

The Relationships Between Dissociation, Attention, and Memory Dysfunction Dissosiyasyon, Dikkat ve Bellek Bozuklukluğu Arasındaki İlişki

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ABSTRACT

Introduction: Dissociation is a disruption in the integrated functions of consciousness, memory, identity, and perception. Dissociative symptoms include derealization/depersonalization, absorption, and amnesia. These experiences can cause a loss of control over mental processes, including memory and attention. In literature, there is a paucity of research concerning the relationships between dissociation and memory performance. In this study, our aim was to investigate the relationships between dissociative experiences, attention, and memory performance in a non-clinical community sample.

Methods: In this study, we examined the relationship between dissociation and cognitive dysfunction among 60 healthy volunteers. We administered the Wechsler Memory Scale-Revised, Auditory Verbal Learning Test, Stroop Color Word Interference Test, and Dissociative Experience Scale.

Here we examined the relationships between the subtypes of dissociation and memory performance as assessed by neuropsychological tests.

Results: We found that verbal memory was negatively associated with dissociative experiences. Pathological dissociation, particularly amnesia and depersonalization/derealization, was reversely linked to general memory performance and long-term memory. Moreover, low dissociators reported higher scores on verbal memory, general memory performance, and long-term memory but lower scores on recognition than high dissociators.

Conclusion: The results of our study suggested that there are significant linkages between dissociative experiences and memory performance.

Keywords: Dissociative experiences, neuropsychological tests, cognitive functions, memory

ÖZET

Amaç: Dissosiyasyon bilinç, bellek, kimlik ve algı gibi fonksiyonlardaki bütünlüğün bozulmasıdır. Dissosiyatif semptomlar kendine ve çevreye karşı yabancılaşma, absorpsiyon ve amnezi gibi belirtileri içermektedir. Bu deneyimler dikkat ve bellek gibi bilişsel süreçlerin kontrolünün bozulmasına neden olabilmektedir. Literatürde dissosiyasyon ve bilişsel fonksiyonlar arasındaki ilişki açısından çelişkili sonuçlar bildirilmiştir. Bu çalışmada, dissosiyatif yaşantılar, dikkat ve bellek süreçleri arasındaki ilişkilerin klinik olmayan örneklemde incelenmesi amaçlanmıştır.

Yöntem: Çalışmaya 60 sağlıklı gönüllü hastane çalışanı dahil edilmiştir. Katılımcılara Dissosiyatif Yaşantılar Ölçeği ile beraber Wescher Bellek Ölçeği, Sözel Bellek Süreçleri testi, ve Stroop testi uygulandı. Nöropsikolojik test performansları ve Dissosiyatif Yaşantılar Ölçeği ve alt ölçekleri arasındaki ilişkiler incelendi.

Bulgular: Wescher Bellek Ölçeğinde sözel bellek performansı ile Dissosiyatif Yaşantılar Ölçeği arasında negatif yönde ilişki vardı. Patolojik dissosiyasyon, özellikle amnezi ve derealizasyon-depersonalizasyon, genel bellek performansı ve uzun süreli bellek arasında ters yönde ilişki bulundu. Ayrıca, düşük dissosiyasyon düzeylerine sahip bireylerin yüksek dissosiyasyon düzeylerine sahip bireylere kıyasla sözel bellek, genel bellek performansı, ve uzun süreli bellek puanları daha yüksekti.

Sonuç: Çalışmamızın sonuçları dissosiyatif yaşantılar ile bellek bozuklukları arasında bağlantı olabileceğini düşündürmektedir.

Anahtar kelimeler: Dissosiyatif yaşantılar, nöropsikolojik test, bilişsel fonksiyonlar, bellek

INTRODUCTION

Dissociation is described as a discontinuity in the normally integrated functions of memory, identity, perception, experience, and consciousness (1,2). Dissociative experiences include subjective phenomena such as amnesia, depersonalization, derealization, absorption, and identity alteration (3). It is a concept that ranges from minor experiences occurring in every individual's life to a major form of psychopathology. Some authors have argued that dissociation can be best understood in a continuum model that is present, to some degree, in everyone, and such symptoms can commonly be experienced at any time in the general population (4,5). It has been found that 80-90% of individuals report dissociative symptoms at least some of the time (5). According to the taxonomic model of dissociation, dissociation may also occur in everyday life, but pathological dissociation arises in response to highly traumatic events as a trait response and refers to psychopathology (6).

Various theoretical models have been proposed to explain dissociative experiences. Some authors have argued that dissociation is a type of cognitive processing deficiency and is associated with a lack of successful integration of information (7,8). Brunet et al. (9) noted that dissociative experiences may interfere with the processing of incoming information from the outside to the brain. It has also been pro-



posed that dissociative experiences represent failures of the mental system to execute the integration of information at higher levels (10). According to this model, dissociation is an inability to control one's mental processes. A failure in cognitive control can lead to miscellaneous types of mental defects, including memory impairments, attention deficits, and misinterpretations of sensory perceptions. Therefore, some researchers believe that dissociative experiences affect neurocognitive functions (3,4,5).

Pierre Janet, one of the first people to define the major characteristics of dissociation, argued that dissociation is related to objective memory disturbances for emotional events (11). Furthermore, Giesbrecht et al. (12) conceptualized dissociation as disruptions of attention and memory, and they developed the Dissociative Experiences Scale (DES). There is a broad consensus in literature that memory deficits are core features of dissociation. According to some authors, the negative effects of dissociation on attention and memory are due to information processing disorders. Several studies have investigated the connections between dissociation and cognitive processes. This research was conducted on college students and patients with depersonalization disorder (DPD), dissociative identity disorder (DID), and borderline personality disorder and has largely provided support for the existence of linkages between cognitive failures and dissociation. Investigations of individuals with DID have suggested that they possess intact cognitive control under neutral conditions, but in minor anxiety-provoking situations, cognitive inhibition becomes degraded (13). Giesbrecht et al. (14) provided further evidence indicating a relationship between dissociation and poor cognitive inhibition during increasing levels of emotional stress or challenge. They observed that students with high DES scores experienced difficulties in suppressing thoughts while viewing emotional video fragments.

Freyd et al. (15) investigated the relationships between selective attention measured by the Stroop test and dissociation in a student sample. The groups with high DES scores showed greater Stroop interference. DePrince and Freyd (16) confirmed these results; in their study, the group of high dissociators demonstrated a greater degree of divided attention under attentional instructions and recalled fewer words than the low dissociators on a free-recall task. Based on these results, the authors argued that dissociative experiences can play a causal role in disrupted attentional control.

It has also been argued that there is a close link between dissociation and memory dysfunction. Researchers showed that highly dissociative participants exhibited greater difficulties in memory functioning than individuals exhibiting low dissociation in patients with dissociative disorders and other samples with dissociative symptoms. In the first extensive study of cognitive processes in DPD, Guralnick et al. (17) demonstrated that participants with DPD exhibited deficits in visual and verbal short-term memories in comparison with normal control participants. Subsequently, DePrince and Freyd (18) examined the attention and memory performance of high and low dissociators in a sample of students. They found no significant differences between the two groups. However, Devill et al. (19) observed increased memory fallibility in high dissociators. Likewise, Candel et al. (20) reported that undergraduate students who scored high on dissociation produced more commission errors in emotional memory than low dissociators. In addition, Holtgraves and Stockdale (21) observed lower general recall in high dissociators.

Research has provided evidence that high levels of dissociation are related to cognitive deficits. In contrast, other studies have shown no relationship between dissociation and cognitive functions. Guralnick et al. (17) could not find significant deficits on neuropsychological measures of attention and memory functions in patients with DPD. Similarly, Rossini et al. (22) reported that individuals with high dissociation had normal cognitive functions. Because of the contradictory findings, further studies are needed to

understand the linkages between dissociation and cognitive functions. In this study, we aimed to investigate the associations of dissociative experiences in terms of absorption, amnesia, and depersonalization/derealization based on attention and memory performance.

METHODS

Participants and Procedures

Sixty healthcare workers (33 women, 27 men) were recruited as participants from Yüzüncü Yıl University, Faculty of Medicine Research Hospital. All individuals met the following inclusion criteria: 1. healthy volunteer; 2. not currently pregnant; 3. aged 20-35; 4. no use of any drug for psychiatric or major medical illness or insomnia; and 5. no history of substance abuse. The mean average age of the sample was 27.0 years, and the unbiased standard deviation was 4.36 years. Forty-five participants (75%) were university graduates, whereas 15 were high school graduates (25%). The study received approval from the University Ethical Committee.

The participants were briefly informed about the aim and procedures of the study. After the explanation of the research, each participant signed a written informed consent form. A set of neuropsychiatric tests was then administered by an experienced specialist psychologist in the psychiatry clinic of the Faculty of Medicine Research Hospital, and DES was concomitantly completed by the participants on their own. The average DES score of the sample was 15 (± 10.7). The participants were classified as low and high (score of 20 or higher) dissociators (18).

Psychometric Instruments

DES

DES is a 28-item self-response screening measure that examines dissociative experiences in daily life. The Turkish version of DES has a reliability and validity equal to its original form (23). Factor analysis showed that the measure has three subscales of depersonalization and derealization, amnesia and absorption, and imaginative involvement (4,24).

Neuropsychological Tests

In order to evaluate cognitive functions, the Wechsler Memory Scale, Auditory-Verbal Learning Test, and Stroop Test were administered to the participants by a clinical psychologist. The neuropsychological testing took approximately 40-45 min.

Wechsler Memory Scale-Revised

The Wechsler Memory Scale-Revised (WMS-R) is designed to assess both immediate and delayed verbal and visual memory, attention, and concentration (25). This comprehensive neuropsychological test battery is generally regarded as one of the best clinical memory tests in use. The attention and concentration, visual and verbal memory, delayed recall, and general memory subtests of WMS-R were administered to the participants.

Auditory Verbal Learning Test

The Rey Auditory Verbal Learning Test (RAVLT) (26) is a widely used clinical and research tool that examines the different aspects of verbal memory components, including immediate, delayed, and free recall; learning rate; retroactive interference; and recognition in adults. It involves repeated auditory presentations and recalls of 15 unrelated words. The test is a useful tool for diagnosing memory disturbances. The validity and reliability of the Turkish version of AVLT were determined by Öktem (27).

Stroop Color Word Interference Test-TBAG Form

The Stroop Color Word Interference Test-TBAG Form is a measure of selective attention and mental sets or cognitive shifting ability with chang-

Table 1. Pearson correlations between dissociative experiences and neuropsychological tests

	Dissociative experiences scale			Depersonalization-derealization
	DES	Amnesia	Absorption	
The Wechsler Memory Scale - Revised				
Verbal memory	-0.50**	-0.51**	-0.46**	-0.47**
Visual memory	-0.09	-0.14	0.01	-0.22
Attention-concentration	-0.11	-0.08	-0.13	-0.07
Delayed recall	-0.41**	-0.46**	-0.33*	-0.42**
General memory performance	-0.42**	-0.35*	-0.35*	-0.45**
The Auditory Verbal Learning Test				
Immediate memory	-0.09	-0.11	-0.04	-0.10
Long term memory	-0.34*	-0.35*	-0.25	-0.43**
Recognition	0.34*	0.34*	0.25	0.43**
Total number of recall	-0.26	-0.26	-0.22	-0.22
The Stroop Color Word Interference Test				
Duration	0.20	0.40*	0.05	0.22
Error	0.23	0.19	0.21	0.26
Corrected response	0.09	0.11	0.06	0.17
*: p<0.05, **: p<0.01				

ing task demands. It also measures the inhibition of habitual behavior patterns and the presence of unusual behavior (interference). A higher interference score indicates poorer performance. These functions mainly represent those of the frontal lobes (27). This test has been adapted and standardized for the Turkish population.

Statistical Analysis

Associations between dissociative experiences and neuropsychological test performances were assessed by running Pearson moment-product correlation coefficients. Low and high dissociators were determined with a cut-off score of higher than 20. Comparisons between the low and high dissociators were conducted using analysis of variance (ANOVA). The statistical significance threshold was $p<0.05$.

RESULTS

As shown in Table 1, the associations between the dissociative experience scale, subscales, and neuropsychological tests were examined statistically using Pearson correlation analysis. Significant negative correlations between dissociation subtypes and the verbal memory subscale of WMS were found. The amnesia and depersonalization/derealization subscales of DES were negatively associated with general memory performance. The delayed recall scale of WMS was also reversely linked to amnesia. Long-term memory was reversely associated with the amnesia and depersonalization/derealization subscales of DES. However, dissociative experiences were positively connected with the recognition scale of AVLT.

We also compared the scores of neuropsychological tests between the low and high dissociators using ANOVA models. High dissociators scored significantly lower than the low dissociators on the verbal memory [$F(1, 58)=13.332$; $p<0.01$], delayed recall [$F(1, 58)=5.473$; $p<0.05$], and general memory performance scales of WMS [$F(1, 58)=11.348$; $p<0.01$]. The low dissociators also demonstrated better performance than the high dissociators on the long-term memory scale of AVLT [$F(1, 58)=7.222$;

$p<0.01$]. However, the high dissociators scored higher than the low dissociators on the recognition scale of AVLT [$F(1, 58)=8.676$; $p<0.01$]. The results are presented in Table 2 and Figures 1 and 2.

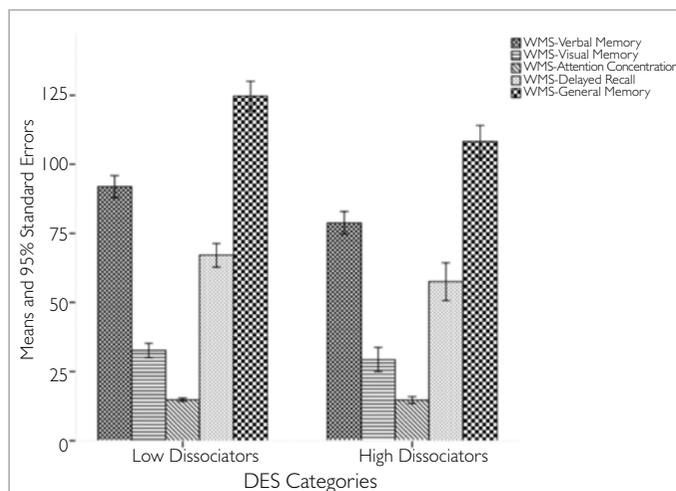
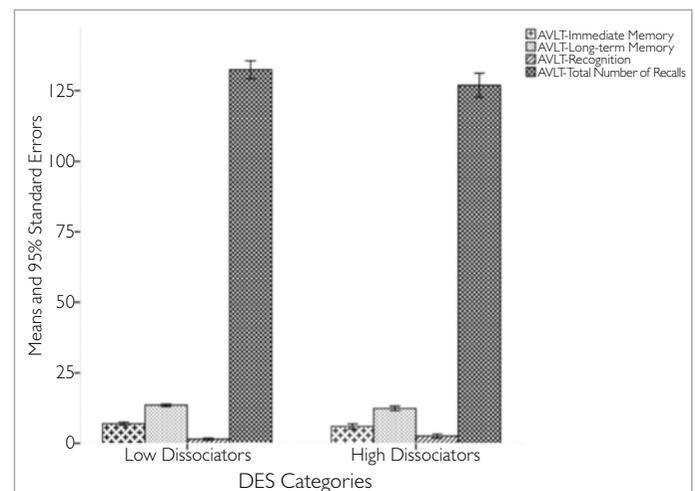
DISCUSSION

Our study examined the relationships between dissociation and cognitive dysfunction among healthy volunteers. Our hypothesis was that dissociation scores were negatively correlated with neuropsychological test performance. Consistent with our expectations, we found that greater levels of dissociation were significantly associated with worse performance in the verbal memory, delayed recall, general memory, and long-term memory indicators. Contrary to our hypothesis, we could not detect significant relationships between dissociative tendencies and test performance in the attention-concentration and Stroop tasks. These findings supported the significant associations of dissociative tendency with memory performance but not with attention. Dissociation, particularly the pathological dissociation of amnesia and depersonalization/derealization, was a significant antecedent of disruptions in the long-term and working memory functions.

In literature, there is a growing interest in dissociative processes, which are believed to be associated with memory dysfunction. Some authors have suggested that dissociative experiences accompany memory disturbances under certain conditions. According to this view, in any state, dissociative symptoms can block the neural mechanisms that play an important role in encoding experiences or sensations from short-term to long-term memory and in consolidating information (28). This idea is supported by neuropsychological investigations. Studies exploring the possible effects of dissociation on memory performance have demonstrated memory difficulties among individuals who reported greater scores on DES (7,19,29). The results of these studies suggest that dissociative experiences can block the information processes at that moment. Both the impaired cognitive integration of experiences and the inability to build connections between

Table 2. ANOVA comparisons between low and high dissociators

	DES categories						
	Low dissociators (n=45)		High dissociators (n=15)		F (1, 58)	P	η^2
	Mean	SD	Mean	SD			
Wechsler Memory Scale-Revised							
Verbal memory	92.00	13.21	78.87	7.38	13.332	0.001	0.187
Visual memory	32.69	8.59	29.40	7.92	1.711	0.196	0.029
Attention /concentration	14.89	1.91	14.73	2.25	0.068	0.795	0.001
Delayed recall	67.16	14.21	57.53	12.40	5.473	0.023	0.086
General memory performance	124.69	17.82	108.27	10.47	11.348	0.001	0.164
Auditory Verbal Learning Test							
Immediate memory	6.89	1.89	5.93	1.62	3.081	0.084	0.050
Long-term memory	13.47	1.32	12.40	1.35	7.222	0.009	0.111
Recognition	1.49	1.24	2.60	1.35	8.676	0.005	0.130
Total number of recall	132.44	10.72	126.93	7.69	3.369	0.072	0.055
Stroop Color Word Interference Test							
Duration	25.40	6.67	27.80	12.19	0.930	0.339	0.016
Error	0.18	0.49	0.40	0.63	1.992	0.163	0.033
Corrected response	1.00	1.31	0.80	1.01	0.289	0.593	0.005

**Figure 1.** Means and standard errors of the Wechsler Memory Scale-Revised subscales by the DES categories**Figure 2.** Means and standard errors of the Auditory Verbal Learning Test subscales by the DES categories

information processes are manifested as memory lapses (30). Our results were in line with previous theoretical assumptions considering the relationships between dissociation and cognitive information processes.

The relationships between dissociation and memory have led researchers to investigate the neuroanatomical structures and neurochemical systems mediating these functions. Neuroimaging studies of dissociation have involved a number of brain areas, including the inferior parietal lobe, prefrontal cortex, and limbic areas, such as the hippocampus, hypothalamus, and amygdala (6). These cortical areas are closely related to the neuroanatomy of memory functions. The activation of the fronto-parietal areas is known to be associated with encoding and retrieval (31),

whereas the role of the prefrontal cortex is to recall recent and distal memories (32). The hippocampal system is critical for encoding and retrieving new episodic information. Hence, a lack of integration between these systems can result in both dissociative symptoms and memory dysfunction. Laboratory studies in patients with dissociative symptoms have also shown the mediating role of the locus coeruleus and noradrenergic system in fear, arousal regulation, and memory function (9). In addition, some authors suggest that elevated levels of stress hormones can damage cells in the hippocampus, which may cause disturbances in its memory integrative functions. Connections between cortisol secretion levels, hippocampal damage, memory deficits, and dissociation support such analytical findings (6).

Our findings suggest that there are multiple possible connections between dissociation and different types of memory. Although there were strong inverse associations between dissociation scores and verbal memory, no significant relationship between dissociation and visual memory was found. DeRuiter et al. (33) investigated verbal working memory using the verbal working memory span test in undergraduates. They indicated that highly dissociative individuals demonstrated poorer verbal memory performance than low or moderate dissociative individuals. In contrast, Velman et al. (34) found that in a nonclinical sample, high dissociators exhibited superior performance than low dissociators on verbal working memory tasks. Dissociative symptomatology is a central feature in post-traumatic stress disorder (PTSD) (35,36), and several studies have demonstrated that verbal memory deficits are salient in this disorder (37,38,39). These studies have also found unsubstantial differences in visual memory across groups of individuals and without PTSD. Scholars have noted that dissociation is associated with specific deficits in verbal memory. The dual representation theory of PTSD proposes that traumas experienced after early childhood give rise to two types of memory, verbally accessible and situationally accessible, through appropriate situational cues. The non-verbal (situationally accessible memory) system is quite primitive, and sensory messages pass very rapidly through it along subcortical pathways, particularly through the amygdala. In contrast, the verbally accessible memory system is more complex. Sensory signals pass to the cerebral cortex and are analyzed in much more detail, particularly by the hippocampus. Functioning of the amygdala generally appears to be enhanced as stress increases, whereas intense stress associated with cortisol tends to impair the functioning of the hippocampus (40,41). Although our sample consisted of non-clinical participants and we did not assess their prior traumatic experiences, our results provided further evidence to support the postulates of the dual representation theory. Verbal memory performance was negatively associated with subtypes of dissociation, whether pathological or non-pathological.

The difference in verbal and visual memory functions may also be linked to hemispheric lateralization. It has been reported that verbal memory is related to the left and visual memory to the right hippocampus (42). The authors investigated the hypothesis that dissociative symptoms may result from a dysfunction of hemispheric interaction. Bob (43) reported that dissociative experiences may occur with interhemispheric competition and dissociation of cerebral hemispheres. Spitzer et al. (44) examined whether there is a relationship between dissociation and interhemispheric structural asymmetry. The investigators discovered that high dissociators had a significantly lower left hemispheric excitability than right hemispheric excitability. Using electroencephalography, Ashworth et al. (45) revealed that there were changes in readings associated with attention and cognitive processes, reflecting the different cortical network interactions. They also demonstrated that participants scoring high in dissociation exhibited left hemispheric lateralization. These findings suggest that dissociation involves a cortical asymmetry with a left hemispheric superiority or a lack of right hemispheric integration.

The relationships between dissociation and the measures of attention were not significant. These results are compatible with those of previous studies. Bruce (5) reported that the difference between high and low dissociators in the measure of attention was not significant. Guralnik et al. (17) did not find any significant differences between high and low dissociators on attentional tasks. Kwan (46) observed no differences between the two groups in their ability to focus and maintain attention on a given task. On the other hand, findings regarding the relationships between dissociation and attention are not unequivocal. Other studies have shown

processes. For example, Freyd et al. (15) examined the effects of dissociation on the Stroop interference test reflecting uncontrollable attention processes. The participants with high DES scores showed greater Stroop interference than those with low DES scores. Another study by DePrince and Freyd (16) reported similar results. The authors argued that high dissociation tendencies disrupt attentional functions.

Contrary to our expectations, the recognition subscale of AVLT was positively correlated with the DES, amnesia, and depersonalization scores. Previous studies generally argued that individuals with high dissociative tendencies may have cognitive disturbances (15,16), but the current results suggest that high dissociative tendencies are advantageous under some conditions. The results of the study examining the relationship between dissociation and verbal working memory span in college students indicated that the high dissociator group had a larger verbal memory span than the low dissociator group. In addition, Cloitre et al. (47) investigated the relationship between dissociation and cognitive avoidance using positive, negative, and neutral stimuli in patients with a history of abuse. The researchers found that higher levels of dissociation were related to superior memory performance for representative stimuli. Moreover, higher levels of dissociation were also related to a greater recall of words. They suggested that "high levels of dissociation may be associated with superior explicit memory retrieval processes as a result of enhanced attentional processing" (48). Given the current relationships between dissociation and recognition performance, it seems that dissociative tendencies play a facilitating role in the retrieval process in non-clinical individuals without psychopathology.

This study has several shortcomings. First, the Structured Clinical Interview for DSM-IV Axis I Disorders was not used to exclude any Axis I disorders. Second, our sample size was relatively small; thus, our findings should be reexamined using more representative samples. Third, only healthy individuals participated in the study, so our findings could not be generalized to clinical groups.

In conclusion, the purpose of this study was to examine the influence of dissociation on both memory and attention functions. Our results suggest that the relationships between cognitive functions and dissociation have multiple features. Dissociative mechanisms can directly affect memory and attentional processes. However, the levels of dissociation are distinctly associated with different aspects of memory functions. These relations and the differences in these associations should be investigated in clinical groups.

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