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**THE RELATIONSHIP BETWEEN
EXECUTIVE FUNCTIONING AND DISSOCIATION**

A Thesis in

Psychology

by

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ABSTRACT

This study aimed to illuminate the cognitive processes underlying dissociation. To accomplish such a goal, self-report measures, a bistable figure perceptual task, and neuropsychological tests were used. First, the relationship between attention and dissociation was examined. There were no observed differences between high and low dissociators on a measure of selective attention and a continuous performance task. The relationship between dissociation and visual perception was also examined. There were no significant differences between the high and low dissociators' number of perceptual shifts on a bistable figure task. Further, both high and low dissociators were able to voluntarily control the reversals. These results lead us to believe that reversal rate and dissociative phenomena are orthogonal constructs. The study also sought to explore the relationship between dissociation and the construct of executive functioning. Self-report and neuropsychological measures assessing different aspects of executive functioning were used. It was found that, although highly dissociative individuals report more executive difficulties than low dissociative individuals, these relative difficulties do not show up on their performance on any of the neuropsychological measures of executive functioning. Further investigation of dissociative processes and cognitive functioning is undoubtedly warranted. Future research should also continue to investigate the relationship between dissociative phenomena and executive functioning as measured by self-report and by neuropsychological measures, perhaps using more ecologically valid tests of executive functioning.

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Introduction

Overview

Dissociation refers to a variety of disruptions in an individual's cognitive processes including absorption, absentmindedness, and forgetfulness. The study of dissociation has recently gained importance due to its ability to inform us about these mental processes. Interestingly, dissociation can be viewed as both a normative phenomenon and a psychopathological phenomenon. Numerous studies have examined clinical dissociation but increasingly, researchers have also considered the more normative dissociative tendencies. Individual differences in attention and perception lie within the realm of normative dissociation. Relatively few studies have examined the relationship between attentional processes and perception in depth. This study employed bistable figures, a class of visual stimuli which can be viewed from two distinct perceptions, to attempt to better understand the cognitive processes underlying dissociation. Within the bistable figure literature, there exists a controversy: should the reversibility of the figures be attributed to 'top-down' processes or 'bottom-up' processes? The current study aimed to expand on previous studies that suggest perceptual shifts are more a result of an executive, top-down process. Furthermore, because relatively few experiments have studied executive functioning in high and low dissociators, several neuropsychological tests of executive functioning were administered. This thesis will first describe the theoretical and empirical foundations of each topic and then present hypotheses for the current study. Next, the design of the study will be presented, followed by results and a discussion of the findings. The thesis will culminate with future directions for research.

Dissociation

The idea of dissociation emerged in the medical and scientific literature between 1775 and 1900 (Ellenberger, 1970). The term psychological dissociation, however, was not coined until the early 1900's, when Pierre Janet studied what he named 'désagréations psychologique' (Janet, 1889). Janet believed that dissociation was an effect of stress, with some individuals experiencing more dissociation than others (see Perry & Laurence, 1984; Ellenberger, 1970; Haule, 1986; Sjöval, 1967, for historical overviews). Janet grouped the dissociative symptoms he observed into three categories: limb paralysis except while hypnotized, amnesia for repetitive behaviors manifest during the recollection of a distressing memory, and the development of conflicting personality characteristics after triggering events (Janet, 1907). As Freud's theories of repression gained favor, however, interest in Janet's work with dissociation waned (Ellenberger, 1970; Frey-Rohn, 1974; Nemiah, 1985, 1991). It was not until the 1980's, when researchers became attracted to the study of multiple personality disorder (MPD) and post-traumatic stress disorder (PTSD) that dissociation again became an important area of interest (Putnam, 1989; Ross, 1989).

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). An individual who is dissociating is unable to integrate his or her thoughts, feelings, and experiences into his or her stream of consciousness and memory (Bernstein & Putnam, 1986). Dissociative tendencies have been shown to be associated with continued interpersonal and self problems even in non-clinical samples (Lukens, 2003; Ruiz, Pincus, & Ray, 1999; Sandberg & Lynn, 1992;

Spindler & Elklit, 2003). Dissociation is clearly a phenomenon which can have a significant impact on daily functioning.

Dissociative experiences can take many forms, ranging from the non-pathological to the pathological. This variation has been described as lying on a continuum (Bernstein & Putnam, 1986). Some argue that dissociation is a continuous variable present to a greater or lesser degree in everyone (Waller, Putnam, & Carlson, 1996). One study indicated that between 80-90% of individuals questioned reported 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 without remembering that time period), few adults report more extreme dissociative experiences (Freyd, Martorello, Alvarado, Hayes, & Christman, 1998). One such extreme dissociative process such as the assumption of multiple identities, likely lies at the pathological end of the continuum (Ray, 1996). More examples of dissociation closer to the middle of the continuum include depersonalization and derealization. Depersonalization involves not experiencing oneself as real, whereas derealization is characterized by not experiencing one's environment as real. Amnesia is another type of dissociation defined by not possessing memories for important events that have occurred throughout one's life (Ray, 1996). Near the non-pathological end of the continuum lie phenomena such as absorption. Absorption has been described as being unaware of other events while completely engrossed in something else such as a movie or book (Ray, 1996).

Dissociative processes occurring within clinical contexts can be conceptualized within a dimensional model. Furthermore, some dissociative experiences, such as

absorption, depersonalization, derealization, and amnesia, do not occur solely within clinical contexts. They have also been found to commonly exist in non-clinical populations, community, and undergraduate student samples (Ray, June Turaj, & Lundy, 1992; Ross, Ryan, Anderson, Ross, & Hardy, 1989). Given this information, some researchers posit that this is indicative of the existence of a dissociative continuum. However, alternate formulations of dissociative processes exist. Another way to conceptualize dissociation is to divide it into its pathological and non-pathological forms. Some studies have suggested that there are indeed two very distinct models of dissociation. In 1996, Waller, Putnam, and Carlson postulated a typological model that distinguished pathological dissociative experiences from dimensional models that include more non-pathological forms of dissociation. Using taxometric analysis, this typological model made a clear distinction between pathological and non-pathological dissociation. They postulated that the nonpathological dissociation included absorption and imaginative involvement while pathological dissociation included dissociative states, derealization, depersonalization, and identity alteration (Waller et al., 1996). The DSM-IV employs a typological, or categorical model that divides mental disorders into mutually exclusive types based on criteria sets with defining features (APA, 2000). It includes five different dissociative disorder diagnoses: Dissociative amnesia, Dissociative fugue, Depersonalization disorder, Dissociative identity disorder (DID), and Dissociative disorder not otherwise specified (NOS) (APA, 2000). It is evident that dividing dissociation into two distinct models, non-pathological and pathological, is not uncommon. However, controversy continues to exist over whether non-clinical

dissociation qualitatively differs from the more psychopathological forms of dissociation (Spiegel, 1963).

Historically, research has focused on the more pathological forms of dissociation such as multiple personality disorder, recently renamed dissociative identity disorder (APA, 2000). As a result, relatively little is known about the more normative processes of dissociation (Ray, 1996). Recently, however, there has been increased interest in this area (Ray, 1996).

Dissociation and the Impact of Abuse

Many people consider it important to understand the etiology of dissociation. Historically, dissociative phenomena have been ascribed to pathological levels of psychological or emotional stress (Kihlstrom, 2005). In fact, the idea of a relationship between dissociation and traumatic events originated in some of Janet's early writings and has since been more systematically investigated. It has been shown that in many cases, dissociation is indeed associated with childhood stress and/or trauma (Kihlstrom, 2001; Ross, 1997). Trauma may take the form of physical or sexual abuse, exposure to violence, or human-made or natural disasters.

Studies have shown that most commonly it is an individual's report of a history of physical and/or sexual abuse that is related to both normative and pathological forms of dissociation (Eisen & Carlson, 1998; Carlson, Armstrong, Loewenstein, & Roth, 1998). In a comprehensive review of 100 cases of dissociative identity disorder (DID), (then called multiple personality disorder), 97% of the individuals reported a history of childhood trauma (Putnam, Guroff, Silberman, Barban, & Post, 1986). The trauma most

commonly took the form of sexual abuse, specifically incest. The witnessing of a violent death was reported by almost half of the patients (Putnam et al., 1986). History of childhood trauma is not confined to dissociative identity disorder, however. Individuals with dissociative disorders other than DID also frequently report abuse during childhood (Coons, Bowman, & Pellows, 1989). 100% of patients with atypical dissociative disorder and 82% of patients diagnosed with psychogenic amnesia reported some sort of abuse (sexual, physical, verbal, neglect) during childhood (Coons et al., 1989). Approximately half of these patients also reported trauma during their adult years.

Even for individuals who do not have a diagnosed dissociative disorder, reported childhood abuse predicts dissociative symptoms (Speigel & Cardena, 1991). Ray (1996) examined the relationship between self-reported abuse and dissociation in a large non-clinical population of undergraduate students. Consistent with other studies, there was a strong positive correlation between all forms of childhood abuse, including sexual abuse, punishment, and neglect, and dissociative experiences (Ray, 1996).

Dissociation has also been found to be more common in individuals with traumatic war-time experiences. Significantly higher levels of dissociative symptoms were found in veterans with PTSD than in veterans without PTSD even when the amount of combat exposure was covaried out (Bremner, Southwick, Brett, Fontana, Rosenheck, & Charney, 1992). The widespread connection between abuse/trauma and dissociation has caused researchers to speculate whether abuse and/or trauma play an important role in the etiology of dissociative symptomatology. If psychological trauma does influence the development of dissociative phenomenon, does it likewise produce cognitive sequelae that may be measured by neuropsychological tests? Although retrospective in nature and

based primarily on self-report, there is a general consensus that there is a reliable connection between trauma and dissociative phenomenon.

Measures of Dissociation

Renewed interest in dissociation has resulted in the development of four self-report measures of various dissociative processes: the Perceptual Alteration Scale (PAS; Sanders, 1986), the Questionnaire of Experiences of Dissociation (QED; Riley, 1988), the Dissociation Questionnaire (DIS-Q; Vanderlinden, Van Dyke, Vandereycken, & Vertommen, 1991), and the Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986). The PAS purports to assess altered perceptual experiences, focusing on experiences that relate to dissociation and binge eating (Sanders, 1986). The QED was developed based on responses from over 1700 undergraduate subjects and measures dissociative disorders like multiple personality disorder, classical hysterics, and the symptoms of temporal lobe epilepsy (Riley, 1988). The DIS-Q was developed originally for use in Europe (Ray, 1996). Of the four scales, the DES is the most commonly used. It utilizes the conceptualization of the continuum to describe dissociative experiences, and has been most extensively developed with abnormal populations (Bernstein & Putnam, 1986; Ross, Heber, Norton, & Anderson, 1989). The DES was designed to measure mental processes such as absorption, depersonalization, amnesia, and other forms of trance-like experiences (Ray et al., 1992). Recently, a revised edition of the DES was created. Called the Curious Experiences Survey, it was developed as a more concise version of the DES (Goldberg, 1999). Although the CES taps the same construct more succinctly, the DES remains the standard scale for research in dissociation. In 1996,

Waller and colleagues used a shorter version of the DES, called the DES-T, which they posited is sensitive to pathological dissociation. The current study will use the DES because, as mentioned before, it takes a dimensional approach. In addition, it will be advantageous to be able to compare findings of this study to the numerous past studies that have used the DES.

As mentioned, the DES was designed to assess various cognitive processes like absorption, depersonalization, and amnesia (Ray et al., 1992). Still, there is some debate as to what the DES actually assesses (Merckelbach, Muris, Rassin, Horselenberg, 2000). Because of such uncertainty, there have been numerous studies which have factor analyzed the DES. Results of these studies, which employed both exploratory and confirmatory factor analysis, initially produced conflicting results. However, recently, analyses of the DES have produced satisfactorily conclusive findings, usually yielding some combination of the following factors: absorption/ fantasy/ daydreaming, depersonalization, derealization, and amnesia. Past studies have reached solutions ranging from one factor to seven factors (see Carlson, Putnam, Ross, Amderson, et al., 1991; Fisher & Elnitsky, 1990; Holtgraves & Stockdale, 1997; Ray et al., 1992; Ray & Faith, 1995; Ross, Joshi, & Currie, 1991; Stockdale, Gridley, Balogh, & Holtgraves, 2002; Waller, 1995). Many of the resulting factors from these studies support the inherent cognitive nature of dissociation.

Dissociation and cognitive processes

Many argue that dissociation is fundamentally cognitive, and that the DES likely assesses cognitive control (Frankel, 1990, 1996; Hacking, 1995). Cognitive control is

related to different types of memory, attentional processes, and imagination (Frankel, 1990, 1996; Hacking, 1995). The lack of cognitive control, or cognitive failures, include many types of mental lapses: perceptual, attentional, memory, and action (Broadbent, Cooper, FitzGerald, & Parkes, 1982). Broadbent developed a self-report measure to assess these so called cognitive failures, named the Cognitive Failures Questionnaire (Broadbent et al., 1982). Although it is primarily a cognitive assessment, it has been frequently compared to the DES. In 1999, Merckelbach, Muris, & Rassin examined the connections between everyday cognitive failures and the DES. Before that study, no study had looked at the relationship between these two measures (Merckelbach et al., 1999). There is good reason to believe that there is a relationship, however. High correlations, ranging from .43 to .51 have been found between the CFQ and the DES (Merckelbach et al., 1999; Merckelbach, Horselenberg, & Schmidt, 2002). The higher a person's self-reported level of dissociation, the more everyday lapses and cognitive failures that he or she reports (Merckelbach et al., 1999). Schurle and Ray (under review) further clarified this relationship. Results confirmed a strong relationship between cognitive failures and dissociation, with cognitive failures as measured by the CFQ encompassing the nonpathological end of the dissociative spectrum (Schurle & Ray, under review).

Numerous studies have looked at the relationship between dissociation and the aforementioned cognitive processes. Some researchers believe that dissociation most strongly affects executive functions like concentration, monitoring, and planning abilities (Hilgard, 1986). Executive functioning can be described as “those capacities that enable a person to engage successfully in independent, purposive, self-serving behavior” (Lezak,

1995). It is a broad construct that encompasses abstract reasoning ability, initiation, controlled attention, strategizing, and perseveration. Individuals who experience deficits in executive functioning sometimes have difficulty “shifting set.” Shifting set refers to flexibility perceptual, cognitive, and response dimensions (Lezak, 1995). Sometimes it can be difficult to distinguish between difficulty shifting set (perseveration) and repetitions due to attentional deficits.

A connection between dissociation and fundamental cognitive processes such as executive functioning was postulated in a study done by Cima, Merckelbach, Klein, Schellbach-Matties, and Kremer (2001). This study examined executive functioning in a sample of forensic inpatients, using four tasks of the 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 and the authors therefore concluded that frontal deficits contribute to dissociation (Cima et al., 2001). More recently, another study confirmed the idea that high levels of dissociation can affect executive functioning. Giesbrecht, Merckelbach, Geraerts, and Smeets (2004) investigated the relationship between dissociation and executive functioning by administering the DES and the Random Number Generation Task (RNG) to 185 undergraduate students. They tested the specific idea that poor executive functioning is related to the pathological aspects of dissociation (Giesbrecht et al., 2004). They found a modestly significant relationship between the executive function of failure to inhibit responses and dissociative amnesia (Giesbrecht et al., 2004). These findings suggest that the link between dissociation and executive functioning warrants further study.

The relationship between dissociative experiences and frontal lobe deficits indeed requires further clarification, as not all studies have shown a correlation between dissociation and executive functioning. In 2000, Gualnik, Schmeidler, and Simeon compared patients with a diagnosed Depersonalization disorder to matched controls on various neuropsychological measures. An extensive battery of neuropsychological measures was administered, including the Wechsler Adult Intelligence Scale –Revised (WAIS-R; Wechsler, 1981a), the Wechsler Memory Scale –Revised (WMS-R; Wechsler, 1981b), the Stroop Color-Word Test (Trennery, Crosson, DeBoe, & Leber, 1990), an emotional Stroop task consisting of neutral, negative, positive, and depersonalization words, Trail Making Tests A and B (TMT A, TMT B; War Department, Adjutant General’s Office, 1944), the Wisconsin Card Sorting Test (WCST; Heaton, Chelune, Talley, Kay, & Curtiss, 1993), and the Vigil Continuous Performance Test (Vigil/W; ForThought, 1996). The participants with Depersonalization disorder showed relative deficits on certain measures of attention, spatial reasoning, and short-term visual and verbal memory (Guralnik et al., 2000). They did not, however, 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.

Similarly, Rossini, Schwartz, and Braun (1996) published a study which determined that intellectual functioning in high dissociators was within the normal range. In addition, they found that a group of 105 inpatients diagnosed with dissociative identity disorder and dissociative disorder not otherwise specified did not significantly differ on general intellectual functioning between groups (Rossini et al., 1996). Due to the

contradictory findings in the literature, more research in this domain is undoubtedly necessary to gain a better understanding of the cognitive effects of dissociation.

Giesbrecht et al. (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 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. In order to thoroughly investigate this relationship it was therefore important to include several different measures of executive functioning in this study.

Dissociation and attention

Although attentional processes are strongly related to dissociation, relatively few studies have examined the two domains. Those that have, have obtained mixed results. In 1998, a Freyd, Martorello, Alvarado, Hayes, and Christman compared 40 high and 40 low dissociators on the Stroop color-naming task and found that high dissociators showed a greater level of interference than did the low dissociators. They argued that this finding is indicative of the role of attentional processes in dissociation (Freyd et al., 1998). More specifically, they argued that high dissociators experience disruptions in consciously controlled attentional abilities (Freyd et al., 1998). A replication of this finding was published in 1999. Researchers found that a group of 54 high dissociators showed greater interference than low dissociators in a standard Stroop task (DePrince &

Freyd, 1999). However, the high dissociators showed less interference on a divided attention Stroop task (DePrince & Freyd, 1999). They argued that for tasks requiring the selection of information while dual or multi-tasking, dissociative individuals may perform better than nondissociative individuals (DePrince & Freyd, 1999).

Not all findings have pointed to differences in selective attentional tasks, however. Also using a standard Stroop task, Guralnik and colleagues (2000) did not find significant differences between individuals with depersonalization disorder and matched controls. This null result could be due to the use of a relatively small sample size of only 30 participants. Given the contradictory findings in the literature, it is unclear if dissociation indeed affects an individual's selective attentional capabilities.

Dissociation and perception

In addition to the surprising lack of literature on attention and dissociation, there is a paucity of literature related to perception and dissociation. The majority of studies on perception and dissociation that do exist have used projective measures. Projective measures purport to gain information about an individual's personality or psychopathology by using his or her responses to a vague or ambiguous stimulus (Hecker & Thorpe, 2005). Numerous studies employing the Rorschach and Thematic Apperception Test (TAT; Murray, 1943) have examined the perceptual processes of individuals diagnosed with Dissociative identity disorder (Armstrong & Lowenstein, 1990; Labott, Leavitt, Braun, & Sachs, 1992; Leavitt & Labott, 1998; Lovitt & Lefkof, 1985; Pica, Beere, Lovinger, & Dush, 2001; Scropo, Weinberger, Drob, & Eagle, 1998; Wagner, Allison, & Wagner, 1983; Young, Wagner, & Finn, 1994).

Summarizing the bulk of this literature generates only two consistent findings. First, individuals with DID tend to cite a disproportionate number of movement responses on the Rorschach. This is generally interpreted in relation to heightened imaginative characteristics (Scroppo et al., 1998). The other consistent finding is that results tend to incorporate an elevated number of responses that refer to some sort of dissociative, splitting, or fragmenting process (Scroppo et al., 1998). Neither finding is particularly surprising, given what we already know about dissociation and high dissociators. Unfortunately, there are few studies that focus on dissociation and perceptual abilities more generally. Given that perception is such a basic, important cognitive process, it follows that more research in this domain should be done.

Individual differences and dissociation

Individuals who are high dissociators often possess a constellation of characteristics. There are three characteristics that stand out as closely related to dissociation and dissociative tendencies: absentmindedness, absorption, and hypnotizability (Ray, 1996). Absentmindedness refers to a lapse of awareness, a “slip,” or mistake. Reason (1993) used the term “absent-mindedness” to refer to a lack of cognitive control. Beginning in the late 1970’s, Reason had begun studying minor, everyday slips or errors. Examples of these slips or errors include forgetfulness, “spacing out,” and daydreaming. Such examples of absentmindedness sound closely related, if not identical, to some examples of normative dissociative experiences. Reason and Mycielska (1982) developed a questionnaire referred to as The Absentmindedness Questionnaire the same year Broadbent and colleagues developed the Cognitive Failures

Questionnaire (CFQ), mentioned first in the ‘dissociation and cognitive processes’ section. The Absentmindedness Questionnaire and the CFQ correlate highly with each other ($r = .68$). As mentioned previously, there is a very strong correlation between the CFQ and the DES (between $r = .43$ and $r = .51$; Merckelbach et al., 1999; Merckelbach et al., 2001). Not surprisingly, it has also been shown that there is a strong correlation between the DES and the Absentmindedness Questionnaire ($r = .56$; Ray, 1996). Clearly the constructs of dissociation and absentmindedness or cognitive failures overlap a great deal.

Another characteristic that dissociation overlaps significantly with is absorption. Absorption includes the ability to become engrossed in a task, whether that task be reading a book, working on a project, watching a movie, or driving down the highway. Tellegen (1992) described absorption as a “marked restructuring of the phenomenal self and world.” Tellegen (1992) related absorption to dissociation by stating, “these more or less transient states may have a dissociated or an integrative and peak-experience-like quality.” Tellegen and Atkinson (1974) developed the Tellegen Absorption Scale (TAS), which is a measure that assesses one’s openness to absorption. The correlation between the TAS and the DES has indeed been found to be quite high, affirming the idea that there is in fact overlap of the two phenomena (between $r = .55$ and $r = .59$; Ray, 1996).

Finally, the separate domains of dissociation and hypnosis have been studied in close connection since at least the 1880’s (Ray, 1996). The relationship between the two constructs has also been investigated in depth by both the scientific and the popular literature. Janet was one of the first to use hypnosis in the study of dissociation (Ellenberger, 1970). There is a great deal of similarity between a hypnotic and

dissociated states of being (Spiegel & Cardéna, 1991). Some posit that hypnosis can be understood as a type of voluntary, or structured dissociation (Nemiah, 1985). According to several studies, individuals who are clinically dissociative are reportedly high in hypnotizability (Bliss, 1986; Frishholz, Lipman, Braun, & Sachs, 1992; Putnam, 1989). The exact nature of the relationship between hypnotizability and dissociation is unknown. Faith and Ray (1994) sought to learn more about this relationship and found that among nonclinical populations, there was little correlation between dissociation and hypnotizability. Other research has also shown that scores on the DES are essentially unrelated to scores on hypnotizability scales (Kirsch & Council, 1992; Putnam, 1994 as cited in Green & Lynn, 1995). It remains uncertain why there is such a difference between clinical and nonclinical populations. Crawford, Brown, and Moon (1993) indicated that any similar traits between dissociation and hypnotizability are likely due to common underlying sustained attentional and disattentional abilities, combined with the ability to give up reality testing.

Bistable figures

Bistable figures, also referred to as reversible or ambiguous figures, are a particular class of visual illusions that have generated extensive theoretical and empirical speculation (Long & Toppino, 1981). Examples include the Necker cube, the Schröder staircase, the Rubin vase-faces figure, and the young girl/old woman (Boring, 1930) picture (see Attneave, 1971 for examples of these and other figures). When viewed for a period of time, these typically well-known figures spontaneously alternate between distinct perceptual organizations. Three different types of such figures have been

identified: figure-ground reversal, perspective reversal, and meaning reversal (Long & Toppino, 1981). The Rubin vase is an example of a figure-ground reversal with meaningful content. The Necker cube is an example of a perspective reversal of a structural figure. The young girl/old woman picture is an example of a meaning reversal. Figure 1 in the Methods section displays the Necker cube and the Rubin vase.

More than 100 years of research have focused on bistable figures. In addition to their inherent intriguing nature, bistable figures have been a popular area of research because they have been hypothesized to reveal a variety of sensory and cognitive processes that lie at the foundation of human perception (Long & Olszweski, 1999). The reversibility of such figures has been attributed to a variety of different phenomena, including eye movements, attentional fluctuations, accommodation changes, neural satiation or fatigue, acuity gradients across the retina, set effects, perceptual learning, perceptual novelty, and more (Boring, 1942; Garcia-Perez, 1989; Long, Toppino, & Kostenbauder, 1983; Long, Toppino, & Mondin, 1992; Horlitz & O'Leary, 1993; Kawabata, Yamagami, & Noaki, 1978; Pheiffer, Eure, & Hamilton, 1956; Vicholkovska, 1906). Through the years, two competing schools of thought have emerged from the many theories, in an attempt to explain the perceptual fluctuations individuals experience when viewing bistable figures (Long et al., 1983).

'Bottom-up' versus 'top-down' processing theories

The debate within the bistable figure literature can be pared down into two general theoretical camps (Long & Toppino, 1981). Some researchers assert the importance of "bottom-up" processing. In "bottom-up" processing, emphasis is placed

on the automatic, passive process of neuronal fatigue or saturation. Other researchers adhere to a “top-down” processing model whereby a more active process of shifting attention prevails.

The theory that favors a “bottom-up” approach is the older theory of the two. This theory, based on the idea of neuronal satiation, proposes that the perceptual shifts are a result of a passive process (Attneave, 1971; Howard, 1961; Kohler & Wallach, 1944; Orbach, Ehrlich, & Heath, 1963). Originally, the “bottom-up” approach was based on Wolfgang Kohler’s theory (1940) of visual or figural after-effects. In this view, the cortical organization underlying one perception of a bistable figure fatigues, or satiates with extended viewing (Long et al., 1983). Due to the satiation, the perception will surrender to a fresher cortical organization underlying the alternative perception. When this cortical organization in turn fatigues, the individual’s perception of the figure will return to the first perception, as it has had an opportunity to at least partially recover from the fatigue. Initially, this satiation model was discussed in the language of Gestalt physiology such that prolonged viewing of a bistable figure resulted in an increase in resistance to the flow of electric current in the brain tissue (Kohler, 1960). This idea was exchanged for a similar model in which satiation was conceptualized as “some kind of fatigue process of aggregates of neurons signaled by an augmentation of the photic response” (Orbach et al., 1963, p. 457). The most recent explanation behind the ‘bottom-up’ process has adjusted in an attempt to relate the satiation theory to the fatiguing of the neural “channels” that are believed to make up the visual system (Regan, 1982).

There is evidence that indeed supports the influence of this more passive, satiation-focused model. Classes of findings typically include the pattern of increasing

reversals with extended viewing, localized adaptation effects, and the relative independence of simultaneously presented reversible figures (Babich & Standing, 1981; Brown, 1955; Carlson, 1953; Hochberg, 1950; Long et al., 1983; Nawrot & Blake, 1989; Toppino & Long, 1987; von Grunau, Wiggin, & Reid, 1984). As mentioned before, when an individual's perception returns to the original perspective, the cortical structure has not yet fully recovered from its fatigue. Because of this, it tires more quickly (Long et al., 1983). Thus, over an extended time period, the perceptual shifts occur more rapidly until a relatively constant rate of fatigue/recovery is reached (Babich & Standing, 1981; Brown, 1955; Cohen, 1959; Howard, 1961; Price, 1969a, 1969b; Spitz & Lipman, 1962). In research examining the effects of selectively adaptive neural channels, it has been found that these channels fatigue over time but recover after a period of rest, which is very similar to the process of perceptual shifts in a bistable figure (Long et al., 1983). Some researchers have thus explicitly related the perceptual shifts to the fatiguing of separate channels in the visual system (Palmer & Bucher, 1981). Finally, when two identical bistable figures are presented side-by-side, the perceptual shifts one experiences for each figure occur independently of the other (Long & Toppino, 1981; Long et al., 1983). Researchers argue that the apparent involuntary nature of the perceptions is more consistent with the "bottom-up" processing model.

Although there is substantial evidence supporting the "bottom-up" explanation of perceptual shifts, there are many other researchers that adhere to an alternative model. This was explained by Rock (1975), who discussed the importance of active selection and hypothesis testing when individuals view bistable figures. This "top-down" model attributes the perceptual shifts to a "cyclic decision process" (Vickers, 1972) or a

“process of continuous trial and error on the part of the perceptual system” (Rock, 1975). Contrary to the passive theory of perceptual shifts, this theory conceptualizes the perspective reversals as different solutions to the perceptual ‘puzzle’ offered by the stimulus (Long & Toppino, 1983). It is likened to a sort of ‘hypothesis-testing’ by the viewer where there are two potential solutions. Proponents of this model explain the finding that the reversal rate increases as viewing time increases by claiming that it is a learning process (Long et al., 1983). Rather than neuronal fatigue, they claim that the individual’s knowledge or awareness of the two perceptual shifts increases, thus the turnaround between perceptions increases. It is an individual’s preference for novelty and expectancy of that novelty that produces perceptual shifts, not fatigue of one set of underlying neural structures (Long & Olszewski, 1999).

In support of the important role of ‘top-down’ processing, several types of findings are commonly cited. These include instructional effects, secondary task effects, and prior experience with the bistable figure (Beer, 1989; Bugelski & Alampay, 1961; Girgus, Rock & Egatz, 1977; Leeper, 1935; Liebert & Burk, 1985; Long et al., 1983; Pelton & Solley, 1968; Reisberg & O’Shaughnessy, 1984; Rock & Mitchener, 1992; Thetford, 1963). Instructional effects include findings that demonstrate it is possible to direct subjects to voluntarily alter the rate of perceptual shifts (Hochberg & Peterson, 1987; Liebert & Burk, 1985; Pelton & Solley, 1968; Seth & Reddy, 1979). In several studies, subjects given voluntary control instructions were able to reduce the total number of reversals they experienced (see Pelton & Solley, 1968; Seth & Reddy, 1979). Interestingly, results showed substantial individual differences in the ability to control perception voluntarily. Several interesting questions are raised by these findings. What

are the underlying mechanisms that mediate this degree of voluntary control of reversals? What are the characteristics of individuals who are better able to control the rate of perceptual shifts? To the author's knowledge, no studies to date have looked at voluntary control of increasing the reversal rate.

Another finding that advocates of the 'top-down' approach cite is of secondary task effects. Several studies have showed that the presence of a distracter task slows the rate of perceived reversals (Reisberg, 1983; Reisburg & O'Shaughnessy, 1984). Reisberg and O'Shaughnessy (1984) found that there was increased time to the first reversal and a reduction in the rate of reversal overall when subjects' attention was divided between the ambiguous figure and a secondary task.

Finally, evidence supporting the influence of 'top-down' processing comes from literature suggesting that prior knowledge of the ambiguous nature of the figure is critical to perceptual shifts. That is, unless an individual realizes that the stimulus being viewed is reversible, he or she may not perceive any reversals whatsoever (Girgus et al., 1977; Horlitz, 1988; Rock & Mitchener, 1992). In one study whereby subjects were not informed that the figures displayed were indeed ambiguous, only approximately one-third of the subjects ever experienced a perceptual shift (Rock & Mitchener, 1992). It was argued that this failure of spontaneous reversal was not readily reconcilable with the "bottom-up" theory of reversal because satiation or fatigue should occur whether the observer is aware of the duality of the perception or not.

Electroencephalogram (EEG) research has further bolstered the "top-down" model of ambiguous figure perception. Gamma band activity in the human EEG has been shown to be closely related to visual information processing and attentional

perceptual mechanisms (Müller, Gruber, & Keil, 2000). In addition, gamma topography, or activation, can index cognitive activation in a very complex and purely internal task (Kissler, Müller, Fehr, Rockstroh, & Elbert, 2000). More specifically, researchers discovered that when individuals viewed ambiguous figures, there was a corresponding increase in gamma band activity in the frontal lobe. (Basar-Eroglu, Strüber, Kruse, Basar, & Stadler, 1996).

In 2000, Strüber, Basar-Eroglu, Hoff, and Stadler undertook an EEG study to analyze any possible differences found between individuals whose perception of dynamic bistable figures switched at a high rate versus those who switched at a low rate. The high-rate switchers had higher gamma activity in general than the low-rate switchers. (Strüber et al., 2000). Both groups showed the highest gamma activity in the frontal lobe, which was consistent with their earlier study (Basar-Eroglu et al., 1996). They argued that the activation of higher-order cortical areas outside the visual cortex during multistable perception strongly supports the influence of top-down processing (Strüber et al., 2000). As a follow-up, the same group of researchers attempted to replicate previous findings using a static bistable figure instead of a dynamic ambiguous figure (Strüber, Basar-Eroglu, Miener, & Stadler, 2001). When they used the Necker cube as the stimulus, they found that there was a general frontal gamma-band enhancement, and higher induced gamma activity for subjects who experienced a higher rate of perceptual shifts (Strüber et al., 2001). Thus, previous findings were replicated, providing further evidence to support the important role of gamma activity in the frontal lobes during bistable figure reversals. Strüber and colleagues (2001) maintained that this substantiates the involvement of attentional top-down processing of figure reversal. Physiological

findings, such as these EEG studies, unmistakably point toward a greater impact of ‘top-down’ processing than of ‘bottom-up’ processing.

Although most of the earlier research in the domain of bistable figures possessed an “either—or” flavor, in the last 15 years, there has been a growing trend to accept the joint impact of both “bottom-up” and “top-down” processes (Hochenberg & Peterson, 1987; Long et al., 1983, 1992; Palmer & Butcher, 1981; Toppino & Long, 1987). Given the strong empirical support of both sides, it is probable that a hybrid theory encompassing both types of processes may be able to provide a more comprehensive explanation (Long et al., 1992). Yet, some argue that the processes governing the rate of perceptual shifts vary based on the viewing conditions (Long et al., 1992). On the whole, it is imperative to emphasize the worth of bistable figures as research tools. At both a theoretical level and an empirical level, the characteristics of perceptual shifts in ambiguous figures can function as metaphor for the different processes which lie at the foundation of human perception (Long et al., 1992).

Individual differences and bistable figures

Bistable figures have not only been valued for their ability to elucidate perceptual processes, they have also been used to examine individual differences in the rate of perceptual shifts. Reversal rate has been found to be correlated with cognitive flexibility, the presence of psychopathology, intelligence, and personality traits (Klintman, 1984; Crain, 1961; Holt & Mason, 1974; Frederiksen & Guilford, 1934; Meredith, 1967; Shiomi, 1982). Klintman’s 1984 study supported the notion that individuals who experience a high number of bistable figure reversals have less cognitive stability. It had

been previously shown that perceptual instability is associated with the capacity for original thinking. Klintman (1984) therefore argued that individuals who experienced a higher number of reversals had more creative potential than individuals experiencing a lower number of reversals.

Certain forms of psychopathology have also been examined in conjunction with bistable figures. Several studies have looked at differences in the reversal rate between individuals diagnosed with schizophrenia and normal controls (Keil, Elbert, Rochstroh, & Ray, 1998; Levander, Bartfai, & Schalling, 1985). The findings have been contradictory, however. Levander and colleagues (1985) found that the number of passive reversals of the Necker cube was significantly lower for men with schizophrenia than for matched male control subjects. This replicated other results indicating that individuals with schizophrenia experience a low frequency of perceptual shifts (Hunt & Guilford, 1932; Nemor, 1953). They hypothesized that this was due to damage to the frontal lobes. More recently, a study using the Rubin vase found that individuals with schizophrenia showed significantly faster reversal rates than matched controls (Keil et al., 1998). The use of different types of ambiguous figures may be a possible explanation for the discrepancy. Another consideration would be medication effects, although results from another study imply that if anything, medication effects would have lowered the reversal rate (Phillipson & Harris, 1984).

Damage to the frontal cortex can lead to disorders of directed attention, such as impairments in concentration accompanied by distractibility, and rapid alternation of attention (for a review, see Stuss & Benson, 1986). As mentioned earlier, some researchers posit that the reversal rate of a bistable figure is related to frontal or executive

functioning. Consistent with this hypothesis, it has been found that individuals with bilateral frontal cortex damage tend to report more perceptual shifts of a Necker cube than matched controls (Teuber, 1964). This finding was replicated using the Rubin vase (Yacorzynski, 1965). Psychopathy, long believed to be related to specific deficits in cognitive processes associated with the functioning of the frontal lobes, has also been examined in relation to bistable figure reversal rate. As expected, psychopaths report significantly more reversals than both incarcerated controls and non-criminal controls (Gorenstein, 1982; Lidberg, Levander, Schalling, & Lidberg, 1978).

Several studies reached a different conclusion regarding the relationship between executive functioning and bistable figures. Like most of the studies employing individuals with schizophrenia, frontal lobe damage, and diagnosed psychopaths, findings indicate that highly hypnotizable individuals experience faster reversals than do low hypnotizables (Crawford, Brown, & Moon, 1993; Wallace, Knight, & Garrett, 1976; Wallace & Priebe, 1985). The reasoning, however, is in exact opposition to the previous theoretical explanation. Crawford et al. (1993) proposed that highly hypnotizable individuals are more susceptible to reversible figures and visual illusions because they have more *efficient* sustained attentional and disattentional abilities. They argue that highly hypnotizable individuals may have a more efficient far frontal executive control (Hilgard, 1986; Pribram, 1991). Clearly, a consensus in the literature has not been reached.

The current study

Traditionally, clinical psychology has been concerned with individual differences and psychopathology while cognitive psychology has been interested in understanding basic mechanisms of mental processes. Drawing from the cognitive and clinical literature, the purpose of this study was to establish a marriage of cognitive principles and clinical processes to better inform both fields of study about the inner workings of the human brain. It interfaced cognitive processes such as perception and clinical phenomenon such as dissociation examining both in relation to neuropsychological measures. The overarching goal was to elucidate the relationship between dissociation and executive functioning. Specifically, the following hypotheses were expected.

Hypotheses

1. Re-examine the relationship between dissociation and attention by using a selective attentional task and a sustained attentional task. Although past studies' results have been mixed, it was hypothesized that individuals high in dissociation would perform more poorly on measures of selective or controlled attention than individuals low in dissociative tendencies. However, it was hypothesized that individuals high in dissociation would perform as well if not better on a task of sustained attention.
2. Examine the relationship between dissociation and executive functioning from a variety of different perspectives. Again, due to the contradictory findings in the literature, more research in this domain is necessary to gain a better understanding of the cognitive effects of dissociation. Several different measures of executive functioning

including self-report, abstract reasoning ability, perseveration, working memory, and decision-making were used.

a) It was hypothesized that individuals higher in dissociation would report more difficulties with executive functioning.

b) It was further hypothesized that their performance across all tasks would be consistent with their self-report indicating relatively poorer executive functioning than individuals low in dissociation.

3. Add to the paucity of literature related to dissociation and perception. To the author's knowledge, no study has examined the impact of dissociation on perceptual stimuli such as bistable figures. Bistable figures have proved to be invaluable for helping us learn more about cognitive and perceptual processes (Long et al., 1992). It was hypothesized that the rate of perceptual shifts when gazing at a bistable figure is governed by more of a 'top-down' process than a 'bottom-up' process. Many researchers have theorized that highly dissociative individuals have relative deficits in executive functioning. Moreover, deficits in executive functioning are related to rapid reversals.

a) Therefore, consistent with aforementioned hypotheses of executive functioning, it was hypothesized that individuals high in dissociation would experience more passive reversals than low dissociators, both of perspective shifts (Necker cube), and of figure-ground reversal (Rubin vase).

b) As an extension of the previous hypothesis, it was postulated that high dissociators, with their relative deficits in executive functioning, would not be as successful as low dissociators in bringing the reversals under voluntary control ('top-down' processing). When asked to bring the perceptual shifts under

voluntary control and *limit* the number of perceptual shifts, it was hypothesized that high dissociators would be less successful than low dissociators, thus experiencing *more* perceptual shifts. When asked to bring the perceptual shifts under voluntary control and *increase* the number of perceptual shifts, again it was hypothesized that high dissociators would be less successful than low dissociators, thus experiencing *fewer* perceptual shifts. It was predicted that this would happen with both the perceptual and the figure-ground ambiguous figures.

Methods

Subjects

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 = 1025) at the beginning of the semester, which consisted of a variety of questionnaires. Students completed the questionnaires in a single 1 ½ hour session in a large group setting in a lecture hall. From their responses, individuals scoring high and low on the Dissociative Experiences Scale 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 section). The low dissociator group consisted of individuals with a DES score of less than 6 (excluding DES scores of 0). Out of the 66 individuals recruited for study participation, one individual was eliminated due to a significant age difference. This resulted in a final sample of 65 participants. Participants were asked a series of background questions at the beginning of the experimental procedure about the accuracy of their vision (normal or corrected-to-normal), whether they are color-blind, which hand is dominant, whether they have experienced a head injury, and whether they have ever been diagnosed with Attention-deficit hyperactivity disorder or a learning disability.

Apparatus and materials

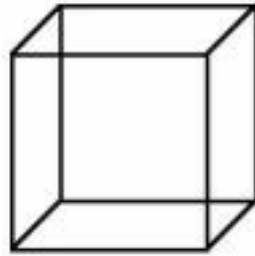
The E Studio © E Prime software (version 1.0) was used to create the bistable figure experimental procedure. The images were presented on a blank computer screen forming a visual angle of about 5 degrees. A head and chin rest was employed to ensure consistency.

Perceptual stimuli

This study used two different reversible figures, because the type of bistable figure used can be an important variable in studying the reversal phenomenon (Strüber et al., 2001). Past literature has cautioned against drawing too broad a generalization with just a single reversible figure.

The Necker cube and the Rubin vase (please see Figure 1) were used as bistable figures. The Necker cube allows a judgment of perspective: whether the cube is viewed from the front or back, while the Rubin vase represents a figure which shifts in terms of figure-ground perception.

Figure 1. Necker cube (top) and Rubin vase (bottom)



Measures

Dissociative Experiences Scale-II (DES) As previously mentioned, the Dissociative Experiences Scale was used as a screening measure to recruit subjects. 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 the time they experience the phenomenon or event described in the question. These answers should be restricted to times when the individual is not under the influence of drugs and/or alcohol. Responses are in 10% increments on a scale from 0 to 100% where zero means “never” and 100 means “all of the time.” Due to the constraints of the mass screening procedures, for this study, the responses were altered slightly so that the scale ranged from 10 to 100% where 10 meant “never” and 100 meant “all of the time.”

Research has demonstrated reliability and validity for the DES in both clinical and non-clinical populations (Carlson & Putnam, 1993; Bernstein & Putnam, 1986; Holtgraves & Stockdale, 1997; Ray & Faith, 1995). Test-retest reliabilities between .79 and .96 have been found (Pitblado & Sanders, 1991; Bernstein & Putnam, 1986; Frischolz, Braun, Sachs, Hopkins, et al., 1990). Internal reliability has ranged from .83 to .93 (Bernstein & Putnam, 1986; Pitblado & Sanders, 1991). As for validity, the DES has been found to be effective in detecting and confirming dissociative identity disorder, post-traumatic stress disorder, and dissociative disorder not otherwise specified (Gleaves, Eberenz, Warmer, & 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 mean DES scores for several different groups: 41-57 for individuals

with Dissociative Identity Disorder, 26-41 for individuals with Post-Traumatic Stress Disorder, 12-24 for late adolescents, and 4-8 for adults in the general population (see Carlson & Putnam, 1993 for a review of studies).

Cognitive Failures Questionnaire (CFQ) Developed by Broadbent et al. in 1982, the CFQ is a 25-item self-report measure of failures in attention, perception, memory, and action. Participants are asked to indicate on a five-point scale how often they have experienced each “failure” in the past months. Zero means “never” and five means “very often.” The CFQ’s reliability is high, possessing an internal consistency of Cronbach’s alpha value equaling .85 (Merckelbach et al., 1999). It also has a high test-retest correlation. Broadbent et al. (1982) reported values of $r = .82$ and $r = .80$. Because the term “cognitive failures” is somewhat nebulous, issues of validity continue to be researched.

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. It was created specifically for neurological populations. Symptoms of dysexecutive syndrome involve difficulties with executive functioning, including impulsivity and problems with planning and insight. Both self- and observer-report forms are available, but for this study, only the self-report questionnaire was used. The questionnaire has individuals rate from “0” (Never) to “4” (Very often) according to their own experience. It is part of the Behavioral Assessment of Dysexecutive Syndrome (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. The DEX has

demonstrated very high internal reliability ($> .8$) when used in both clinical (Parkinson's disease) and control samples (Mathias, 2003). To the author's knowledge, no published study including the initial validation study, provides test-retest reliability or interrater reliability data.

Iowa Gambling Task (IGT) The IGT is a laboratory-based gambling exercise simulating real-life decision-making that was developed by Bechara, Damasio, Damasio, and Anderson (1994). Players are given four decks of cards and a loan of \$2000 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. The IGT has been used to examine executive functioning in populations of individuals with brain damage, antisocial personality disorder, and substance abuse. Studies have shown that individuals with brain damage, specifically in the ventromedial region of the prefrontal cortex, tend to perform similarly to substance dependent individuals, choosing cards that lead to high immediate gains despite higher future losses (Bechara, Tranel, & Damasio, 2000; Bechara, Dolan, & Hindes, 2002). A computerized version of the IGT was used.

Operation Span Task (OSPAN) This measure of assesses controlled attention and working memory, which many researchers believe to be types of executive functioning. It was developed in 1989 by Turner and Engle. 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.

Vigil/W Continuous Performance Test (Vigil/W) The Vigil/W is a computerized test assessing sustained attentional abilities (The Psychological Corporation, 1994). A series of letters are presented on the screen and the individual is instructed to press a key each time the designated stimulus is observed. There are two parts of the Vigil/W. In the first part, the target stimulus is the letter “K”. In the second part, the target stimulus is again “K,” but only if immediately preceded by the letter “A.” Each part is approximately 7 minutes in length. Following the test, scores relating the speed of information processing (Reaction Time), inattentiveness (Errors of Omission), and Impulsivity (Errors of Commission) can be computed. Due to time constraints in this study, only the “K” portion was administered.

The split-half method was used to determine reliability of the Vigil/W. For the “K” part, alpha coefficients are as follows: Reaction Time (.95), Errors of Omission (.95), and Errors of Commission (.88). For the “AK” part, alpha coefficients are as follows: Reaction Time (.90), Errors of Omission (.91), and Errors of Commission (.96) (The Psychological Corporation, 1994).

Wisconsin Card Sorting Test (WCST) The WCST is a well-established test measuring executive functioning, specifically, assessing abstract reasoning the ability to

shift or maintain set, and perseveration (Berg, 1948). The subject is given a pack of cards on which are printed one to four symbols: triangle, star, cross, or circle in red, yellow, green, or blue. The subject's task is then to place them one by one under four stimulus cards according to a principle that must be deduced from the examiner's responses. The most common way to score the test is for Categories Achieved and Perseverative Errors. Satisfactory interrater reliabilities have been reported (Axelrod, Goldman, & Woodard, 1992). The standard version of the WCST includes a deck of 128 cards. Recently, practical and financial constraints have led to the development of an abbreviated version, the 64-card WCST (WCST-64). In direct comparisons, several studies have found the WCST-64 to be generally comparable to the standard version (for a review see Greve, 2001). Because of the comparability of the WCST and the WCST-64, for efficiency this study used the WCST-64.

Wechsler Test of Adult Reading (WTAR) The WTAR is a test which provides an estimate of the individuals' intellectual functioning more accurate than self-reported grade point average (GPA) and/or standardized test scores (SAT). It requires the individual to pronounce a list of words out loud. This test will be included in order to approximate each subject's general level of intelligence in order to be able to rule out level of intellectual functioning as a reason for any differences in performance on other tests or differences in number of reversals. Several studies have found significant differences in the number of reversals related to intelligence (Crain, 1961; Holt & Mason, 1974). Individuals with higher IQs experienced more perceptual shifts than individuals with lower IQs.

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 et al., 1989). The self-report questionnaires including the background questions, CFQ, and DEX were given at the beginning of each experimental session. They were followed by the perceptual task for all subjects. The order of the perceptual stimuli were randomized across subjects to control for effects of fatigue, practice, changes in level of motivation, or other nonspecific effects. The order of the neuropsychological tests remained the same across subjects: OSPAN, IGT, VIGIL/W, WTAR, and WCST-64.

In the passive conditions of the bistable figure task, subjects were instructed to not try and control their perception, to minimize blinking, focus at the center of the figure, and press a key whenever the perception of the figure changes. In the voluntary conditions, subjects were instructed to either minimize the number of reversals or to make the reversals happen as quickly as possible without using peripheral strategies such as blinking. Again, they were instructed to focus at the center of each figure and press a key whenever the perception of the figure changes.

The perceptual tasks included a Necker cube stimulus and a Rubin vase. Each subject viewed each stimulus in three different ways: passively, voluntarily minimizing the number of reversals, and voluntarily maximizing the number of reversals. For each condition, three trials of 60 seconds each were administered. A rest period of 15 seconds was given between each condition.

Data analysis

Independent sample t-tests were conducted to determine group differences between the high and low dissociators on the perceptual task and the measures of executive functioning, including the following: total CFQ score, total DEX Questionnaire score, mean number of reversals across the three trials for each condition, net amount of money earned or loss on the Iowa Gambling Task, number of words recalled and number of words in the correct order recalled on Operation Span task, omissions, commissions, and average delay on the Vigil/W, total correct, total errors, perseverative responses and failure to maintain set on the WSCT-64, and total score on the WTAR. Significance was measured using $p < .05$. All of the analyses were performed on an IBM-platform based computer using SPSS version 10.0

Results

There were 33 high dissociators and 32 low dissociators that comprised the two groups. There were 59 participants (90.8%) who reported right-handedness, 4 participants (6.2%) who reported left-handedness, and 2 participants (3.1%) who reported being ambidextrous. No subjects reported a history of moderate to severe traumatic brain injury (TBI). There were 8 participants (12.3%) who reported a history of mild TBI with no persisting symptoms. Because there were no significant differences in demographic information or neuropsychological measures between those who reported mild TBI, they were included in further analyses.

Means, standard deviations, t-values and significant differences between the high and low dissociation groups for DES total score, age, high school GPA, Penn State GPA, total SAT score, and WTAR raw score are shown in Table 1. It should be noted that there were two participants who did not report their Penn State GPA and one participant who did not report her high school GPA. Two participants could not recall their total SAT score. All 65 participants were administered the WTAR, which provides an even more accurate estimate of premorbid intellectual functioning than GPA or SAT score. The two groups did not significantly differ on any of the demographic variables or estimates of intellectual functioning. As expected, an independent samples t-test revealed that the high and low dissociation groups differed significantly on the total DES score [$t(63) = -28.89, p < .001$]. Mean DES scores of the two groups were consistent with those reported in other studies of undergraduate students (e.g. Freyd et al., 1998). High dissociators ranged in age from 18-22 years of age ($M = 19.09, SD = 1.09$). Their gender composition was 59% male and 41% female, and their ethnic background composition

was 81% Caucasian not of Hispanic origin, 13% Asian-American, 3% African-American, and 3% Hispanic. The age range of participants in the low dissociation group was 18-21 years of age ($M = 19.03$, $SD = 1.02$). The gender composition was 39% male and 61% female and ethnic background composition was 88% Caucasian not of Hispanic origin, 3% Asian-American, 6% African-American, and 3% Hispanic. There were no Native-American participants in either group

Means, standard deviations, t-values and significant differences between the high and low dissociation groups for the questionnaires, the bistable figure perceptual task, attentional task, and the three executive functioning tasks are shown in Table 2. The difference between the high and low dissociation groups on total CFQ score was very significant [$t(63) = -5.11$, $p < .001$] which is consistent with numerous studies citing the strong correlation between the DES and the CFQ (Merckelbach et al., 1999; Merckelbach, Horselenberg, & Schmidt, 2002).

The first part of hypothesis one predicted that individuals high in dissociation would perform more poorly on measures of selective or controlled attention than individuals low in dissociative tendencies. This was not supported. Contrary to expectation, t-tests on the OSPAN revealed that there were no differences between high and low dissociators on number of words recalled or number of words recalled in the correct order. Hypothesis one also predicted that individuals high in dissociation would perform as well if not better than individuals low in dissociation on a task of sustained attention. This portion of hypothesis one was supported, as there were no observed differences between high and low dissociators on number of omissions, number of commissions, or average delay on the Vigil/W.

The first part of hypothesis two postulated that individuals higher in dissociation would report more difficulties with executive functioning. Consistent with expected findings, the high and low dissociation groups differed significantly on the total DEX score [$t(63) = -5.61, p < .001$]. Hypothesis two further predicted that the performance of high dissociators across all tests of executive functioning would be relatively poorer than the performance of low dissociators. However, although the high dissociation group reportedly significantly more executive difficulties, the neuropsychological measures did not reflect it. Table 2 includes the means, standard deviations, t-values and significance between the high and low dissociation groups for the three executive functioning tasks. None of the significance values even approached a trend toward a difference between high and low dissociators.

Similar to hypothesis two, hypothesis three predicted that because of relatively poorer executive functioning, individuals high in dissociation would experience more passive reversals than low dissociators, both of perspective shifts (Necker cube), and of figure-ground reversal (Rubin vase). The average number of shifts per minute was calculated from the three trials. There were no significant differences found between high and low dissociators in the passive condition of the Necker cube or the Rubin vase. The second part of hypothesis three postulated that high dissociators would not be as successful as low dissociators in bringing the reversals under voluntary control ('top-down' processing). When asked to bring the perceptual shifts under voluntary control and *limit* the number of perceptual shifts, it was hypothesized that high dissociators would be less successful than low dissociators, thus experiencing *more* perceptual shifts. When asked to bring the perceptual shifts under voluntary control and *increase* the

number of perceptual shifts, again it was hypothesized that high dissociators would be less successful than low dissociators, thus experiencing *fewer* perceptual shifts. It was predicted that this would happen with both the perceptual and the figure-ground. Once again, there were no significant differences between the high and low dissociators when number of perceptual shifts was averaged across each set of trials. Table 2 includes the means, standard deviations, t-values, and significance of the bistable figure task: none even approach significance.

Table 1. Means, Standard Deviations, and t-values for Demographic Variables

Variable	High Dissociators		Low Dissociators		t-value	df	p
	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>			
DES-Total	36.80	6.98	1.53	0.73	-28.89	63	<.001
Age	19.09	1.09	19.03	1.02	-.24	63	.809
High School GPA	3.65	0.47	3.81	0.34	1.57	62	.121
Penn State GPA	3.19	0.45	3.25	0.48	.47	61	.643
SAT Total	1200.16	137.26	1208.44	151.34	.23	61	.821
WTAR Total	38.00	5.45	39.61	5.61	1.17	63	.246

Table 2. Means, Standard Deviations, and t-values for Measures

Variable	High Dissociators		Low Dissociators		t-value	df	p
	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>			
CFQ Total	47.41	12.96	31.15	12.71	-5.11	63	<.001
DEX Total	29.25	11.00	15.97	7.86	-5.61	63	<.001
Necker natural	12.91	5.56	13.35	5.45	.32	61	.753
Necker minimize	8.70	3.73	8.05	2.83	-.78	61	.440
Necker maximize	25.97	13.81	28.42	12.02	.75	61	.455
Rubin natural	14.52	7.42	14.31	7.00	-.12	63	.908
Rubin minimize	8.23	4.72	7.76	4.36	-.42	63	.677
Rubin maximize	32.93	18.47	39.78	18.97	1.48	63	.145
OSPAN Total Recalled	29.91	5.38	30.85	4.40	.77	63	.442
OSPAN Correct order	25.44	6.75	25.30	6.43	-.08	63	.935
IGT	-131.17	1217.26	-16.51	1346.43	.35	61	.725
Vigil Omissions	1.25	1.22	1.97	3.62	1.07	63	.290
Vigil Commissions	1.72	1.30	1.64	1.76	-.21	63	.831
Vigil Average Delay	416.43	31.74	410.35	39.88	-.68	63	.500
WCST Total Correct	50.81	9.15	53.21	5.24	1.30	63	.198
WCST Total Errors	13.19	9.15	10.79	5.24	-1.30	63	.198
WCST Perseverative Resp	9.13	10.04	8.39	5.30	-.37	63	.714
WCST Fail to Maintain Set	0.16	0.37	0.27	0.52	.98	62	.329

Discussion

This study aimed to illuminate the cognitive processes underlying dissociation. To accomplish such a goal, self-report measures, a bistable figure perceptual task, and neuropsychological tests were used. Numerous past studies have used questionnaires to compare dissociation to other constructs such as hypnotizability, personality, and psychopathology. Relatively few studies, however, have used laboratory-based neuropsychological measures to examine dissociative phenomena. Broadly, the study sought to explore the relationship between dissociation and the construct of executive functioning. It was found that although highly dissociative individuals report more executive difficulties than low dissociative individuals, these relative difficulties do not show up on their performance on neuropsychological measures of executive functioning. Implications of such findings are discussed below.

The first hypothesis of the study focused on dissociation and selective versus sustained attention. In part, it predicted that individuals who report frequent dissociative experiences would perform more poorly on measures of selective (controlled) attention than individuals who do not report many dissociative experiences. This was based on several studies that found that high dissociators experience relative difficulties in selective or controlled attention (DePrince & Freyd, 1999; Freyd et al., 1998). Contrary to expectation, there was no observed difference between high and low dissociators on their performance on the OSPAN, a measure of selective attention. Our results instead support those from a study done by Guralnik and colleagues (2000) that did not find any significant differences in high and low dissociative individuals on a task of selective

attention. Another study that compared high and low dissociators on attentional tasks also failed to find differences between the groups. Kwan (2004) found no differences in abilities to suppress interference, abilities to shift focus, or abilities to maintain focus. However, although highly dissociative individuals did not exhibit deficits in selective attention, their attentional capacity did worsen when the task involved interpersonal details of a behavioral nature (Kwan, 2004). This was consistent with past research suggesting that even when explicitly instructed to pay close attention, highly dissociative individuals pay less attention to interpersonal actions than low dissociators (see Kwan, 2004 for a review). It is likely that highly dissociative individuals' attentional capabilities are specifically influenced by interpersonal variables.

The first hypothesis also predicted that individuals high in dissociation would perform as well if not better than individuals low in dissociation on a task of sustained attention. This portion of hypothesis one was supported, as there were no observed differences between high and low dissociators on a continuous performance task. Although attentional processes are considered to be strongly related to dissociation, relatively few studies before this one used laboratory-based attentional measures to examine the two domains. This study confirmed the idea that highly dissociative individuals do not differ from low dissociative individuals on laboratory-based measures of selective/controlled attention. However, future research should consider the role that interpersonal variables play in attentional processes of dissociative populations.

The second hypothesis formed the core of the study: to examine the relationship between dissociation and executive functioning from a variety of different perspectives. Self-report measures and several neuropsychological tasks assessing different aspects of

executive functioning were included. The first part of hypothesis two postulated that individuals higher in dissociation would report more difficulties with executive functioning. As predicted, high dissociators endorsed significantly more difficulties with executive functioning than low dissociators. Interestingly, the mean DEX score reported by high dissociators was substantially higher than the mean DEX score reported by patients with Parkinson's disease (Mathias, 2003).

Hypothesis two further predicted that across all tasks of executive functioning high dissociators would perform relatively worse than low dissociators. Study results failed to confirm this as no differences in the performance of high and low dissociators were observed on any of the neuropsychological measures. The neuropsychological measures included in this study evaluated a variety of different facets of executive functioning, including controlled attention/working memory, problem-solving, shift of set, abstract reasoning, and perseveration. Although the expected differences in executive functioning were not demonstrated in the results, the study's findings were exceptionally consistent across all neuropsychological measures in that highly dissociative individuals do not demonstrate executive deficits as measured by such laboratory tests. Highly dissociative individuals report difficulties in executive functioning that do not seem to show up on any of the neuropsychological measures. The issue can now be raised: Why not? One of the major strengths of this study is that it employed a variety of tests of executive functioning that arguably comprise the range of different executive abilities. Our findings are supported by Gualnik and colleagues (2000) study comparing subjects with Depersonalization disorder to matched controls on

various neuropsychological measures. No significant differences were found between the groups on measures of executive function (Guralnik et al., 2000).

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 at least moderate traumatic brain injury or dementia, the DEX self-report has been shown to correlate with some neuropsychological tests of executive functioning such as the modified WCST and Trail-making tests (Burgess, Alderman, Evans, Emslie, & Wilson, 1998). However, other researchers have found that self-awareness of deficits as measured by the DEX following a traumatic brain injury is very poor (Bogod, Mateer, & Macdonald, 2003). The Self-awareness of Deficits Interview (SADI) actually showed a stronger correlation than the DEX did with the actual neuropsychological measures. In general, neurological populations with acquired deficits tend to underestimate their difficulties. This is in direct opposition to this study's finding that high dissociators overestimate their difficulties. The clinical usefulness of the DEX with neurological populations has in fact been questioned (Alderman, Dawson, Rutterford, & Reynolds, 2001).

Although the correlation between self-reported deficits and actual performance are often weak, the DEX has been found to consistently correlate with the Behavioral Assessment of Dysexecutive Syndrome (BADs) test battery (Wilson et al., 1996). The BADs is considered to be a more ecologically valid test for assessing patients with dysexecutive syndrome, including more real-to-life problem-solving situations. The DEX includes the following tests. The Rule Shift Cards Test examines a subject's ability to respond correctly to a rule and subsequently shift from one rule to another. Similar in

some ways to the WCST, this aims to assess shift-of set and perseveration. The Action Program Test presents subjects with a novel, practical problem solving task. In order to solve it, individuals must work backward through five steps. The Key Search Test is a measure analogous to the real-life situation of looking for one's keys. Subjects are asked to plan how to thoroughly search an area for their keys. It enables assessment of an individual's ability to plan an efficient and effective course of action. The Zoo Map Test is another test of planning, requiring individuals to chart how they would visit a series of locations in a zoo while obeying predetermined rules. There are a limited number of variations on a route that can be followed in order that none of the rules are broken. The Temporal Judgment Test asks subjects to estimate the length of time it takes for certain events such as, "How long does it take to blow up a party balloon?" Finally, the Modified Six Elements Test, which consists of three tasks (arithmetic, picture naming, dictation) each of which has two parts. The subject must attempt at least part of each of the subtasks within 10 minutes, following the rule that they are unable to consecutively switch to a similar subtask.

One study used four subtests from the BADS to examine executive dysfunction in high dissociators in a forensic setting. Cima and colleagues (2001) suggested that among male prison inmates, dissociative symptoms are related to frontal deficits as measured by the BADS. They administered four tasks from the BADS including Rule Shift Cards test, Key Search test, Temporal Judgment test, and Zoo map test. It is possible that they found a relationship between dissociation and executive functioning because these tests are more ecologically valid. Another study that investigated the relationship between dissociation, specifically pathological dissociation, and executive functioning discovered

that there was a modestly significant relationship between inhibition failure and dissociative amnesia (Giesbrecht et al., 2004). Although the current study did not find a relationship between dissociation and executive functioning, a few studies have. This begs the question whether some tests of executive functioning are better able to distinguish high and low dissociators. The current study does add to our knowledge of executive functioning and dissociation, but more research is clearly needed to clarify this relationship.

The third hypothesis sought to add to the paucity of literature related to dissociation and perceptual processing. As past studies cited executive deficits to be related to more rapid reversals, it was initially suspected that individuals high in dissociation would experience more passive reversals than low dissociators, both of perspective shifts (Necker cube), and of figure-ground reversal (Rubin vase). This idea was not supported as there were no significant differences found between high and low dissociators in the passive condition of the Necker cube or the Rubin vase. This finding can be used to compare the constructs of dissociation and hypnotizability. Crawford and colleagues (1993) found that highly hypnotizable individuals experienced more passive Necker cube reversals. Wallace and Priebe (1985) also found that more hypnotic susceptibility meant more passive Necker cube reversals. Our finding that there was no difference between high and low dissociators in the number of passive Necker cube reversals lends further evidence to the notion that dissociation is fundamentally different than hypnotic susceptibility.

The second part of hypothesis three postulated that high dissociators would not be as successful as low dissociators in bringing the reversals under voluntary control—

minimizing and maximizing the number of reversals for the perceptual and the figure-ground images. When asked to bring the perceptual shifts under voluntary control and *limit* the number of perceptual shifts, it was hypothesized that high dissociators would be less successful than low dissociators, thus experiencing *more* perceptual shifts. When asked to bring the perceptual shifts under voluntary control and *increase* the number of perceptual shifts, again it was hypothesized that high dissociators would be less successful than low dissociators, thus experiencing *fewer* perceptual shifts. As in the first part of hypothesis three, there were no significant differences between the high and low dissociators when number of perceptual shifts was averaged across each set of trials. Both high and low dissociators were able to voluntarily control the reversals, which supports past research claiming that individuals can bring reversals under conscious control (Liebert & Burk, 1985). But there was no significant difference for how well each group was able to voluntarily maximize or minimize the reversals. The results from the bistable figures tasks lead us to believe that reversal rate and dissociative phenomena are orthogonal constructs.

There were several limitations of this study. First, the experimental procedure was conducted in a laboratory setting. There are some inherent disadvantages to testing in a controlled setting including the relative lack of ecological validity. In addition, it could be argued that the neuropsychological tests of executive functioning included in the study, while valid and reliable for the respective specific abilities measured, do not have as much ecological validity as ideally desired.

Another limitation of the study is that the vast majority of the sample consisted of Caucasian undergraduate students. This makes it problematic to generalize findings from

this study to the general adult population or to individuals from other racial, ethnic, or cultural backgrounds. In addition, the subjects included in the study were principally high functioning individuals with no severe psychopathology. It can be questioned whether these results would apply to clinical populations of dissociative individuals.

Further investigation of dissociative processes and cognitive functioning is undoubtedly warranted. Future programs of research should consider including both clinical and non-clinical dissociative populations in comparison to controls. As previously mentioned, future research should also continue to investigate the relationship between dissociative phenomena and executive functioning as measured by self-report and by neuropsychological measures. Related to self-report measures, one suggestion would be to devise and administer both a self-rating and a significant-other rating for the CFQ and the DES. The DEX already has a significant-other form. It would be interesting to determine whether there is a significant correlation between the self-report and other-report. It would be also be relevant to explore whether the other rating forms of the CFQ, DES, and DEX would have a stronger relationship to actual laboratory-based tasks than self-report measures.

Another recommendation for future research would be to use different, more ecologically valid tests of executive functioning when examining differences between high and low dissociators. This study's results showed that although highly dissociative individuals from a non-clinical population consistently report more difficulties with executive functioning, the traditional neuropsychological measures of executive functioning do not seem to be sensitive to differences in the frequency of dissociative experiences. It would be valuable to attempt to find and incorporate laboratory-based

tasks that are sensitive to such differences and that would be able to differentiate groups of high and low dissociators. An example of one such battery to use would be the BADS, as it is considered to assess more practical day-to-day functioning. Further, it would be worthwhile to consider devising some original tests of executive functioning that might be more sensitive to dissociative phenomena. Some have argued that dissociation is related to a difficulty in judging time. One task that might assess such a deficit would be to have subjects estimate how much time has gone by while doing a task that requires close attention versus a task that doesn't require as much attention.

In summary, this study has effectively ruled out executive functioning as measured by laboratory tests to be a contributing factor to the phenomenon of dissociation. Although this study aspired to clarify the cognitive processes underlying dissociation, it potentially served to raise as many questions as it answered. It did serve, however, to successfully rule out executive functioning as a contributing factor to non-pathological types of dissociation. The sample size used was comparable to other studies that have explored similar issues. Our study was one of the first to look at executive functioning and dissociation using neuropsychological measures to do so. This innovative study delved into new territory using a variety of novel measures to examine the cognitive processes underlying dissociation. To the author's knowledge, this study was the first to examine the impact of dissociation on perceptual stimuli such as bistable figures. As hypothesized, individuals who report many dissociative experiences also report more executive deficits. Contrary to expectation, these highly dissociative individuals fail to demonstrate such deficits in higher-level cognition as measured by

neuropsychological tests. Future research is essential to further explore the cognitive processes which underlie the elusive phenomena of dissociation.

References

Aikens, D. & Ray, W.J. (2001). Frontal lobe contributions to hypnotic susceptibility: A neuropsychological screening of executive functioning. *International Journal of Clinical and Experimental Hypnosis*, 49(4), 320-329.

Alderman, N., Dawson, K., Rutterford, N.A., & Reynolds, P.J. (2001). A comparison of the validity of self-report measures amongst people with acquired brain injury: A preliminary study of the usefulness of EuroQol-5D. *Neuropsychological Rehabilitation*, 11(5), 529-537.

American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders* (4th ed.-Text Revision). Washington DC: American Psychiatric Association.

Armstrong, J.G., & Lowenstein, R.J. (1990). Characteristics of patients with multiple personality and dissociative disorders on psychological testing. *Journal of Nervous and Mental Disease*, 178, 448-454.

Attneave, F. (1971). Multistability in perception. *Scientific American*, 225, 62-71.

Axelrod, B.N., Golman, R.S., & Woodard, J.L. (1992). Interrater reliability in scoring the Wisconsin Card Sorting Test. *The Clinical Neuropsychologist*, 6, 143-155.

Babich, B., & Standing, L. (1981). Satiation effects with reversible figures. *Perceptual and Motor Skills*, 52, 203-210.

Basar-Eroglu, C., Strüber, D., Kruse, P., Basar, E., & Stadler, M. (1996). Frontal gamma-band enhancement during multistable visual perception. *International Journal of Psychophysiology*, 24 (1-2), 113-125.

- Bechara, A., Damasio, A.R., Damasio, H., & Anderson, S.W. (1994). Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition*, *50*, 7-15.
- Bechara, A., Dolan, S., & Hinds, A. (2002). Decision-making and addiction (part II): myopia for the future or hypersensitivity to reward? *Neuropsychologia*, *40*, 1690-1705.
- Bechara, A., Tranel, D., & Damasio, H. (2000). Characterization of the decision-making deficit of patients with ventromedial prefrontal cortex lesions. *Brain*, *123*, 2189-2202.
- Beer, J. (1989). Learning effects while passively viewing the Necker cube. *Perceptual and Motor Skills*, *69*, 1391-1394.
- Berg, E.A. (1948). A simple objective treatment for measuring flexibility in thinking. *Journal of General Psychology*, *39*, 15-22.
- Bernstein, E.M., & Putnam, F.W. (1986). Development, reliability, and validity of a dissociation scale. *Journal of Nervous and Mental Disease*, *174*, 727-735.
- Bliss, E.L. (1986). *Multiple personality, allied disorders, and hypnosis*. New York: Oxford University Press.
- Bogod, N.M., Mateer, C.A., & MacDonald, S.W.S. (2003). Self-awareness after traumatic brain injury: A comparison of measures and their relationship to executive functions. *Journal of the International Neuropsychological Society*, *9*, 450-458.
- Boring, E.G. (1930). A new ambiguous figure. *American Journal of Psychology*, *42*, 444-445.

Boring, E.G. (1942). *Sensation and perception in the history of experimental psychology* (pp. 268-271). New York: Appleton-Century.

Broadbent, D.E., Cooper, P.F., FitzGerald, P., & Parkes, K.R. (1982). The Cognitive Failures Questionnaire (CFQ) and its correlates. *British Journal of Clinical Psychology, 21*, 1-16.

Brown, K.T. (1955). Rate of apparent change in a dynamic ambiguous figure as a function of observation time. *American Journal of Psychology, 68*, 358-371.

Bruce, A.S., Ray, W.J., & Carlson, R.A. (under review). Understanding cognitive failures: What's dissociation got to do with it? *The American Journal of Psychology*.

Bugelski, B.R., & Alampay, D.A. (1961). The role of frequency in developing perceptual sets. *Canadian Journal of Psychology, 15*, 205-211.

Burgess, P.W., Alderman, N., Evans, J., Emslie, H., & Wilson, B.A. (1998). The ecological validity of tests of executive function. *Journal of the International Neuropsychological Society, 4*, 547-558.

Carlson, V.R. (1953). Satiation in a reversible perspective figure. *Journal of Experimental Psychology, 45*, 442-448.

Carlson, E.B., Armstrong, J., Loewenstein, R., & Roth, D. (1998). Relationships between traumatic experiences and symptoms of posttraumatic stress, dissociation, and amnesia. In J.D. Bremner and C.R. Marmar (Eds.), *Trauma, memory, and dissociation* (pp. 205-227). Washington, D.C.: American Psychiatric Press.

Carlson, E.B., Putnam, F.W., Ross, C.A., Amderson, G., Clark, P., Torem, M., Coons, P., Bowan, E., Chu, J.A., Dill, D., Loewenstein, R.J., & Braun, B.G. (1991). Factor analysis of the Dissociative Experiences Scale: A multicenter study. In B.G. Braun & E.B. Carlson (Eds.), *Proceedings of the Eighth International Conference on Multiple Personality and Dissociative States*. Chicago: Rush.

Carlson, E.B., & Putnam, F.W. (1993). An update on the Dissociative Experiences Scale. *Dissociation, 6*(1), 16-27.

Cima, M., Merckelbach, H., Klein, B., Schellbach-Matties, R., Kremer, K. (2001). Frontal lobe dysfunctions, dissociation, and trauma self-reports in forensic psychiatric patients. *Journal of Nervous and Mental Disease, 189*, 188-190.

Cohen, L. (1959). Rate of apparent change of a Necker cube as a function of prior stimulation. *American Journal of Psychology, 72*, 327-344.

Coons, P.M., Bowman, E.S., & Pellows, T.A. (1989). Post-traumatic aspects of the treatment of victims of sexual abuse and incest. *Psychiatric Clinical of North America, 12*, 325-337.

Crain, K. (1961). Binocular rivalry: Its relationship to intelligence, and a general theory of its nature and physiological correlates. *Journal of General Psychology, 64*, 259-283.

Crawford, H.J., Brown, A.M., & Moon, C.E. (1993). Sustained attentional and disattentional abilities: Differences between low and highly hypnotizable persons. *Journal of Abnormal Psychology, 102* (4), 534-543.

DePrince, A.P., & Freyd, J.J. (1999). Dissociative Tendencies, Attention, and Memory. *Psychological Science, 10*, (5), 449-452.

Eisen, M.L., & Carlson, E.B. (1998). Individual Differences in Suggestibility: Examining the influence of dissociation, absorption, and a history of childhood abuse. *Applied Cognitive Psychology, 12*, S47-S61.

Ellenberger, H.F. (1970). *The discovery of the unconscious*. New York: Basic Books.

Engle, R.W., Kane, M.J., & Tuholski, S.W. (1999). Individual differences in working memory capacity and what they tell us about controlled attention, general fluid intelligence, and functions of the prefrontal cortex. In Miyake, A. & Shah, P (Eds.), *Models of working memory: Mechanisms of active maintenance and executive control* (pp. 102-134). New York: Cambridge University Press.

Faith, M., & Ray, W.J. (1994). Hypnotizability and dissociation in a college age population: Orthogonal individual differences. *Personality and Individual Differences, 17*, 211-216.

Fischer, D.G. & Elnitsky, S. (1990). A factor analytic study of two scales measuring dissociation. *American Journal of Clinical Hypnosis, 32*(3), 201-207.

ForThought. (1996). *Vigil/W: Continuous Test Performance: User and technical manual*. New Hampshire: Author.

Frankel, F.H. (1990). Hypnotizability and dissociation. *American Journal of Psychiatry, 147*, 823-829.

Frankel, F.H. (1996). Dissociation: the clinical realities. *American Journal of Psychiatry (Festschrift Supplement), 153*, 64-70.

Frederiksen, N.O., & Guilford, J.P. (1934). Personality traits and fluctuations of the outline cube. *American Journal of Psychology, 46*, 470-474.

- Frey-Rohn, L. (1974). *From Freud to Jung*. Boston: Shambhala.
- Freyd, J.J., Martorello, S.R., Alvarado, J.S., Hayes, A.E., & Christman, J.C. (1998). Cognitive environments and dissociative tendencies: Performance on the standard Stroop task for high versus low dissociators. *Applied Cognitive Psychology, 12*(7), S91-S103.
- Frischholz, E.J., Braun, B.G., Sachs, R.G., Hopkins, L., Shaeffer, J.L., Leavitt, F., Pasquotto, J.N., Schwartz, D.R. (1990). The Dissociative Experiences Scale: Further replication and validation. *Dissociation, 3*(3), 151-153.
- Frischholz, E.J., Lipman, L., Braun, B., & Sachs, R. (1992). Psychopathology, hypnotizability, and dissociation. *American Journal of Psychiatry, 149*, 1521-1525.
- Garcia-Perez, M.A. (1989). Visual inhomogeneity and eye movements in multistable perception. *Perception & Psychophysics, 46*, 397-400.
- Gershuny, B.S. & Thayer, J.F. (1999). Relations among psychological trauma, dissociative phenomena, and trauma-related distress: A review and integration. *Clinical Psychology Review, 19*, 631-637.
- Giesbrecht, T., Merckelbach, H., Geraerts, E., & Smeets, E. (2004). Dissociation in undergraduate students: Disruptions in executive functioning. *The Journal of Nervous and Mental Disease, 192* (8), 567-569.
- Girgus, J., Rock, I., & Egatz, R. (1977). The effect of knowledge of reversibility on the reversibility of ambiguous figures. *Perception & Psychophysics, 22*, 550-556.
- Gleaves, D.H., Eberenz, K.P., Warner, M.S., & Fine, C.G. (1995). Measuring clinical and non-clinical dissociation: A comparison of the DES and QED. *Dissociation, 8*(1), 24-31.

Goldberg, R.L. (1999). The Curious Experiences Survey, a revised version of the Dissociative Experiences Scale: Factor structure, reliability, and relations to demographic and personality variables. *Psychological Assessment, 11*(2), 134-145.

Gorenstein, E.E. (1982). Frontal lobe functions in psychopaths. *Journal of Abnormal Psychology, 91* (5), 368-379.

Green, J.P., & Lynn, S.J. (1995). Hypnosis, dissociation, and simultaneous task performance. *Journal of Personality and Social Psychology, 69* (4), 728-735.

Greve, K.W. (2001). The WCST-64: A standardized short-form of the Wisconsin Card Sorting Test. *The Clinical Neuropsychologist, 15* (2), 228-234.

Guralnik, O., Schmeidler, J., & Simean, D. (2000). Feeling unreal: Cognitive processes in depersonalization. *American Journal of Psychiatry, 157*, 103-109.

Hacking, I. (1995). *Rewriting the soul: Multiple personality and the sciences of memory*. New Jersey: Princeton.

Haule, J.R. (1986). Pierre Janet and dissociation: The first transference theory and its origins in hypnosis. *American Journal of Clinical Hypnosis, 29*, 86-94.

Heaton, R.K., Chelune, G.J., Talley, J.L., Kay, G.C., Curtiss, G. (1993). *Wisconsin Card Sorting Test Manual*. Odessa, FL: Psychological Assessment Resources, Inc.

Hecker, J.E., & Thorpe, G.L. (2005). Personality Assessment. In *Introduction to Clinical Psychology*, (pp. 226-261). Boston: Pearson Education, Inc.

Hilgard, E.R. (1986). *Divided consciousness: Multiple controls in human thought and action*. New York: John Wiley & Sons, Inc.

Hochburg, J. (1950). Figure-ground reversal as a function of visual satiation. *Journal of Experimental Psychology*, 40, 682-686.

Hochberg, J., & Peterson, M.A. (1987). Piecemeal organization and cognitive components in object perception: Perceptually coupled responses to moving objects. *Journal of Experimental Psychology: General*, 116, 370-380.

Holt, G.L., & Matson, J.L. (1974). Necker cube reversals as a function of age and IQ. *Bulletin of the Psychonomic Society*, 4, 519-521.

Holtgraves, T., & Stockdale, G. (1997). The assessment of dissociative experiences in a non-clinical population: Reliability, validity, and factor structure of the Dissociative Experiences Scale. *Personality and Individual Differences*, 22, 699-706.

Horlitz, K.L. (1988). Satiation vs. past experience in the perception of reversible figures. *Proceedings of the 59th Annual Meeting of the Eastern Psychological Association*. April, Buffalo, NY.

Horlitz, K.L., & O'Leary, A. (1993). Satiation or availability? Effects of attention, memory, and imagery on the perception of ambiguous figures. *Perception & Psychophysics*, 53 (6), 668-681.

Howard, I.P. (1961). An investigation of a satiation process in reversible perspective of revolving skeletal shapes. *Quarterly Journal of Experimental Psychology*, 40, 682-686.

Hunt, J., & Guilford, J.P. (1932). Fluctuation of an ambiguous figure in dementia praecox and in manic depressive patients. *Journal of Abnormal and Social Psychology*, 27, 443-452.

Janet, P. (1889). *L'automatisme psychologique*. Paris: Félex Alcan.

Janet, P. (1907). *The major symptoms of hysteria*. New York: The Macmillan Company.

Kawabata, N., Yamagami, K., & Noaki, M. (1978). Visual fixation points and depth perception. *Vision Research*, *18*, 853-854.

Keil, A., Elbert, T. Rockstroh, B., & Ray, W.J. (1998). Dynamical aspects of motor and perceptual processes in schizophrenic patients and healthy controls. *Schizophrenia Research*, *33*, 169-178.

Kihlstrom, J.F. (2001). Dissociative Disorders. In H.E. Adams & P.B. Sutker (Eds.), *Comprehensive Handbook of Psychopathology (3rd ed.)*. New York: Plenum Press.

Kihlstrom, J.F. (2005). Dissociative Disorders. *Annual Review of Clinical Psychology*, *1*, 227-253.

Kirsch, I., & Council, J.R. (1992). Situational and personality correlates of hypnotic responsiveness. In E. Fromm & M.R. Nash (Eds.), *Contemporary hypnosis research* (pp. 267-291). New York: Guilford Press.

Kissler, J., Müller, M.M., Fehr, T., Rockstroh, B., & Elbert, T. (2000). MEG gamma band activity in schizophrenia patients and healthy subjects in a mental arithmetic task and at rest. *Clinical Neurophysiology*, *111* (11), 2079-2087.

Klinton, H. (1984). Original thinking and ambiguous figure reversal rates. *Bulletin of the Psychonomic Society*, *22* (2), 129-131.

Kohler, W. (1940). *Dynamics in Psychology*. New York: Liveright.

Kohler, W. (1960). *Dynamics in Psychology*. New York: Grove Press.

Kohler, W., & Wallach, H. (1944). Figural aftereffects, an investigation of visual processes. *Proceedings of the American Philosophical Society*, 88, 269-357.

Kwan, D.E. (2004). Dissociation and self/interpersonal functioning: The mediating role of attention. *Doctoral thesis*, The Pennsylvania State University.

Labott, S.M., Leavitt, F., Braun, B., & Sachs, R. (1992). Rorschach indicators of multiple personality disorder. *Perceptual and Motor Skills*, 75, 147-158.

Leavitt, F., & Labott, S.M. (1998). Rorschach indicators of dissociative identity disorders: Clinical utility and theoretical implications. *Journal of Clinical Psychology*, 54, 803-810.

Leeper, R. (1935). A study of a neglected portion of the field of learning: The development of sensory organization. *Journal of Genetic Psychology*, 46, 41-75.

Levander, S.E., Bartfai, A., & Schalling, D. (1985). Regional cortical dysfunction in schizophrenic patients studied by computerized neuropsychological methods. *Perceptual and Motor Skills*, 61, 479-495.

Lezak, M.D. (1995). *Neuropsychological Assessment*, (3rd Edition). New York: Oxford University Press.

Liebert, R.M., & Burk, B. (1985). Voluntary control of reversible figures. *Perceptual and Motor Skills*, 61, 1307-1310.

Long, G.M. & Olszweski, A.D. (1999). To reverse or not to reverse: When is an ambiguous figure not ambiguous? *American Journal of Psychology*, 112(1), 41-71.

Long, G.M. & Toppino, T.C. (1981). Multiple representations of the same reversible figure: Implications for cognitive decisional interpretations. *Perception*, 10, 231-234.

Long, G.M., Toppino, T.C., & Kostenbauder, J. (1983). As the cube turns: Evidence for two processes in the perception of a dynamic reversible figure. *Perception & Psychophysics*, *34*, 29-38.

Long, G.M., Toppino, T.C., & Mondin, G. (1992). Prime time: Fatigue and set effects in the perception of reversible figures. *Perception & Psychophysics*, *52*, 609-616.

Lovitt, R., & Lefkof, G. (1985). Understanding multiple personality with the Comprehensive Rorschach System. *Journal of Personality Assessment*, *49*, 289-294.

Lukens, S.D. (2003). Self- and peer- report of personality and interpersonal problems of high and low dissociative individuals. *Dissertation Abstracts International: Section B: The Sciences and Engineering*, *63*, 4377.

Mathias, J.L. (2003). Neurobehavioral functioning of persons with Parkinson's Disease. *Applied Neuropsychology*, *10* (2), 57-68.

Merckelbach, H., Horselenberg, R., & Schmidt, H. (2002). Modeling the connection between self-reported trauma and dissociation in a student sample. *Personality and Individual Differences*, *32*, 695-705.

Merckelbach, H., Muris, P., & Rassin, E. (1999). Fantasy proneness and cognitive failures as correlates of dissociative experiences. *Personality and Individual Differences*, *26*, 961-967.

Merckelbach, H., Muris, P., Rassin, E., Horselenberg, R. (2000). Dissociative experiences and interrogative suggestibility in college students. *Personality and Individual Differences*, *29*, 1133-1140.

Meredith, G.M. (1967). Some attributive dimensions of reversibility phenomena and their relationship to rigidity and anxiety. *Perceptual and Motor Skills*, *24*, 843-849.

Müller, M.M., Gruber, T., & Keil, A. (2000). Modulation of induced gamma band activity in the human EEG by attention and visual information processing.

International Journal of Psychophysiology, 38 (3), 283-299.

Murray, H.A. (1943). *Thematic Apperception Test manual*. Cambridge, MA: Harvard University Press.

Nawrot, M., & Blake, R. (1989). Neural integration of information specifying structure from stereopsis and motion. *Science*, 244, 716-718.

Nemiah, J.C. (1985). Dissociative disorders. In H. Kaplan & B. Sadock (Eds.), *Comprehensive textbook of psychiatry* (4th ed., pp. 942-957). Baltimore: Williams & Wilkins.

Nemiah, J.C. (1991). Dissociation, conversion, and somatization. In D. Spiegel (Ed.), *Dissociative disorders. American Psychiatric Press Review of Psychiatry*, 10, 248-275.

Nemor, N. (1953). The alternation of an ambiguous figure in paretics and schizophrenics. *Journal of Abnormal and Social Psychology*, 48, 445-447.

Orbach, J., Ehrich, D., & Heath, H.A. (1963). Reversibility of the Necker cube: I. An examination of the concept of "satiation of orientation." *Perceptual and Motor Skills*, 17, 439-458.

Palmer, S.E., & Butcher, N.M. (1981). Configural effects in perceived pointing of ambiguous triangles. *Journal of Experimental Psychology: Human Perception and Performance*, 7, 88-114.

Pelton, L.H., & Solley, C.M. (1968). Acceleration of reversals of a Necker cube. *American Journal of Psychology*, 81, 585-588.

Perry, C., & Laurence, J. (1984). Mental processing outside of awareness: The contributions of Freud and Janet. In K.S. Bowers & D. Meichenbaum (Eds.), *The Unconscious Reconsidered* (p. 9-48). New York: John Wiley & Sons, Inc.

Pheiffer, G.H., Eure, S.B., & Hamilton, C.B. (1956). Reversible figures and eye movements. *American Journal of Psychology*, *69*, 452-455.

Phillipson, O.T., & Harris, J.P. (1984). Effects of chlorpromazine and promazine on the perception of some multi-stable visual figures. *Q. Journal of Experimental Psychology*, *36A*, 291-308.

Pica, M., Beere, D., Sophie, L., & Dush, D. (2001). The responses of dissociative patients on the Thematic Apperception Test. *Journal of Clinical Psychology*, *57*, 847-864.

Pitblado, C., & Sanders, B. (1991). Reliability and short-term stability of the Dissociative Experiences Scale. In B.G. Braun & E.B. Carlson (Eds.), *Proceedings of the 8th international conference on multiple personality and dissociative states*. Chicago: Rush.

Pribram, K. (1991). *Brain and perception: Holonomy and structure in figural processing*. Hillsdale, NJ: Erlbaum.

Price, J.R. (1969a). Effect of extended observation on reversible perspective duration. *Psychonomic Science*, *16*, 75-76.

Price, J.R. (1969b). Studies of reversible perspective: A methodological review. *Behavior Research Methods and Instrumentation*, *1*, 102-106.

Putnam, F.W., Guroff, J.J., Silberman, E.Kl, Barban, L., & Post, R.M. (1986) The Clinical Phenomenology of Multiple Personality Disorder: Review of 100 Recent Cases. *Journal of Clinical Psychiatry*, 47 (6), 285-293.

Putnam, F.W. (1989). *Diagnosis and treatment of multiple personality disorders*. New York: Guilford.

Putnam, F.W. (1994, November). *The nature of dissociation*. Paper presented at the 10th annual meeting of the International Society for Traumatic Stress Studies, Chicago, IL.

Ray, W.J., June, K., Turaj, K., & Lundy, R. (1992) Dissociative experiences in a college age population: A factor analytic study of two dissociation scales. *Personality and Individual Differences*, 13, 417-424.

Ray, W.J., & Faith, M. (1995). Dissociative experiences in a college age population: Follow-up with 1190 subjects. *Personality and Individual Differences*, 18, 223-230.

Ray, W.J. (1996). Dissociation in Normal Populations. In L.K. Michelson & W.J. Ray (Eds.), *Handbook of Dissociation: Theoretical, Empirical, and Clinical Perspectives*. New York: Plenum Press.

Reason, J. (1993). Self-report questionnaires in cognitive psychology: have they delivered the goods? In A. Baddeley & L. Weiskrantz (Eds.), *Attention: selection, awareness and control: a tribute to Donald Broadbent* (pp.406-423). Oxford: Clarendon Press.

Reason, J., & Mycielska, K. (1982). *Absent-minded? The psychology of mental lapses and everyday errors*. Englewood Cliffs, New Jersey: Prentice-Hall.

- Regan, D. (1982). Visual information channeling in normal and disordered vision. *Psychological Review*, 89, 407-444.
- Reisburg, D. (1983). General mental resources and perceptual judgments. *Journal of Experimental Psychology: Human Perception and Performance*, 9, 966-979.
- Reisburg, D., & O'Shaughnessy, M. (1984). Diverting subjects' concentration slows figural reversals. *Perception*, 13, 461-468.
- Riley, K. (1988). Measures of dissociation. *Journal of Nervous and Mental Disease*, 176, 449-450.
- Rock, I. (1975). *An introduction to perception*. New York: Macmillan.
- Rock, I., & Mitchener, K. (1992). Further evidence of failure of reversal of ambiguous figures by uninformed subjects. *Perception*, 21, 39-45.
- Ross, C.A. (1989). *Multiple personality disorder*. New York: John Wiley.
- Ross, C. A., Heber, S., Norton, G., & Anderson, G. (1989). Differences between multiple personality disorder and other diagnostic groups on structured interview. *Journal of Nervous and Mental Disease*, 177, 487-491.
- Ross, C.A., Joshi, S., & Currie, R. (1991). Dissociative experiences in the general population: A factor analysis. *Hospital and Community Psychiatry*, 42, 297-301.
- Ross, C.A., Ryan, L., Anderson, G., Ross, D., & Hardy. (1989). Dissociative experiences in adolescents and college students. *Dissociation*, 2(4), 239-242.
- Ross, C.A. (1997). *Dissociative identity disorder: diagnosis, clinical features and treatment of multiple personality*. New York: Wiley.

Rossini, E.D., Schwartz, D.R., & Braun, B.G. (1996). Intellectual functioning of inpatients with Dissociative identity disorder and Dissociative disorder not otherwise specified. *The Journal of Nervous and Mental Disease, 184* (5), 289-294.

Ruiz, M.A., Pincus, A.L., & Ray, W.J. (1999). The relationship between dissociation and personality. *Personality and Individual Differences, 27*, 239-249.

Sandberg, D.A., & Lynn, S.J. (1992). Dissociative experiences, psychopathology and adjustment, and child and adolescent maltreatment in female college students. *Journal of Abnormal Psychology, 101*, 717-723.

Sanders, S. (1986). The perceptual alternation scale: A scale measuring dissociation. *American Journal of Clinical Hypnosis, 2*, 95-102.

Scroppo, J.C., Weinberger, J.L., Drob, S.L., & Eagle, P. (1998). Identifying dissociative identity disorder: A self-report and projective study. *Journal of Abnormal Psychology, 107*, 272-284.

Shiomi, K. (1982). Relationship between reversible-figure latencies and scores on two personality scales. *Perceptual and Motor Skills, 54*, 803-807.

Sjövall, B. (1967). *Psychology of tension: An analysis of Pierre Janet's concept of "tension psychologique" together with an historical aspect*. Stockholm: Svenska Bokförlaget.

Spiegel, D., & Cardena, E. (1991). Disintegrated experience: The dissociative disorders revisited. *Journal of Abnormal Psychology, 100*, 366-378.

Spiegel, H. (1963). The dissociation-association continuum. *Journal of Nervous and Mental Disease, 136*, 374-378.

Spindler, H. & Elklit, A. (2003). Dissociation, psychiatric symptoms, and personality traits in a non-clinical population. *Journal of Trauma and Dissociation*, 4, 89-107.

Spitz, H.H., & Lipman, R.S. (1962). Some factors affecting Necker cube reversal rate. *Perceptual and Motor Skills*, 15, 611-625.

Stockdale, G.D., Gridley, B.E., Balogh, D.W., & Holtgraves, T. (2002). Confirmatory factor analysis of single- and multiple-factor competing models of the Dissociative Experiences Scale in a nonclinical sample. *Assessment*, 9(1), 94-106.

Strüber, D., Basar-Eroglu, C., Hoff, E., & Stadler. (2000). Reversal-rate dependent differences in the EEG gamma-band during multistable visual perception. *International Journal of Psychophysiology*, 38 (3), 243-252.

Strüber, D., Basar-Eroglu, C., Miener, M., & Stadler, M. (2001). EEG gamma-band response during the perception of Necker cube reversals. *Visual Cognition*, 8 (3/4/5), 609-621.

Stuss, D.T., & Benson, D.F. (1986). *The frontal lobes*. New York: Raven Press.

Tellegen, A. (1992). *Note of structure and naming of the MPQ Absorption Scale*. Unpublished manuscript, University of Minnesota, Minneapolis.

Tellegen, A., & Atkinson, G. (1974). Complexity and measurement of hypnotic susceptibility: A comment on Coe and Sarbin's alternative interpretation. *Journal of Personality and Social Psychology*, 33, 142-148.

Teuber, H.L. (1964). The riddle of frontal lobe functions in men. In J.M. Warren & G. Akert (Eds.), *The frontal granular cortex and behavior*. (pp. 410-444). New York: McGraw-Hill.

The Psychological Corporation. (1994). *Vigil/ W.* Austin, Texas: The Psychological Corporation.

Thetford, P. (1963). Influence of massing and spacing on Necker cube reversals. *Perceptual and Motor Skills, 16*, 215-222.

Toppino, T.C., & Long, G.M. (1987). Selective adaptation with reversible figures: Don't change that channel. *Perception & Psychophysics, 42*, 37-48.

Trener, M.R., Crosson, B., DeBoe, J., & Leber, W.R. (1990). *Stroop Neuropsychological Screening Test: Professional manual*. Odessa, FL: Psychological Assessment Resources, Inc.

Turner, M.L., & Engle, R.W. (1989). Is working memory capacity task dependent? *Journal of Memory and Language, 28* (2), 127-154.

Vanderlinden, J., Van Dyke, R., Vandereycken, W., & Vertommen, H. (1991). Dissociative experiences in the general population in the Netherlands and Belgium: A study with the Dissociative Questionnaire (DIS-Q). *Dissociation, 4*, 180-184.

Vicholkovska, A. (1906). Illusions of reversible perspective. *Psychological Review, 13*, 276-290.

Vickers, D. (1972). A cyclic decision model of perceptual alternation. *Perception, 1*, 31-48.

von Grunau, M.W., Wiggan, S., & Reid, M. (1984). The local character of perspective organization. *Perception & Psychophysics, 35*, 319-324.

Wagner, E.E., Allison, R., & Wagner, A. (1983). Diagnosing multiple personalities with the Rorschach: A confirmation. *Journal of Personality Assessment, 47*, 143-149.

Wallace, B., Knight, T.A., & Garrett, J.B. (1976). Hypnotic susceptibility and frequency reports to illusory stimuli. *Journal of Abnormal Psychology*, 85, 558-563.

Wallace, B., & Priebe, F.A. (1985). Hypnotic susceptibility, interference, and alternation frequency to the Necker cube illusion. *The Journal of General Psychology*, 112 (3), 271-277.

Waller, N.G., Putnam, F.W., & Carlson, E.B. (1996). Types of dissociation and dissociative types: A taxometric analysis of dissociative experiences. *Psychological Methods*, 1(3), 300-321.

War Department, Adjutant General's Office. (1944). *Army Individual Test Battery: Manual of directions and scoring*. Washington, D.C.: Author.

Wechsler, D. (1981a). *Wechsler Adult Intelligence Scale – Revised: Administration and scoring manual*. San Antonio, TX: The Psychological Corporation.

Wechsler, D. (1981b). *Wechsler Memory Scale –Revised: Administration and scoring manual*. San Antonio, TX: The Psychological Corporation.

Wilson, B.A., Alderman, N., Burgess, P.W., Emslie, H.E., & Evans, J.J. (1996). *Behavioral assessment of the dysexecutive syndrome*. Bury St. Edmunds, England: Thames Valley Test Company.

Yacorzynski, G.W. (1965). Organic mental disorders. In B.B. Wolman (Ed.), *Handbook of clinical psychology*. New York: McGraw-Hill.

Young, G.R., Wagner, E.E., & Finn, R.F. (1994). A comparison of three Rorschach diagnostic systems and use of the Hand Test for detecting multiple personality disorder in outpatients. *Journal of Personality Assessment*, 62, 485-497.

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