: 14992962]
- Spaulding W, Garbin CP, Dras SR. Cognitive abnormalities in schizophrenic patients and schizotypal college students. *Journal of Nervous and Mental Disease*. 1989; 177:717–728. [PubMed: 2592961]
- Spohn HE, Strauss ME. Relation of neuroleptic and anticholinergic medication to cognitive functions in schizophrenia. *Journal of Abnormal Psychology*. 1989; 98:367–380. [PubMed: 2574202]
- Stein MB, Jang KL, Livesley WJ. Heritability of social anxiety-related concerns and personality characteristics: a twin study. *Journal of Nervous and Mental Disease*. 2002; 190:219–224. [PubMed: 11960082]
- Stevens A, Burkhardt M, Hautzinger M, Schwarz J, Unckel C. Borderline personality disorder: impaired visual perception and working memory. *Psychiatry Research*. 2004; 125:257–267. [PubMed: 15051186]
- Sundbom E, Kullgren G, Armelius BA. Psychodynamic features in borderline personality disorder identified by a subliminal test, the Defense Mechanism Test. *Acta Psychiatrica Scandinavica*. 1989; 80:101–105. [PubMed: 2669443]
- Thomasius R, Zapletalova P, Petersen K, Buchert R, Andresen B, Wartberg L, Nebeling B, Schmoldt A. Mood, cognition and serotonin transporter availability in current and former ecstasy (MDMA) users: the longitudinal perspective. *Journal of Psychopharmacology*. 2006; 20:211–225. [PubMed: 16510479]
- Trull TJ, Durrett CA. Categorical and dimensional models of personality disorder. *Annual Review of Clinical Psychology*. 2005; 1:355–380.
- Trull TJ, Tragesser SL, Solhan M, Schwartz-Mette R. Dimensional models of personality disorder: Diagnostic and Statistical Manual of Mental Disorders Fifth Edition and beyond. *Current Opinion in Psychiatry*. 2007; 20:52–56. [PubMed: 17143083]

- Umka J, Mustafa S, ElBeltagy M, Thorpe A, Latif L, Bennett G, Wigmore PM. Valproic acid reduces spatial working memory and cell proliferation in the hippocampus. *Neuroscience*. 2010; 166:15–22. [PubMed: 20006675]
- Vermeulen J, Aldenkamp AP, Alpherts WC. Memory complaints in epilepsy: correlations with cognitive performance and neuroticism. *Epilepsy Res*. 1993; 15:157–170. [PubMed: 8370353]
- Vogtmaier MM, Seidman LJ, Salisbury D, McCarley RW. Neuropsychological dysfunction in schizotypal personality disorder: a profile analysis. *Biological Psychiatry*. 1997; 41:530–540. [PubMed: 9046985]
- Widiger TA. Generalized social phobia versus avoidant personality disorder: a commentary on three studies. *Journal of Abnormal Psychology*. 1992; 101:340–343. [PubMed: 1583229]
- Widiger TA, Mullins-Sweatt SN. Five-factor model of personality disorder: a proposal for DSM-V. *Annual Review of Clinical Psychology*. 2009; 5:197–220.
- Wing JK, Babor T, Brugha T, Burke J, Cooper JE, Giel R, Jablenski A, Regier D, Sartorius N. SCAN. Schedules for Clinical Assessment in Neuropsychiatry. *Archives of General Psychiatry*. 1990; 47:589–593. [PubMed: 2190539]

Table 1

Demographic and clinical characteristics of the study subjects (N=736).

Characteristic	N	%
Gender		
Male	270	36.7
Female	466	63.3
Age (years)		
<40	119	16.2
40–44	148	20.1
45–49	149	20.2
50–59	154	20.9
60	166	22.6
Education		
Less than 10 years	108	14.8
10–12 years	353	48.2
Over 13 years	271	37
Marital status		
Never married	112	15.2
Married	360	48.9
Widowed/divorced/separated	264	35.9
Axis I disorders		
Alcohol use disorders	188	25.5
Substance use disorders other than alcohol	109	14.8
Major depressive disorder	168	22.8
Bipolar disorder	21	2.9
Psychotic disorders (schizophrenia, delusional disorder, and psychotic disorders not elsewhere classified)	8	1.1
Anxiety disorders (obsessive-compulsive disorder, panic disorder, agoraphobia, and social phobia)	145	19.7
Any Axis I disorders	377	51.2

Table 2

Subjective appraisal of memory and performance on modified version of California Verbal Learning Test (CVLT) of 736 subjects

Variable	N=736
Subjective memory	
Confidence about memory functioning, %	
Excellent	20.3
Good	52.3
Fair	23.2
Poor	3.0
Very poor	0.7
Worry about memory functioning, %	
None	56.3
Occasional	37.9
Often	5.4
Objective memory (modified version of CVLT)	
Numbers of correct answer in immediate recall, mean (SD)	7.8 (2.8)
Numbers of correct answer in delayed recall, mean (SD)	6.2 (2.9)
Numbers of correct answer in recognition, mean (SD)	15.1 (2.6)

Table 3

Multiple regression analyses of PD scores and subjective appraisal of memory (n=736)

	Lack of confidence about memory functioning			Worry about memory functioning		
	model 1 ^a Estimate	p	model 2 ^b Estimate	p	model 1 ^a Estimate	p
Paranoid PD score	0.002	0.890	-0.016	0.393	0.019	0.184
Schizoid PD score	0.075	<0.0001	0.062	0.002	0.037	0.023
Schizotypal PD score	0.039	0.002	0.029	0.040	0.022	0.038
Histrionic PD score	0.032	0.074	0.016	0.438	0.023	0.121
Narcissistic PD score	-0.015	0.353	-0.019	0.29	0.001	0.928
Borderline PD score	0.055	<0.0001	0.037	0.015	0.042	<0.0001
Antisocial PD adulthood score	0.037	0.001	0.029	0.033	0.016	0.092
Antisocial PD childhood score	0.005	0.676	-0.008	0.529	0.007	0.450
Avoidant PD score	0.065	<0.0001	0.043	0.033	0.059	<0.0001
Dependent PD score	0.054	0.011	0.032	0.165	0.062	<0.0001
Obsessive-compulsive PD score	-0.017	0.210	-0.024	0.105	0.027	0.019

Abbreviation: PD, personality disorder.

^a: Model 1 was adjusted for age, gender, education, and marital status,^b: Model 2 was adjusted for Axis I disorders (alcohol use disorders, substance use disorders other than alcohol, major depressive disorder, bipolar disorder, psychotic disorders, and anxiety disorders), and all variables in Model 1.

Table 4
Multiple regression analyses of PD scores and objective measures of verbal memory (n=736).

	Immediate recall				Delayed recall				Recognition			
	Model 1 ^a		Model 2 ^b		Model 1 ^a		Model 2 ^b		Model 1 ^a		Model 2 ^b	
	Estimate	p	Estimate	p	Estimate	p	Estimate	p	Estimate	p	Estimate	p
Paranoid PD score	-0.040	0.635	-0.059	0.542	-0.056	0.300	-0.060	0.322	-0.091	0.065	-0.090	0.105
Schizoid PD score	0.000	0.999	-0.022	0.830	-0.145	0.016	-0.178	0.006	-0.154	0.006	-0.170	0.004
Schizotypal PD score	-0.042	0.497	-0.047	0.510	-0.084	0.030	-0.101	0.022	-0.054	0.137	-0.054	0.182
Histrionic PD score	0.155	0.078	0.203	0.044	-0.048	0.392	-0.043	0.499	-0.003	0.956	0.008	0.895
Narcissistic PD score	0.051	0.532	0.081	0.364	-0.053	0.304	-0.037	0.510	-0.071	0.140	-0.067	0.192
Borderline PD score	0.095	0.120	-0.148	0.053	-0.013	0.733	0.002	0.968	-0.009	0.805	0.023	0.603
Antisocial PD adulthood score	0.019	0.744	0.062	0.373	-0.047	0.187	-0.039	0.368	-0.019	0.571	-0.001	0.976
Antisocial PD childhood score	-0.016	0.815	-0.016	0.815	-0.085	0.154	-0.060	0.152	0.001	0.985	0.030	0.435
Avoidant PD score	0.115	0.179	0.103	0.316	-0.013	0.817	-0.037	0.564	-0.037	0.463	-0.011	0.856
Dependent PD score	0.169	0.106	0.085	0.115	-0.032	0.628	-0.036	0.621	0.026	0.670	0.027	0.683
Obsessive compulsive PD score	0.088	0.195	0.077	0.304	0.089	0.039	0.076	0.104	0.056	0.164	0.054	0.206

Abbreviation: PD, personality disorder.

^a: Model 1 was adjusted for age, gender, education, and marital status,

^b: Model 2 was adjusted for Axis I disorders (alcohol use disorders, substance use disorders other than alcohol, major depressive disorder, bipolar disorder, psychotic disorders, and anxiety disorders), and all variables in Model 1.