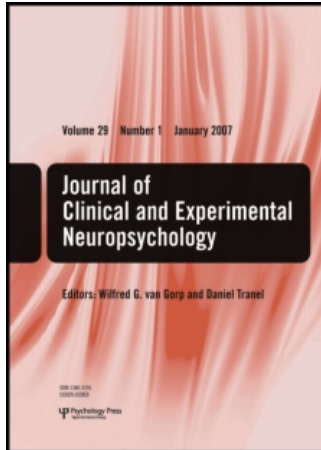


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The relationship between executive functioning and dissociation

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Although dissociation by definition affects cognition, few studies have used neuropsychological measures to examine dissociative phenomena. This study compared 33 high and 32 low dissociators based on the Dissociative Experiences Scale, on self-report and neuropsychological measures of executive function, including the Dysexecutive Questionnaire, Iowa Gambling Task, Operation Span task, and Wisconsin Card Sorting Test-64. High dissociators endorsed significantly more executive difficulties than did low dissociators, but these difficulties were not related to their performance on neuropsychological measures. Results suggest that dissociative individuals' perceptions of executive impairments may be divorced from objective deficits, revealing an important process underlying the clinical manifestations of dissociation.

INTRODUCTION

Cognitive problems can have a profound impact on one's ability to function on a daily basis. One integral aspect of cognition is executive function, which can be described as "those capacities that enable a person to engage successfully in independent, purposive, self-serving behavior" (Lezak, 1995). Executive function is a broad construct that encompasses abstract reasoning, initiation, controlled attention, strategizing, and perseveration. The relationship between executive functioning and psychiatric illnesses such as schizophrenia, bipolar disorder, and unipolar depression has been extensively researched (Elvegård & Goldberg, 2000; Fossati, Ergis, & Allilaire, 2002; Kuperberg & Heckers, 2000; Quraishi & Frangou, 2002; Rogers et al., 2004; Sharma & Antonova, 2003). Investigators consistently report that for patients suffering from such disorders, executive function is considerably impaired. Despite extensive research on these disorders, however, other psychiatric phenomena such as dissociation have been virtually neglected.

The defining feature of dissociation is the disruption of an individual's usually integrated

cognitive processes, such as consciousness, memory, identity, or perception (American Psychiatric Association, 2000). Dissociative experiences, which are present to a greater or lesser degree in everyone, can take many forms, ranging on a continuum from the nonpathological to the pathological (Bernstein & Putnam, 1986; Waller, Putnam, & Carlson, 1996). Between 80–90% of individuals report dissociative symptoms at least some of the time (Gershuny & Thayer, 1999). While the majority of adults report mild dissociative experiences such as "highway hypnosis" (losing awareness while driving, then suddenly discovering some distance has been traveled), few adults report more extreme dissociative experiences (Freyd, Martorello, Alvarado, Hayes, & Christman, 1998). One such extreme dissociative process involves the assumption of multiple identities (American Psychiatric Association, 2000). Pathological forms of dissociation have been extensively researched, and the study of normative dissociation has recently gained importance due to its ability to inform us about cognitive processes (Ray, 1996).

Although dissociation is fundamentally cognitive in nature, surprisingly few studies have used

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traditional laboratory-based neuropsychological measures to study dissociative phenomena. Only three studies have examined the relationship between dissociation and executive functioning. Many investigators believe that there is a connection between dissociation and the executive functions of concentration, self-monitoring, and planning (Cima, Merckelbach, Klein, Schellbach-Matties, & Kremer, 2001; Hilgard, 1986). One study examined executive functioning in a sample of forensic inpatients, using four tasks from the Behavioral Assessment of Dysexecutive Syndrome (BADS) test battery (Wilson, Alderman, Burgess, Emslie, & Evans, 1996). Higher levels of dissociation were associated with poor performance on the BADS. The authors concluded that frontal deficits contribute to dissociation (Cima et al., 2001). More recently, investigators tested the idea that poor executive functioning is related to the pathological aspects of dissociation (Giesbrecht, Merckelbach, Geraerts, & Smeets, 2004). They administered the Dissociative Experiences Scale (DES) and the Random Number Generation Task to undergraduates and found a modestly significant relationship between failure to inhibit responses and dissociative amnesia (Giesbrecht et al., 2004). However, not all studies have shown a correlation between dissociation and executive functioning. One study compared patients with depersonalization disorder to matched controls on various neuropsychological measures (Guralnik, Schmeidler, & Simeon, 2000). Participants with depersonalization disorder did not significantly differ from the control group on measures of overall intellectual functioning or executive functioning (Guralnik et al., 2000). It should be noted that only 15 participants were included in each group, decreasing power and increasing the likelihood of Type II error.

Due to the contradictory findings in the literature, the relationship between executive function and dissociation requires further clarification. Giesbrecht and colleagues (2004) called specifically for more research on systematic exploration of differences in executive functioning between high and low dissociators. One difficulty in systematically exploring the relationship between executive functioning and dissociation is that the construct of executive functioning is extraordinarily broad. Among the different aspects of cognition, it includes abstract reasoning, controlled attention, cognitive flexibility, planning, perseveration, and complex decision making. As a result, this investigation followed a recommendation to employ multiple measures of executive function (Goldberg & Bougakov, 2005). Furthermore, no studies have looked at the relation-

ship between self-reported executive functioning and dissociation. Consequently, we employed a self-report measure to examine the relationship between dissociation and participants' perceived executive dysfunction. In addition, it should be noted that dissociation, like executive functioning, covers a wide range of experiences.

The overarching goal of this study was to elucidate the relationship between dissociation and executive functioning. Specifically, it was hypothesized that high dissociators would report more difficulties with executive functioning than would low dissociators. It was further hypothesized that their performance across all tasks of executive function (including abstract reasoning ability, perseveration, working memory, and decision making) would be consistent with their self-report, indicating relatively poorer executive functioning than individuals low in dissociation.

METHOD

Participants

Participants consisted of 66 undergraduate students at a large public university. As part of their introductory psychology course requirements, students participated in a mass screening session ($N = 1,025$) at the beginning of the semester, which consisted of a variety of questionnaires. Students completed the questionnaires in a single 1½-hour session in a large group setting in a lecture hall. From their responses, individuals scoring high and low on the Dissociative Experiences Scale (DES) were recruited by telephone for participation in the experiment. The high dissociator group consisted of individuals having a DES score of 29 and higher, which is consistent with mean DES scores of clinical samples (see Measures). The low dissociator group consisted of individuals with a DES score of less than 6. No participants reported sensory abnormalities (e.g., visual impairment), attention-deficit/hyperactivity disorder, learning disability, or history of neurological illness (e.g. traumatic brain injury, multiple sclerosis) that would interfere with neuropsychological testing. Out of the 66 individuals recruited for study participation, 1 individual was a nontraditional student who was eliminated due to a large age discrepancy. This resulted in a final sample of 65 participants.

High dissociators ($n = 33$) ranged in age from 18–22 years ($M = 19.09$, $SD = 1.09$). Their gender composition was 59% male and 41% female, and their ethnic background composition was 81%

Caucasian, 13% Asian-American, 3% African-American, and 3% Hispanic. The age range of participants in the low dissociation group ($n = 32$) was 18–21 years ($M = 19.03$, $SD = 1.02$). The gender composition was 39% male and 61% female, and ethnic background composition was 88% Caucasian, 3% Asian-American, 6% African-American, and 3% Hispanic.

Measures

Dissociative Experiences Scale-II (DES)

The DES is the most commonly used self-report measure of dissociation (Bernstein & Putnam, 1986; Ross, 1997). The DES was used as a screening measure to recruit participants. The DES is a 28-item self-report measure of dissociation that was developed by Bernstein and Putnam (1986). On the questionnaire, participants are asked to indicate what percentage of time they experience the phenomenon or event described in the question. Instructions indicate that answers should be restricted to periods of time when they are not under the influence of drugs and/or alcohol. Responses on the original DES involved placing a tick on a 100-mm line to indicate what percentage of the time is spent in the various experiences. This method is time consuming to score, and we instead used Carlson and Putnam's (1993) DES-II alternative response set. The alternative responses are in 10% increments on a scale from 0 to 100%, where 0 means "never", and 100 means "all of the time."

Research has demonstrated reliability and validity for the DES using data from both clinical and nonclinical populations (Bernstein & Putnam, 1986; Carlson & Putnam, 1993; Holtgraves & Stockdale, 1997; Ray & Faith, 1995). Internal consistency is high (Cronbach $\alpha = .93$; Bernstein & Putnam, 1986). Consistent with previous findings, our data showed high internal consistency (Cronbach $\alpha = .98$). Test–retest reliabilities between .79 and .96 have been found (Bernstein & Putnam, 1986; Frischolz et al., 1990; Pitblado & Sanders, 1991). Split-half coefficients ranging from .83 to .93 have been reported (Carlson & Putnam, 1993). The DES has been found to be effective in detecting and confirming dissociative identity disorder, posttraumatic stress disorder, and dissociative disorder not otherwise specified (Gleaves, Eberenz, Warner, & Fine, 1995). While the DES is not a diagnostic measure and does not provide cutoff scores for identification of various groups of people, past research has cited the following ranges for mean DES scores for several different groups: 41–57 for individuals with dissociative identity disorder,

26–41 for individuals with posttraumatic stress disorder, 12–24 for adolescents, and 4–8 for adults in the general population (see Carlson & Putnam, 1993, for a review of studies).

Dysexecutive Questionnaire (DEX Questionnaire)

The DEX Questionnaire is a 20-item self-report measure designed to assess a range of cognitive, emotional, and behavioral changes that accompany dysexecutive syndrome (Wilson, Evans, Emslie, Alderman, & Burgess, 1998). Symptoms of dysexecutive syndrome involve difficulties with executive functioning, including impulsivity and problems with planning and insight. The self-report version of the DEX was used in the present study where individuals rate executive symptoms from "0" (never) to "4" (very often) according to their own experience. It is part of the Behavioral Assessment of Dysexecutive Syndrome (BADSD; Wilson et al., 1996). Items include topics like difficulty planning, unrealistic expectations, and perseveration. An impairment score is calculated by summing the individual item scores with higher scores reflecting greater executive dysfunction. The DEX has demonstrated high internal reliability ($>.8$) when used in both clinical (Parkinson's disease) and control samples (Mathias, 2003). Data from our sample also revealed high internal consistency (Cronbach $\alpha = .90$).

Iowa Gambling Task (IGT)

The IGT is a laboratory-based gambling exercise that simulates real-life decision making (Bechara, Damasio, Damasio, & Anderson, 1994). Players are given four decks of cards and a loan of \$2,000 of fake money. They are then instructed to proceed in a way that will allow them to lose the least amount of money and win the most. Each card carries an immediate reward (\$100 in Decks A and B and \$50 in Decks C and D), but some cards also carry a penalty (large penalties in Decks A and B and small penalties in Decks C and D). Playing mostly from the disadvantaged decks leads to an overall loss while playing from the advantageous decks leads to an overall gain. Studies have shown that individuals with brain damage, specifically in the ventromedial region of the prefrontal cortex, choose cards that lead to high immediate gains despite higher future losses (Bechara, Dolan, & Hindes, 2002; Bechara, Tranel, & Damasio, 2000). A computerized version of the IGT was used. The dependent variable was the net amount of money earned or lost.

Operation Span Task (OSPAN)

This computer-administered measure assesses controlled attention and working memory, which many believe to be types of executive functioning (Turner & Engle, 1989). It requires participants to maintain certain information “online” while they simultaneously process unrelated information. Participants are asked to solve a series of simple arithmetic problems. After each arithmetic problem, the participant must read aloud a word. Finally, after a series of problems, the participant must recall the words. It has been argued that the OSPAN task assesses the working memory/attentional system, which correlates significantly with general fluid intelligence (Engle, Kane, & Tuholski, 1999). In this study, the OSPAN was administered by computer. The dependent variables were the number of words recalled total and the number of words recalled in the correct order.

Wisconsin Card Sorting Test-64 card version (WCST-64)

The WCST is a well-established test measuring executive functioning: specifically, assessing abstract reasoning, the ability to shift or maintain sets, and perseveration (Axelrod, Golman, & Woodard, 1992; Berg, 1948; Heaton, Chelune, Talley, Kay, & Curtiss, 1993). The participant is given a pack of cards. Each card has one of four symbols on it (triangle, star, cross, or circle) printed in red, yellow, green, or blue. The participant’s task is to place cards one by one under four stimulus cards according to a principle that must be deduced from the examiner’s responses. The WCST-64 and the standard 128-card version of the WCST are comparable (for review see Greve, 2001). Consequently, the WCST-64 was employed in this study due to its efficiency. The WCST-64 has satisfactory interrater reliabilities (Axelrod et al., 1992). The dependent variables were the total correct responses, total perseverative responses, and participants’ failure to maintain set.

Wechsler Test of Adult Reading (WTAR)

The WTAR was used as an estimate of the participants’ intellectual functioning (Ginsberg, 2003). It requires the individual to pronounce a list of words out loud. The WTAR has been shown to correlate with commonly accepted measures of intelligence and has good internal and test–retest reliability (Ginsberg, 2003).

Design and procedure

Study participants were selected based on their DES score. Individuals scoring 29 and higher comprised the “high dissociation” group, and individuals scoring below 6 comprised the “low dissociation” group. These cutoff scores are consistent with those used in previous studies (Carlson & Putnam, 1993; Freyd et al., 1998; Ross, Heber, Norton, & Anderson, 1989). The DEX was administered by an advanced graduate student in clinical psychology at the beginning of each experimental session, followed by the OSPAN, IGT, WTAR, and WCST-64.

RESULTS

Primary analyses

High and low dissociator groups did not significantly differ on demographic variables, including age, gender, and ethnicity. Similarly, no differences were observed on a measure of general intellectual functioning. As expected, an independent-samples *t* test revealed that the high and low dissociation groups differed significantly on the DES score, $t(63) = -28.89, p < .001$. The mean DES scores of the high dissociator group was consistent with those found in pathological samples (Freyd et al., 1998). Independent-sample *t* tests were conducted to determine group differences between the high and low dissociators on measures of executive functioning. Means, standard deviations, *t*-values and significant differences between the high and low dissociation groups for the DEX, IGT, OSPAN, and WCST-64 are shown in Table 1. Consistent with expected findings, the high and low dissociation groups differed significantly on the DEX, $t(63) = -5.61, p < .001$. In contrast, no significant differences were found between high and low dissociators on any of the neuropsychological measures. Nonparametric statistical analyses were performed when appropriate, and no significant differences emerged.

Further analyses

Because the high and low dissociation groups differed significantly on the DEX, we conducted further analyses to evaluate which aspects of executive functioning were more associated with dissociative symptoms. One study using a nonclinical sample conducted an exploratory factor analysis of the DEX (Chan, 2001). The five factors that resulted were (a) inhibition (behavioral and emotional inhibition), (b) intentionality (poor planning/

TABLE 1
Means, standard deviations, and *t*-values for demographic variables and measures

Variable	High dissociators		Low dissociators		<i>t</i> -value	df	Cohen's <i>d</i>	p
	Mean	SD	Mean	SD				
DES	36.80	6.98	1.53	0.73	-28.89	63	7.11	<.001
Age ^a	19.09	1.09	19.03	1.02	-0.24	63	0.06	.809
WTAR	38.00	5.45	39.61	5.61	1.17	63	0.29	.246
DEX	29.25	11.00	15.97	7.86	-5.61	63	1.39	<.001
Factor 1: Inhibition	7.78	3.40	4.61	2.77	-4.14	63	1.02	<.001
Factor 2: Intentionality	6.75	3.22	5.00	2.37	-2.50	63	0.62	.015
Factor 3: Know-do dissoc	5.91	2.52	2.72	2.34	-5.28	63	1.31	<.001
Factor 4: In-resistance	3.66	1.84	1.33	1.16	-6.10	63	1.51	<.001
Factor 5: Social regulation	2.09	1.42	1.33	1.19	-2.34	63	0.58	.022
OSPAN Total Recalled	29.91	5.38	30.85	4.40	0.77	63	0.19	.442
OSPAN Correct order	25.44	6.75	25.30	6.43	-0.08	63	0.02	.935
IGT	-131.17	1,217.26	-16.51	1,346.43	0.35	61	0.09	.725
WCST Total Correct	50.81	9.15	53.21	5.24	1.30	63	0.32	.198
WCST Perseverative resp	9.13	10.04	8.39	5.30	-0.37	63	0.09	.714
WCST Fail to maintain set	0.16	0.37	0.27	0.52	0.98	62	0.47	.329

Note. DES = Dissociative Experiences Scale; WTAR = Wechsler Test of Adult Reading; DEX = Dysexecutive Questionnaire; OSPAN = Operation Span Task; IGT = Iowa Gambling Task; WCST = Wisconsin Card Sorting Test.

^aIn years.

decision making), (c) knowing–doing dissociation (lack of insight), (d) in-resistance (abstract thinking problems/perseveration), and (e) social regulation (lack of concern for social norms). Factor scores were created based on our data, and independent-sample *t* tests were conducted to determine group differences between the high and low dissociators. See Table 1 for means, standard deviations, *t*-values, and significant differences between the high and low dissociation groups for the five DEX factors. The high and low dissociation groups differed significantly on each factor of the DEX.

DISCUSSION

This study examined the relationship between executive function and dissociation using a self-report measure and several laboratory-based neuropsychological tests. We correctly hypothesized that individuals higher in dissociation would report significantly more difficulties with executive functioning. Follow-up analyses further determined that high dissociative individuals report significantly more difficulties with executive functioning on each of the five factors of the DEX. Our second hypothesis failed to be confirmed as there were no observed differences in the performance of high and low dissociators on any of the neuropsychological measures of executive function. Results from our study are contrary to two previous studies that found significant differences

between highly dissociative individuals and controls on neuropsychological tests of executive functioning. One of these studies examined dissociation among a small psychiatric forensic population (Wilson et al., 1996), and the other study administered only one neuropsychological test (Giesbrecht et al., 2004). Possible reasons for our discrepant findings include our use of a nonincarcerated population with no documented history of previous brain injury or neurological condition that could affect neuropsychological performance. In addition, we ensured that participants with high and low levels of dissociation did not differ on a measure of estimated general intellectual functioning.

Our findings are supported by a study that found no significant differences in neuropsychological test performance between subjects with depersonalization disorder and matched controls (Guralnik et al., 2000). The neuropsychological measures included in the current study evaluated a variety of different facets of executive functioning, including controlled attention/working memory, problem solving, set shifting, abstract reasoning, and perseveration. These measures were included to ensure that we covered a broad range of different types of executive functioning. Further, it was important to include tests that assessed abilities directly related to dissociation, such as controlled attention/working memory, set shifting, and perseveration, and those that assessed more indirectly related skills like abstract reasoning and problem solving. Although the expected differences in objective measures of executive functioning were

not demonstrated in the results, the study's findings were exceptionally consistent across all objective measures. Results indicated that although highly dissociative individuals report more executive difficulties than do low dissociative individuals, these relative difficulties are not reflected by their performance on neuropsychological measures of executive functioning.

Highly dissociative individuals report more executive difficulties than do low dissociative individuals in all realms of executive functioning as measured by the DEX. The five factors used were inhibition (Factor 1), intentionality (Factor 2), knowing-doing dissociation (Factor 3), in-resistance (Factor 4), and social regulation (Factor 5). High and low dissociators were found to significantly differ in all of the factors, with little variation in significance. Results support the idea that high dissociators report many more problems across all facets of executive function. Further research is needed to investigate the discrepancy between high dissociators' perceived executive deficits and normal performance on objective neuropsychological measures. In particular, it would be worthwhile for a future study to administer the DEX as part of the complete BADS test battery to individuals reporting high levels of dissociation.

Several studies that may shed some light on the issue of self-reported executive deficits versus laboratory performance have used neurological populations. Among individuals with moderate traumatic brain injury or dementia, the DEX has been shown to correlate with neuropsychological tests of executive functioning such as the WCST and Trail Making tests (Burgess, Alderman, Evans, Emslie, & Wilson, 1998). In general, however, neurological populations with acquired deficits such as traumatic brain injury, tend to underestimate their difficulties (Bogod, Mateer, & Macdonald, 2003). This is in direct opposition to the present study's finding that high dissociators overestimate their difficulties. Whereas patients with acquired brain damage and degenerative disorders of the frontal lobes may express symptoms of anosognosia, participants reporting high levels of dissociation may be hypervigilant to their executive failures. It is also possible that the common measures of executive functioning fail to capture the very real executive deficits that high dissociators report. Shallice and Burgess (1991) determined that although patients with damage to frontal lobes performed in the normal range on tests of executive functioning, they reported experiencing difficulties in their daily lives. These findings suggest that executive functions may not solely be manifested at a cognitive level, measured

by objective neuropsychological tests, but on a cognitive-behavioral level in daily-life tasks (Chan, 2001). Executive functions represent a very broad range of cognitive abilities, and the laboratory-based measures utilized in this study may lack ecological validity. Consequently, the measures employed in this study may not adequately capture the everyday executive deficits experienced by individuals with high levels of dissociation. Future programs of research should consider employing ecologically valid measures such as the BADS. In addition, future research should include both clinical and nonclinical dissociative populations of varying ages and educational backgrounds.

One of the major strengths of the current study is that it is one of the first to employ a broad array of laboratory-based neuropsychological tests examining multiple aspects of executive function in dissociation. Also, this is the first study to find a significant relationship between dissociation and self-reported executive dysfunction.

In summary, this study delved into new territory using a variety of novel measures to examine the cognitive processes underlying dissociation. As hypothesized, individuals who reported many dissociative experiences also reported more executive deficits. Contrary to expectations, these highly dissociative individuals failed to demonstrate such deficits in higher level cognition as measured by neuropsychological tests. Results suggest the possibility that dissociative individuals' perceptions of executive impairments are divorced from their actual experience. Future research is essential to further explore the cognitive processes that underlie the phenomena of dissociation.

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