Cognitive Functioning in Depersonalization Disorder

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Abstract: Depersonalization disorder (DPD) is a dissociative disorder characterized by a subjective sense of unreality and detachment, and has been associated with deficits in perception and short-term memory. In this study, 21 DPD and 17 healthy comparison participants free of psychiatric disorders were administered a comprehensive neuropsychologic battery. The groups did not differ in full-scale, verbal, and performance IQ (Wechsler Adult Intelligence Scale), in working memory (Paced Auditory Serial Addition Test), or in selective attention (Digit Span with Distracters). The DPD group performed significantly worse on immediate visual and verbal recall (Wechsler Memory Scale, Revised), but not on delayed recall. Dissociation severity was significantly correlated with processing slowness and distractibility. We conclude that DPD is associated with cognitive disruptions in early perceptual and attentional processes.

Key Words: Attention, cognition, depersonalization, dissociation, memory.

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Depersonalization disorder (DPD) is one of the major DSM-IV-TR dissociative disorders (American Psychiatric Association, 1994). Recently, 2 large cohorts have thoroughly characterized the disorder and have revealed a highly consistent phenomenology (Baker et al., 2003; Simeon et al., 2003). The prevalence of DPD is not well established, but estimated at 2.4% (Ross, 1991), suggesting that DPD might be as or more common as schizophrenia and bipolar disorder. DPD is, however, rarely diagnosed and is consistently undertreated. Simeon (2004) has offered a number of explanations for the infrequent diagnosis of DPD, which include limited familiarity of clinicians with the disorder, reluctance of patients to disclose symptoms, a tendency to diagnose depersonalization as simply a variant of depression, anxiety, or stress, and pessimism about treatment options.

Many psychiatric conditions have been associated with deficits in cognitive functioning. Such deficits have been reliably demonstrated in, for example, schizophrenia, major depressive disorder, and borderline personality disorder across a wide range of neurocognitive tasks (e.g., Heinrichs and Zakzanis, 1998; Ruocco, 2005; Veiel, 1997). These cognitive deficits exert a profound influence on life functioning (Gold et al., 2002; Jaeger et al., 2006), as mental ability has been shown to be an important predictor of work performance (Schmidt and Hunter, 1998) and is essential for the performance of basic activities of daily living (Velligan et al., 1997).

Pertinent research in DPD is limited, but the first extensive study of cognitive processes in DPD (Guralnik et al., 2000) revealed that depersonalized participants exhibited deficits in visual perception and visual-spatial reasoning for both two- and three-dimensional stimuli. They were also compromised in visual and verbal short-term memory, for both abstract and meaningful information, especially under information overload conditions. DPD participants had difficulty with early stimulus encoding tasks under conditions of heightened distraction, to which they responded with more omission errors (lowered perceptual sensitivity). Findings were interpreted as suggesting that depersonalization was marked by a particular vulnerability in early information processing at the level of perception and attention. Deficits in short-term memory were presumed secondary to difficulties in perceiving and focusing on new information.

Guralnik et al.'s (2000) study lacked, however, tests of delayed memory, and also failed to control for another possible explanation of the findings, notably that the latter might be mediated by general psychopathology such as anxiety or depression, rather than being uniquely related to depersonalization. Thus, the aim of the present study was 2-fold. First, we wanted to further investigate cognitive processes in DPD, while attempting a replication of our earlier findings. Therefore, we systematically targeted the different stages of information processing, from perception (exploring the verbal, spatial, visual and auditory modalities, as well as the cross-modal interface), through attention of various sorts (divided, selective, challenged), to working, immediate, and delayed memory. Our hypotheses were that participants with DPD would exhibit compromises in the areas of early information processing (encoding new information, particularly when a lot of information was presented that required differentiating important form unimportant), but would be relatively unim-

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paired in longer-term memory processes. Second, we wanted to exclude the possibility that prior findings of subtle attentional deficiencies in DPD might be mediated by general psychopathology, such as depression or anxiety, rather than being uniquely associated with dissociation.

METHODS

Participants

Twenty-one participants with DSM-IV diagnosis of DPD and 17 normal comparison participants (NC) were recruited through local newspaper ads. Written informed consent was obtained from all participants. Participants were assessed for Axis I and Axis II disorders using the Structured Clinical Interview for DSM-IV Axis I Disorders – Patient Version (SCID-P; First et al., 1995) and the Structured Interview for DSM-IV Personality Disorders (SIDP-IV; Pfohl et al., 1995), respectively. The NC group had no lifetime history of any Axis I or II disorders.

DPD participants met DSM-IV criteria for DPD as assessed by clinical interview and confirmed by the Structured Clinical Interview for DSM-IV Dissociative Disorders-Revised (SCID-D-R; Steinberg, 1994). Participants with lifetime history of psychotic disorders, current substance use disorders, major medical or neurologic disorders, and history of head trauma were excluded from the study. All participants were medication-free for at least 5 weeks before testing.

Participants were administered the Dissociative Experiences Scale (Bernstein and Putnam, 1986), a well-validated 28-item self-report measure of dissociation. We employed the DES total score (mean of all 28 items), as well as the depersonalization subscale score (mean of items 7, 12, 13, 24, and 28; Simeon et al., 1998). One DPD subject did not complete the DES. DPD participants were also administered the 17-item Hamilton Rating Scale for Depression (HRSD; Hamilton, 1960) and the Hamilton Rating Scale for Anxiety (HRSA; Hamilton, 1959). Although the HRSD and HRSA were not administered to the NC group of the current study, we have reported elsewhere extremely low respective scores in similarly recruited normal control groups free of lifetime Axis I and II disorders (Simeon et al., 2007).

Cognitive Measures

An approximately 5-hour test battery was administered examining participants' intelligence, attention, and memory, which included the following tests.

Wechsler Adult Intelligence Scale

The Wechsler Adult Intelligence Scale (WAIS; Wechsler, 1981, 1997) is the most widely used standardized measure of intelligence in adults. Initially, we administered the WAIS-R version (Wechsler, 1981) (11 DPD and 9 NC participants), subsequently replaced by the WAIS-III version (Wechsler, 1997). The WAIS-R consists of 11 subtests, 6 of which measure Verbal IQ (Information, Comprehension, Similarities, Digit Span, Arithmetic, and Vocabulary) whereas 5 measure Performance IQ (Digit Symbol, Picture Completion, Block Design, Picture Arrangement, and Object Assembly). The WAIS-III consists of 14 subtests, the 11 of the WAIS-R and 3 newly added ones. The WAIS-III also introduced 4 new index scores calculated from individual subtests: Verbal Comprehension (Vocabulary, Similarities, Information), Perceptual Organization (Picture Completion, Block Design, Matrix Reasoning), Working Memory (Arithmetic, Digit Span, Letter Number Sequencing), and Processing Speed (Digit Symbol, Symbol Search). One NC subject did not fully complete the WAIS-R, and 1 DPD subject did not fully complete the WAIS-III.

Wechsler Memory Scale, Revised

The Wechsler Memory Scale, Revised (WMS-R; Wechsler, 1987) is a widely used standardized test of overall memory. It yields an overall score, as well as separate scores for verbal and visual memory, and for immediate versus delayed recall. Verbal memory is tested by the Verbal Paired Associates and the Logical Memory subtests. The Verbal Paired Associates subtest is a measure of cued recall; word pairs are presented to participants 3 times with memory recall after each trial. Moreover, delayed Verbal Paired Associates performance is quantified by a means of a single later recall trial. The Logical Memory test is used to evaluate memory in terms of free recall performance. During this task, participants listen to 2 stories, both followed by an immediate and a delayed free recall.

Visual memory is indexed by the Figural Memory, Visual Paired Associates, and Visual Reproduction subtests. Figural Memory consists of the presentation of abstract designs, which participants subsequently have to identify from an array of similar designs. The Visual Paired Associates subtest parallels the Verbal Paired Associates. Thus, on learning trials, participants are shown nonsense line drawings, which are paired with colored squares; on the recall trials, participants view the line drawing and have to recall the corresponding color. During Visual Reproduction, participants are shown figures that they have to reproduce. One subject did not complete the delayed recall tasks of the WMS-R.

Paced Auditory Serial Addition Test

The Paced Auditory Serial Addition Test (PASAT; Gronwall, 1977) involves a series of single digits read aloud at a steady rate on a tape recorder. Subjects are required to add each number to the one immediately following it and report the answer, while also attending to the next number recited (i.e., add the first number to the second and give the answer; add the second number to the third and give the answer; add third number to the forth and give the answer; and so on). The PASAT is considered a measure of working memory, as well as divided attention.

Digit Span With Distraction Test

In the Digit Span with Distraction Test (Oltmanns and Neale, 1975), a subject is asked to immediately recall a series of 6 numbers read by a female voice on a tape while ignoring intermingled numbers read by a male. This test assesses selective attention and the impact of distracters on immediate recall.

Data Analysis

Group comparisons employed Student's independent-sample *t*-tests to compare scores between the 2 groups. To separate out the effects of initial encoding of information from long-term memory, ANCOVA analyses were employed to examine between-group differences in delayed memory scores of the WMS using immediate recall scores as the covariate. In addition to group comparisons, within the DPD group, we examined the relationships between symptom severity (dissociation, depression, anxiety) and cognitive measures using Pearson's correlations. The NC group exhibited very limited variance in dissociation symptoms, which did not lend itself to correlational analyses.

RESULTS

Demographics

The groups did not differ significantly in gender (DPD: 10 women and 11 men; NC: 10 women and 7 men; $\chi^2(1) = 0.47$, NS) or age (DPD: $M = 31.0$, $SD = 7.7$; NC: $M = 28.7$, $SD = 10.3$; $t(36) = 0.77$, NS). Groups did differ significantly in years of education (DPD: $M = 15.0$, $SD = 2.5$; NC: $M = 17.2$, $SD = 2.4$; $t(36) = 2.57$, $p < 0.05$). However, given the comparable IQ of the 2 groups (see below), between-group cognitive comparisons were not covaried for education.

Symptom Measures

In the DPD group, current Axis I comorbidity was bipolar disorder ($N = 1$), major depressive disorder ($N = 2$), dysthymia ($N = 2$), panic disorder ($N = 5$), agoraphobia ($N = 1$), social phobia ($N = 5$), simple phobia ($N = 1$), obsessive-compulsive disorder ($N = 2$), generalized anxiety disorder ($N = 4$), post-traumatic stress disorder ($N = 1$), and body dysmorphic disorder ($N = 1$). Eight DPD participants had at least 1 personality disorder (5 DPD subjects were not administered the SIDP-IV). Table 1 summarizes all symptom scores.

TABLE 1. Symptom Scores for the DPD and NC Groups

	DPD ($N = 21$)		NC ($N = 17$)	
	Mean	***SD***	**Mean**	***SD***
SCID-D				
Amnesia	1.2	0.4	N/AP	—
Depersonalization	4.0	0.0	N/AP	—
Derealization	3.4	1.0	N/AP	—
Identity Confusion	2.3	1.5	N/AP	—
Identity Alteration	1.1	0.3	N/AP	—
DES				
Total	28.0	14.5	4.5	3.4
Depersonalization	53.5	18.9	2.0	2.4
HRSD	7.9	4.4	N/AV	—
HRSA	9.9	5.0	N/AV	—

SCID-D indicates Structured Clinical Interview for DSM-IV Dissociative Disorders-Revised; DES, Dissociative Experiences Scale; HRSD, Hamilton Rating Scale for Depression; HRSA, Hamilton Rating Scale for Anxiety; N/AP, not applicable; N/AV, not available.

Cognitive Functioning: Between-Group Comparisons

WAIS scores and comparisons are summarized in Table 2. The 2 groups did not differ in IQ scores or on any of the individual subtests. However, the groups did differ on indices of the WAIS-III, significantly so on the Processing Speed Index, and with a trend towards significance on the Perceptual Organization Index.

On the WMS-R (Table 3), the DPD group performed significantly worse on total, verbal, and visual memory scores, all of which reflect short-term memory only. The DPD group also performed significantly worse on 2 of the 4 delayed recall subtests, but these differences were no longer evident when immediate recall was controlled for by ANCOVA analyses (Logical Memory: $F(1,34) = 0.34$, NS; Visual Reproduction: $F(1, 34) = 1.14$, NS).

The 2 groups did not differ on the PASAT test or on the Digit Span with Distracters (Table 3).

DPD Group: Correlations Between Cognition and Symptomatology

DES total score was significantly negatively correlated with WAIS Full scale IQ ($r = -0.46$, $p < 0.05$, $n = 17$), WAIS-III Processing Speed Index ($r = -0.71$, $p < 0.05$, $n = 9$), and the WAIS Arithmetic subtest ($r = -0.47$, $p < 0.05$, $n = 17$). DES score also showed a strong inverse correlation with the Digit Span with Distracters score ($r = -0.65$, $p < 0.001$, $n = 18$), and a strong positive correlation with the number of errors in the distracter condition ($r = 0.69$, $p < 0.001$, $n = 18$). DES score did not correlate with WMS or PASAT scores. Interestingly, the DES depersonalization subscale score was unrelated to the WAIS scores, but was significantly associated with the number of errors on the Digit Span in the distracter condition ($r = 0.51$, $p < 0.05$, $n = 18$).

Studies have shown that dissociation tends to covary with anxiety and depression (e.g., Ijzendoorn and Schuengel, 1996), raising the possibility that the relationship between dissociation and cognitive functioning might be mediated by 1 of these 2 factors. However, there were no significant correlations between depression or anxiety ratings and any cognitive measures, with the sole exception of the delayed recall of the Logical Memory WMS subtest (HRSD: $r = -0.65$, $p < 0.01$, $n = 16$; HRSA: $r = -0.56$, $p < 0.05$, $n = 15$). Thus, neither anxiety nor depression fulfilled the requirements of a mediator as outlined by Baron and Kenny (1986).

DISCUSSION

Results of the assessment battery indicated that depersonalized participants differed from normal controls on very specific cognitive dimensions within the general context of comparable intellectual ability. In summary, the 2 groups did not differ in full scale, verbal, and performance IQ (WAIS). However, DPD participants did worse on 2 of the 4 overall indices of the new WAIS version (despite the limited power of the smaller sample size): they had significantly slower processing speed and tended toward significantly worse perceptual organization. The DPD group also performed significantly worse on immediate visual and verbal recall (WMS),

TABLE 2. Comparison of the DPD and NC Groups on the Wechsler Adult Intelligence Scale

	DPD (N = 21)		NC (N = 17)					
	Mean	***SD***	**Mean**	***SD***	***t***	***df***	***p***	**Cohen's *d***
IQ scores								
Full IQ	110.2	8.2	113.7	15.6	0.85	34	0.40	0.29
Verbal IQ	113.8	10.9	116.3	15.4	0.57	34	0.57	0.20
Performance IQ	102.1	9.8	107.5	13.6	1.38	34	0.17	0.47
Index scores								
Verbal Comprehension Index[a]	112.9	12.1	122.8	13.3	1.60	15	0.13	0.83
Perceptual Organization Index[a]	102.0	12.0	113.1	13.4	1.86	16	0.08	0.93
Working Memory Index[a]	112.8	16.5	116.3	13.4	0.47	15	0.64	0.24
Processing Speed Index[a]	97.7	12.1	116.1	20.2	2.32	15	0.03*	1.20
Subtest scores								
Information	12.4	2.8	12.7	2.9	0.30	34	0.76	0.10
Digit Span	12.6	2.2	12.1	2.4	0.67	34	0.51	0.23
Vocabulary	12.8	2.5	13.6	3.3	0.88	35	0.39	0.30
Arithmetic	11.3	3.0	11.7	3.1	0.45	35	0.65	0.15
Comprehension	12.8	2.3	13.5	3.2	0.68	34	0.50	0.23
Similarities	11.1	1.4	12.1	2.3	1.61	34	0.12	0.55
Picture Completion	9.5	2.9	10.7	2.9	1.27	35	0.21	0.43
Picture Arrangement	10.7	2.3	11.0	2.9	0.36	34	0.72	0.12
Block Design	10.5	2.4	11.4	2.9	1.03	36	0.31	0.34
Object Assembly	9.2	1.6	10.1	1.4	1.70	34	0.10	0.58
Digit Symbol	10.3	1.8	11.3	2.7	1.3	35	0.19	0.45
Letter Number Sequencing[a]	12.0	3.3	12.6	2.3	0.44	15	0.66	0.23
Symbol Search[a]	10.9	2.1	13.6	4.3	1.69	15	0.11	0.87
Matrix Reasoning[a]	12.6	2.2	12.5	2.8	0.09	16	0.93	0.05

[a]Values available only for WAIS-III (see Methods).
*Significant at the 0.05 level (2-tailed).

but not on delayed memory. There were no group differences in working memory (PASAT) and selective attention (DSTD). In the DPD group, dissociation severity was significantly correlated with full scale IQ, the processing slowness index, and vulnerability to distraction on the DSTD. Depersonalization severity was only related to the number of errors on the DSTD. Importantly, the findings were not mediated by general psychopathology such as anxiety and depression.

Very much in line with our previous study (Guralnik et al., 2000), the DPD group had intact general intelligence, but demonstrated subtle impairments in short-term memory. The current findings show that manifest long-term memory deficits are subsidiary to difficulties in earlier stages of information processing. Moreover, we found no group differences on the working memory index of the WAIS, as well as on the PASAT, rendering it unlikely that the cognitive disruption in DPD rests within the domain of working memory. Therefore, considering our present and previous findings (Guralnik et al., 2000), we suspect that compromises in short-term memory might be attributable to even earlier stages of information processing (i.e., perception and attention). In fact, the DPD group showed a trend towards significant impairment on the WAIS Perceptual Organization index, as well as an overall reduced processing speed on the respective WAIS index, all suggestive of difficulties in readiness to efficiently process new perceptual information. Further supporting this viewpoint, dissociation severity was associated with difficulty focusing attention and vulnerability to distraction. Moreover, dissociation severity, as measured by the DES total but not depersonalization symptoms, was related to lower total IQ scores. This is finding is in line with studies showing that higher DES scores but not depersonalization symptoms go along with subtle deficits in executive functioning (Cima et al., 2001; Giesbrecht et al., 2004).

It is noteworthy that the cognitive profile of patients with DPD clearly differs from findings in other dissociative disorders, notably Dissociative Identity Disorder, which has been linked to excessive intertest scatter on intelligence tests, with some signs of neuropsychologic deficits on distractibility measures (Armstrong and Loewenstein, 1990; Rossini et al., 1996). This divergence suggests that there are several qualitatively distinct dissociative constructs, which differ both in their clinical and cognitive presentations.

Limitations of this study are several and include the small number of participants in each group coupled with the large number of administered tests. Another limitation was the switch to the newer version of the WAIS midstudy; still, the 2 versions are known to yield highly comparable IQ

TABLE 3. Comparison of the DPD and NC Groups on the WMS-R, PASAT, and Digit Span With Distracters

	DPD (N = 21)		NC (N = 17)					
	Mean	***SD***	**Mean**	***SD***	***t***	***df***	***p***	**Cohen's *d***
General Memory	127.4	20.6	147.1	15.7	3.26	36	0.002**	1.09
Verbal Memory	71.4	14.3	83.8	13.4	2.72	36	0.010*	0.91
Logical Memory	25.3	6.6	31.1	6.4	2.73	36	0.010*	0.91
Verbal Paired Associates	20.9	2.9	22.2	2.14	1.64	36	0.110	0.55
Visual Memory	57.9	8.3	63.4	3.82	2.50	36	0.017*	0.83
Figural Memory	7.7	1.6	8.2	1.13	1.03	36	0.312	0.34
Visual Paired Associates	14.7	3.3	16.9	1.73	2.46	36	0.019*	0.82
Visual Reproduction	35.8	5.4	38.5	2.96	1.82	36	0.077	0.61
Delayed Verbal								
Logical Memory	24.3	8.7	29.6	6.9	2.05	35	0.048*	0.69
Verbal Paired Associates	7.8	0.8	8	0	1.31	35	0.199	0.44
Delayed Visual								
Visual Paired Associates	5.6	1.1	6	0	1.57	35	0.125	0.53
Visual Reproduction	32.1	8.1	36.8	4.97	2.08	35	0.045*	0.70
Digit Span With Distracters								
Total correct	13.2	2.5	14.2	2.25	1.35	34	0.187	0.46
Errors	1.2	1.3	1.4	2.09	0.34	34	0.733	0.12
PASAT								
Total correct	32.8	11.6	36.1	11.6	0.90	34	0.395	0.31

*Significant at the 0.05 level (2-tailed).
**Significant at the 0.01 level (2-tailed).

scores. Strengths of the study lie in the use of thoroughly diagnosed participants, an understudied clinical population, and well-validated cognitive tests. Strengths also include the compelling overall replication of our earlier findings.

In sum, DPD seems to be associated with intact overall intelligence yet cognitive tendencies toward slower processing speed, poorer perceptual organization, vulnerability to distraction, and problems with immediate but not delayed recall. The present study clearly highlights the need for further studies to shed light on information processing disturbances associated with the dissociative detachment characteristic of depersonalization, with a particular emphasis on early mechanisms of attention and perception.

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