DISTORTED TIME PERCEPTION AS AN UNDERLYING FACTOR OF PSYCHOSIS PRONENESS AND DISSOCIATION

THESIS

Prsented to the Graduate Council of the
University of North Texas in Partial
Fulfillment of the Requirements

For the Degree of

MASTER OF ARTS

By

Gregory C. Koehler, B.S.
Denton, Texas
August, 1995

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Distortions in the perception of time historically have been associated with dissociation and psychosis in clinical populations. However, the relations among dissociation, psychosis, and time perception in sub-clinical populations have not been investigated. In the present study, college undergraduates scoring either normally or deviantly high on the Per-Mag were given a Dissociative Experiences Scale (DES) and a computerized time-estimation/production task. Participants scoring high on the Per-Mag obtained higher scores on the DES than participants scoring low on the Per-Mag. Per-Mag scores also correlated positively with DES scores across 608 total participants screened. The relation between dissociative and psychotic symptomatology is discussed considering dichotomous versus continuous conceptualizations of psychopathology. The effects of intelligence, social desirability, malingering, gender, and post-traumatic stress on the measures used are also discussed.

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CHAPTER I

INTRODUCTION

Most mental processes, whether they involve higher cortical functions such as speech development and articulation, or lower brain functions like sleep/wake cycles, seem to be associated with the concept of time. Without a well grounded conception of past, present, and future, humankind would not be able to do most of the things we take for granted. Anticipation of events, planning, sequential abilities, social causality, and temporal sequencing are a few of the historically measured abilities attributed to intelligence (Kaufman, 1990). But, these abilities may also be regarded as our ability to conceptualize and/or exercise time.

This author agrees with Holzman and Matthysse (1990) who call out for the study of specific deficits or symptoms which possibly cut across clinical diagnoses. The purpose of this thesis is to bring into consideration evidence that accurate perception of time is integral in normal psychological functioning. Therefore, it seems reasonable that a distortion in the perception of time might be associated with certain manifestations of psychopathology.

First, an historical review of the literature is presented to highlight the importance of time perception within a philosophical orientation. Secondly, contemporary research is presented from learning/developmental, biological, neuropsychological, social, and cognitive/behavioral fields of study which have shed light on the notion of time perception, and its role in psychopathology. Lastly, a study is presented which integrated research from the areas of psychosis proneness, dissociation, and time psychology.

Historical Survey

Psychologists, philosophers, and scientists from many diverse fields have been trying to conceptualize, measure, predict and control time since the beginning of civilization. The Greeks felt that time was important enough to designate Chronos as their god of time (Fraisse, 1963). Kant believed time to be the prerequisite of all perceptions and ideas; that nothing could exist without time (Hothersall, 1990). Leibnitz claimed that God had constructed the human body and the mind like two parallel clocks which he referred to as a psychological parallelism (Hothersall, 1990). Newton was not only a great physicist, he was also a clockmaker, and was fascinated with the concept of time. He referred to God as the "Great Watchmaker" (Hothersall, 1990).

William James (1910) presented time as a phenomenological duration which is very complex. He recognized that biological rhythms (heart beat) existed which effect our perception of time. He even called the heart beat a type of a clock. Based on our individual awareness of our bodies, James stated that time is recognized by the individual as a perception and is a discrete flow. He wrote: "In general, a time filled with varied and interesting experiences seems short in passing, but long as we look back. On the other hand, a tract of time empty of experiences seems long in passing, but in retrospect short" (p.243).

In an update on Einstein's theory of relativity, Calder (1979) stated that "the rates of all the essential living processes are governed by the rates of atomic action" (p. 146). He expressed that all time is relative, including our internal, biological clock. Also, every atom in the universe is a natural timepiece. According to Einsteinian theory, strong gravity slows brain waves and heart rates. Therefore, Calder states that all atomic activity, including 'real' time as measured by atomic clocks and our individual internal clocks (e.g., aging), slow under the influence of gravity. This occurs because our bodies are composed of atoms.

However, Henri Bergson (1889/1975) stated that Einstein's theory only dealt with space, not time. He said that physics as a science only deals with space and not time because it does not account for duration, which is perceived in the mind. He called the latter form of time "spacialized time".

Although Freud did not dedicate much of his writings to the role of time in consciousness, he did believe pathological behavior to be evidenced, due to a distortion and condensation of time, to the point of development where unmet needs were originally manifest in life. He further believed the unconscious to be timeless, and stated that time also plays a direct function in forgetting (Freud, 1907/1960).

In 1947, Kohler published the 2nd edition of Gestalt Psychology. By this time, the principles of Gestalt psychology were already well known; but in this work the philosophical underpinnings of Gestalt psychology are made clear. "Experienced order in time is always structurally identical with a functional order in the sequence of correlated brain processes" (p. 62). Kohler believed that the experience of time is similar to experience of space, but not identical. He often used music as an analogy to describe how we group time in the same way we group space in our minds. For example, musical rhythm is a group of beats in physical space over a repetitive set of time.

Kohler contrasted his views of experience to those of James and Bergson. He said they believed all experience to be a continuous flow and our percepts are only secondary knowledge of that experience. However, Kohler stated that the brain is a medium (of the physical world) which perceives external physical events, and that the events gives rise to a mental structure. Further, because we experience distortions of time and space, there must be a separate mental process taking place.

Piaget (1927/1975) said that psychological time is the coordination of motions of the person at different velocities, and that development of time perception is central to ego development and object development. According to Piaget, qualitative time tracks with the three stages of development; however, quantitative time is similar to measurement with numbers. He outlined three stages of human development which are critical to normal functioning in our physical world.

In Stage I development, time has no velocity except in a spatial sense. There is no sequential ability. Perception of time is developed through experience in a spatio-temporal way correlated with sensori-motor ability during Stage II development. In reference to the third stage of development, Piaget stated that "...operational time is constructed as soon as the order of successions is deduced from the colligation of durations and vice versa." (p. 472). He said the child discovers the conservation of uniform velocity simultaneously with the measurement (i.e., perception) of time.

Piaget believed that time is separate from space. It is not a '4th dimension' of space. He said that time deals with displacements and partitions of objects in space or within the mind. Furthermore, psychological time is not intuitive.

Dewey (1960) stated "time is a philosophical problem of the first importance" (p. 229). Dewey asked the following question: "Is what happens simply a spatial rearrangement of what existed previously or does it involve something qualitatively new?" (p. 230). Dewey identified two "Morals" which were a) "time is opportunity, for individuals to discover their potential," and b) "art is the compliment of science" (p. 242). He said that through creativity, art is a catalyst for change, which all science regards as time. Without freedom, there can be no creativity, no change, and therefore, no development throughout time.

Kelly (1955) argued that a person is a form of motion, and that constructs are in transition. His Individuality Corollary states that "persons differ from each other in their construction of events" (p. 55). Also, Kelly's Organisation Corollary states that "Each person characteristically evolves, for his convenience in anticipating events, a construction system embracing ordinal relationships between constructs" (p. 56). Therefore, individual differences are an important factor when assessing temporally related factors of behavior.

Fraisse (1963) cited Piaget and related many developmental aspects to the development of time perception. Specifically, he described how Piaget demonstrated that infants and children use their knowledge of memory and present situation to obtain desired objects or meet needs. Also, Fraisse stated that language development increases human ability to understand personal history and social environment. Further, by learning to control our emotions, we increase our ability to reference more information from the past and obtain desired objects in the future, within a longer perspective. Otherwise, unchecked emotions tend to lock our ability to utilize information into the present, thereby making past experiences or future expectations of our behaviors inaccessible.

Fraisse (1963) stated that memory is a construction and serves as a defense against the movement of time, and that we use our knowledge to order our memories in the most probable way.

Fraisse (1963) proposed that the mentally ill are victims of the present because they cannot order the past in anticipation of the future. DeGreef (1927; as cited in Cutting & Silzer, 1990) stated that the temporal horizon of the severely mentally ill is approximately 10 days. All their personal history before 10 days ago lies on one plane of occurrence. This horizon is similar to that of young children.

Fraisse (1963) also stated that our temporal horizon is a function of the social groups to which we belong (i.e. religious, family, military, professional, and civil groups). Each group consists of its own stream of past which criss-cross other streams within an individual. Fraisse conceptualized time as a function of society. "As population increases, so does the number of people wearing watches" (p. 289).

Frobenius (1927; as cited by Fraisse, 1963) found that biological clocks were not affected by external cues. His participants were able to wake within a few minutes of each day regardless of external cues such as clocks in their bedrooms or silence, even if the clock was set wrongly. Fraisse (1963) found that the less time estimated, the more accurate we are. People can estimate seconds closer to actual clock time than we can estimate hours.

Historically, the concept of time seems to have been a subject of great interest to many scientists and scholars. Leading philosophers, scientists, and psychologists put a great deal of emphasis on the perception of time in their writings. It would appear that as we approach the 21st century, the concept of time is not well understood. It seems that most researchers take the concept of time for granted, yet time is often a basic unit of measure in research projects. For these reasons, psychologists should be interested in how an individual's construct of time affects their functioning.

Contemporary Research

Research on the perception of time and the effects of time distortion completed since the work of Fraisse comes from various philosophical and scientific orientations. These include physiological, biological, social, and learning/developmental. They seem to agree that time is a very important underlying function of human thought and action.

Physiological Models

Previous research has demonstrated that the induction of temporal disintegration in normal participants predicated delusional thought content (Melges, 1978). Brain damaged and schizophrenic patients appear to have a distorted perception of the passage of time (Cutting & Silzer, 1990) and difficulty duplicating a fixed duration of time (Cutting & Silzer, 1990; Lennart, 1983). Also, depressive inpatients have been found to under-estimate the flow of time, becoming more inaccurate as the depression worsens (Kitamura & Kumar, 1982).

Tysk (1983) found that in a psychiatric population, schizophrenics tended to overestimate time intervals of minutes or seconds, and that depressed patients tended to underestimate time. Both groups were inferior in time estimations to control groups.

Hemispheric laterality studies which look at the role of time in psychopathology are sparse. However, the few studies which have attempted to investigate this seemed to indicate a prominent right hemisphere advantage for time regulation.

In looking at the role of time and hemispheric laterality in schizophrenia, Mo and Chavez (1986) were unable to support a left hemisphere disturbance in schizophrenia. They determined that "hemispheric reversal of time information is an indication of an underlying process for both perceptual aberration and poor premorbid adjustment, at a fundamental level" (p. 791).

Further support of right hemispheric disturbance and time distortion underlying schizophrenia comes from a literature review conducted by Cutting and Silzer (1990). In reference to data comparing right hemisphere damaged patients with schizophrenics, they stated that "the most striking finding from the schizophrenia literature was the overlap between the experience of schizophrenics and those with right hemisphere damage ..." (p. 213). They also concluded that:

> our sense of time does have a focal representation within the brain, and that the existence of a shared psychopathology between schizophrenics and those with right-sided brain damage suggests that

the former condition may itself be a consequence of right hemisphere dysfunction. (p. 213)

Also, Hilgard (1965) found a greater right hemisphere involvement in hypnosis susceptibility, a characteristic believed to be related to dissociation. This construct will be addressed more fully in later sections.

It is highly unlikely that time perception is solely a right hemisphere function. Although anatomical asymmetries are widely recognized to exist in the brain, the functional role of hemispheric assymetries in language, visual and emotional processing is open to debate (Kutas, Hillyard, & Gazzaniga, 1988; Aboitiz, Scheibel, & Zaidel, 1992; Tucker, 1990) Although interhemispheric specialization is recognized in verbal and other skills, it is also recognized that one hemisphere is only superior to the other and not completely responsible for these tasks (Hellige, 1993). Time perception may be primarily a right hemisphere function, but it is highly likely that both hemispheres play crucial roles. When considering the role that memory plays in our perception of time, as well as other highly learned tasks, the left hemisphere may be more important than Mo and Chavez hypothesize (Anderson & Schooler, 1991). Therefore, time perception likely does not have a focal representation within the brain as Seiver (1990) stated. It is interesting to note than in these studies, only individuals with clinical levels of psychopathology were included in the experimental groups. Also, these studies were not looking at underlying levels of cognitive malfunctioning in psychopathology.

Biological Models

Although mostly taken for granted, humans are aware of the ongoing movement and duration of time. Every human being has a personal, internal sense of time; a sense that normally correlates closely with external, or 'real' time. "The nervous system provides both the anatomical structure and the physiological activity required to constitute a clock, and may be regarded as a clock" (Gooddy, 1988, p. 57).

A good analogy of our biological clock is a clock with a pendulum. If the biological clock operated by pendulum, one could imagine that it barely swings while sleeping. While dreaming, it would swing wider. In a nightmare, it would swing even wider until awakening. If the nightmare continued while "awake", the pendulum would be swinging wildly. When this happens, the person is in a psychotic state. During depression, the imaginary pendulum would be swinging slightly wider than during normal sleep, but not as wide as it normally should be swinging.

Dopamine levels have been found to effect the internal clock as measured by millisecond time interval auditory discrimination tasks in schizophrenic and affective disordered patients (Rammsayer, 1990). All of the schizophrenic patients were being treated with neuroleptic drugs at the time of the study, and most of the affective disordered patients were being treated with tricyclic medications. The affective disorders represented were major depression with melancholia and dysthymic disorder. Ramsayer determined that the significant differences between the groups was not a function of attentional deficits or age. Other studies also confirm that the estimate of subjective time does not appear to be related to aging in adults (Gallant, Fidler, & Dawson, 1991; Salthouse, Wright, & Ellis, 1979).

In a highly controlled temporal isolation study, (Monk, Fookson, Moline, & Pollack, 1985) participants were found to be psychologically influenced by diurnal rhythms. Performance and affective states seemed to correlate with time of day and circadian rhythms. The clinical ramifications of this study were believed to be for endogenous depression cases. The authors particularly noted the effect of time perception on diurnal rhythms: "the psychological variables of mood and performance efficiency are particularly susceptible to distortion by the various demands and intrusions of outside life, and by knowledge of clock time" (p. 185). Therefore, in order to test for effects of internal processes on performance and affect, the experimenters (Monk et al., 1985) felt it necessary to control the environment for these external factors.

Another study looking at the effect of external stimuli on the internal clock demonstrated that high levels of auditory stimulation sped up the internal clock (Treisman, Faulkner, Naish, & Brogan, 1990). Other studies have looked at the relation of motor mechanisms to internal clocks using 175 to 825 millisecond tasks (Collyer, Broadbent, & Church, 1992), and circadian variations in the time perception of rats using 1 to 16 second intervals (Shurtleff, Raslear, & Simmons, 1990).

Biological studies seem to indicate that accurate time perception requires an accurate perception of our biological clock correlated with external cues, and is related to normal functioning. Theses studies demonstrate that inaccurate time perception is likely related to schizophrenia and affective disorders, and is not a function of attention (Rammsayer, 1990). However, the role time perception plays in populations experiencing sub-clinical levels of odd or affective symptoms remains unknown.

Social Models

There are few scientific studies of the effect of culture on the perception of time. However, psychologists have hypothesized that culture does affect time perception, along with the sense of self. This is noted in the religious practices, works of art, societal structures, and life-styles of various cultures observed around the world

(Denber, 1986; Eibl-Eibesfeldt, 1989; Fraisse, 1963; Freud, 1960; Meehl, 1990).

Kraepelin (1907, as cited by Chapman, 1990) believed that a fast pace of life was a contributing factor in dementia paralytica. Jones (1988), in a report of cultural differences in time perspective, noted the following observations of goal setting and the future.

> ...one must believe that there is in fact a high probability that present actions increase the probability of reaching future goals. DeVolder and Lens (1982) found that high school boys in Belgium who had higher GPAs believed in a stronger relation between present actions and future outcomes than did students with lower GPAs. Moreover, these same (high GPA) students articulated goals that could be located in the more distant future, compared to the goals articulated by students with lower GPAs. (p. 22)

Levine (1988) suggested that there is evidence that population size is positively related to a number of behaviors associated with the pace of life, especially walking speed. As cited by Levine (1988), previous research methods have monitored walking speed (Levine,1988; Amato,1983; Bornstein & Bornstein, 1976), talking speed (Levine & Lynch, 1985), accuracy of clocks (Levine & Bartlett, 1984), currency exchanges (Amato, 1983), and speed of post office transactions (Levine & Bartlett, 1984) in various cities around the world in order to relate these phenomena to time perception.

Individuals from various minority cultures are known to experience phenomena as part of their religious belief system that may be misinterpreted as psychopathological in the popular culture of the United States (Dana, 1993). Therefore, it is important when interpreting results from studies of time perception and/or psychopathology that researchers consider the social and cultural beliefs of any minority individuals who may be in the study.

Learning/Developmental Models

Miller and Barnet (1993) recently proposed a temporal coding hypothesis in which they stated: "(a) temporal contiguity alone is necessary and sufficient for learning to occur, (b) associations incorporate temporal relationships between events, and (c) the encoded temporal relationships influence the conditioned response to a CS" (pp. 107-108). They also proposed that time is the common thread which runs through and ties all of our memories and thoughts together. However, sequencing seems to be necessary for anticipation or prediction of cause-effect relations. It is highly likely, when considering Piaget's third stage of human development, that sequencing and temporal contiguity are two factors of learning theory which are related and also underlie the acquisition and function of time perception.

It seems apparent that time plays a major role in our ability to function normally and in our sense of self. It also seems reasonable that if, according to Piaget, we learn what time is during a critical stage of development, and it is the major underlying factor of learning in general, than any distortion of this "construct" or process will have very dramatic affects on our ability to function normally.

It is nearly impossible for human beings to conceptualize life without time. Sometimes it seems as if our language does not seem adequate to describe time. Yet Denber (1986) eloquently stated, "The development of a time sense would seem to be another way to give order and structure to biological life, for where the time-space continuum disappears, disorder appears... Thus, life equals time" (p. 216).

As stated earlier, Piaget (1975) believed that perception of time was central to ego and object development. Therefore, it seems logical to assume that any disease or faulty thought processes which distort the perception of time may contribute to a dissociation of the self. Denber (1986) linked a loss in the experience of the self and time to clinical psychological disorders including depression, schizophrenia, and other psychopathology. Others have also noted the association between a lost sense of self within space and time, and psychopathology (Agarwal, 1989; Meehl, 1990; Nosachev, 1992). Furthermore, Melges

(1977a) found that distortions of personal space correlated with distortions of personal time.

A possible explanation for the decrement of motor control or performance on psycho-motor tasks in clinical depression and schizophrenia may be a loss of "coordination" (Meehl, 1990; Piaget, 1975). Elling (1985) states that coordination refers to internally or externally triggered temporal contingencies between different behaviors. A loss of coordination would result in a disintegration of the behaviors otherwise coordinated. Prolonged latencies in the coordinated behaviors would be expected. This may also account for findings of body-image aberration found in schizophrenia (Chapman, Chapman, & Raulin, 1978; Melges, 1977a, 1977b).

The role of learning and memory in our ability to function normally can not be understated. Our ability to estimate and replicate discrete periods of time likely requires intact memory skills. Essentially what one is doing when estimating or producing time is bringing forth from memory instances of remembered time and comparing it to the present passage of time. Therefore, the ability to recall memories of time elements seems crucial. If psychotic or affective disordered individuals are unable to estimate or produce time accurately when compared to normals, they may be experiencing a memory problem independent of any cognitive processing problem.

Present Study

To set the stage for the present study, the research presented within the following sections of the paper pools literature together which seems to indicate that time distortion underlies many psychological and psychiatric disorders. The main focus is on research which seems to be pointing to correlations between dissociation, psychosis, psychosis-proneness, and time distortion.

Dissociation

The research presented thus far indicates that the sense of self is related to the developmental learning of time perception. Any disintegration of the sense of self seems to be related to a distorted sense of time (Denber, 1968; Fraisse, 1963; Freud, 1960; Piaget, 1975). The knowledge of oneself in space and time is held in tact by memories. Calev (1983) found a memory deficit in normal participants believed to be prone to schizophrenia. Janet believed the cardinal feature of the pathological separation between ideas and behaviors and consciousness was amnesia (Bernstein and Putnam, 1989).

Many of the symptoms of dissociation seem to be related directly to the person's perception of self in time. For example, flashbacks transport the person experiencing them to a different place and time. These experiences are noted to be common in Posttraumatic Stress Disorder (Bernstein, et al. 1989; Denber, 1986). In reference to Depersonalization

Disorder, the DSM-IV [American Psychiatric Association (APA), 1994] states "Other common associated features include ... a disturbance in one's sense of time" (p. 488). The essential features of dissociative disorders are listed as "a disruption in the usually integrative functions of consciousness, memory, identity, or perception of the environment" (p. 477). An alternative way of stating this is that the essential feature of dissociative disorders is a disruption in the usually integrative function of time perception.

Bernstein and Putnam (1986) developed the Dissociation Experiences Scale (DES) "to offer a means of reliably measuring dissociation in normal and clinical populations" (p. 727). They viewed dissociative experiences on a continuum from normal everyday experiences like daydreaming to clinical disorders such as Multiple Personality Disorder. Some of the questions are directly related to distortion of time, with most others related to distortions in the sense of self (Fischer & Elnitsky, 1990).

Interestingly, many of the symptoms occurring in dissociative disorders also occur in schizophrenia. Examples of related symptoms are hallucinations, depersonalization, and derealization (APA, 1994). In a series of studies, Melges (1977b, 1978) found that temporal disintegration was positively correlated with depersonalization in acutely mentally ill psychiatric patients. Melges (1977b) defined depersonalization as having two components, self-estrangement and body image diffusion. Melges (1977a) found that temporal disorganization covaried with symptoms of inner-outer event confusion in an adult psychiatric population including diagnoses of schizophrenia, mania, and depression. It may be that dissociation is similar to schizotypy in that it is a dormant trait marker for schizophrenia (Seiver, 1990).

Psychosis-Proneness/Schizotypy

Is schizophrenia a disease, or a mental disorder? Depending on how one views the manifestation called schizophrenia, one could reasonably argue for one or the other, or even for both views. Like Meehl, this author is a monist, and agrees with Meehl when he states that "the mind is the brain in action..." (p. 11). However, this does not change the fact that the location of any specific memory stored within the brain will likely never be found. The human brain is not a computer, being much more complex than any computer system currently known. It would appear then that schizophrenia can be conceptualized as both an organic disease and a mental disorder.

Meehl (1990) summarized and extended his etiologic model of schizophrenia, reiterating that schizotypes (not synonymous with DSM-IV schizotypal personality disorder) have inherited a schizotaxia, which Meehl defined as "a genetically determined integrative defect, predisposing to schizophrenia and a sine qua non for that disorder" (p. 35). However, Meehl stated that only a minority of the people with schizotaxia (i.e., schizotypes) decompensate to the point of being diagnosable as schizophrenic. Others show milder manifestations of the defect, some diagnosable, some not. He extended his model by proposing "hypokrisia", as the specific "neuron-level process that underlies the schizotaxia" (p. 36).

Meehl (1990) further described hypokrisia as a spatio-temporal slippage in the firing rates of neurons in the brain. As it has already been demonstrated that time is a subjective construct each person imposes on the environment, a scientist measuring synaptic firing rates is only imposing his/her measuring system onto the subject. Therefore, the scientist looking for the specific physical etiological factors involved in schizophrenia should be looking for the damaged organic components or sub-systems within the central and peripheral nervous systems which allow us to perceive and duplicate time.

However, if one desires to discover the role of the manifestations or perceptions of brain functions (i.e., mental functions or representations) in schizophrenia, then measuring the individual's subjective perception of time seems indicated. Time can only be "sensed" or perceived after it has been created directly within the brain, or re-created indirectly within the brain via memory functions.

Only then are organisms able to function normally by accurately anticipating events, behaviors, thoughts, and emotions.

Several previous research findings cited indicate that schizophrenics experience temporal distortion. However, none of these studies looked specifically at sub-clinical levels of psychosis. Although normal controls groups are usually used, discriminating between controls and non-clinical participants who may be prone to psychosis has not been considered in temporal discrimination tasks, or in any of the other physiological, biological, or learning/developmental studies.

Many researchers seem to agree with Chapman (1990) and think of psychopathology as lying on a continuum, and that manifestations of symptomatologies along this continuum are varied (Holzman, 1990; Muntaner, Garcia-Sevilla, Fernandez, & Torrubia, 1988; Widiger, 1990). Chapman (1990) stated that "Most of the symptoms of schizotypal personality disorder listed in DSM-III-R indeed appear as watered-down versions of schizophrenic symptoms" (p. 113). Furthermore, magical thinking, suspiciousness or paranoid ideation, and social isolation were found to be predictive of schizophrenia in a long-term follow-up study of non-psychotic individuals diagnosed with schizotypal personality disorder (Fenton & McGlashan, 1989).

Consider four symptoms, each of which occur in more than one of the disorders listed in the DSM-IV. Symptom A (negative affect) and symptom C (withdrawal from society) form part of a cluster of symptoms for a particular personality disorder. However, symptom A (negative affect) is also part of the Schizophrenia cluster. Symptom B (dissociation), however, loads into schizophrenia and not into the personality disorder cluster.

A-> Depression

B-> Dissociative Disorder

A-C-> Personality Disorder

A-B-C-> Schizophrenia

Therefore, screening individuals for psychosis-prone traits seems like a reasonable approach for diagnostic purposes.

In a series of previous studies attempting to identify participants at risk for psychosis, the Perceptual Aberration-Magical Ideation Scale (Per-Mag), was identified as the most promising overall screening measure for psychosis-proneness in college students (Chapman & Chapman, 1987; Chapman, Edell, & Chapman, 1980). The Per-Mag is the combination of two separate scales, the Perceptual Aberration Scale (PAS) and Magical Ideation Scale (MIS) developed by Chapman (et al., 1987). The Chapmans and others have looked for correlates to the Per-Mag to account for greater percentages of the overall variance believed to account for psychosis-proneness in college students as well as in other populations (Allen, Chapman, & Chapman, 1987; Allen, Chapman, Chapman, Vuchetich, & Frost, 1987; Balogh & Merritt, 1990; Balogh, Merritt, & Steuerwald, 1991; Carpenter, 1983; Chapman & Chapman, 1987; Fenton et al. 1989; Lenzenweger & Loranger, 1989; Lenzenweger & Loranger, 1989; Muntaner, Garcia-Sevilla, Fernandez, & Torrubia, 1988; Ward, McConaghy, & Catts, 1991). Validity of the Per-Mag scale for identifying individuals prone for psychosis was mostly upheld in all of these studies. Also, in a chronic psychiatric schizophrenic population, the Per-Mag did not identify participants believed to vary in social experience (Carpenter, 1983), a criterion thought to correlate with psychosis-proneness at that time, but which has since been abandoned (Lenzenweger, et al., 1989; Meehl, 1990; Seiver, 1990).

Lenzenweger et al. (1989) found the Perceptual Aberration Scale (PAS) to be positively correlated with the presence of the following personality disorders in a nonpsychotic psychiatric sample: Schizoid ($r = .36$, $p < .001$); Schizotypal ($r = .43$, $p < .001$); Borderline ($r = .20$, $p < .05$); Avoidant ($r = .28$, $p < .005$); Dependent ($r = .27$, $p < .01$); Obsessive-compulsive ($r = .37$, $p < .001$). No significant correlations were found for antisocial, histrionic, narcissistic, and passive-aggressive personality disorders.

Also, the PAS was found to be significantly positively correlated with clinical symptoms of anxiety (r = .43, p < .001), depression (r = .31, p < .01; r = .34, p < .001), and prior hospitalizations (r = .22, p < .05). The PAS was found to be significantly negatively correlated with global adjustment (r = -.19, p < .05). No significant correlations were found for social competence or age at onset. In a separate study, the Per-Mag was also found to correlate with the depression subscale of the General Behavior Inventory (Allen et al., 1987).

Schizotypal personality disorder symptoms and Clinical Anxiety Scale (Snaith, Baugh, Clayden, Husain, & Sipple, 1982) scores accounted for 26% of the total variance underlying the PAS in a non-psychotic psychiatric sample. The schizoid personality disorder symptoms, avoidant personality disorder symptoms, obsessive-compulsive personality disorder symptoms, and the Beck Depression Inventory (BDI) accounted for an additional 6% of the total variance underlying the PAS. However, other researchers have found the Per-Mag scale to be confounded by response set biases, primarily measuring social desirability of the participants (Peltier & Walsh, 1990). Also, the Per-Mag was found to have a false-positive problem because it identified actively psychotic individuals in a prepsychotic sample in information-processing tasks (Merritt & Balogh, 1986). Studies by Chapman et al. (1980, 1987) have determined that physical anhedonia and impulsivity/social nonconformity were not related to psychosis-proneness, but were likely related to proneness for affective disorders. The Perceptual Aberration Scale (PAS) alone distinguished those prone for psychosis from those prone for affective disorders (Lenzenweger, et al., 1989). Meehl (1990) and Seiver (1990) agree with the notion that social anhedonia is probably not a good indicator of schizotypy. However, Katsanis and Iacono (1990) found that physical anhedonia and social anhedonia scales successfully differentiated a psychiatric group of patients from their relatives and the latter from a group of normals.

The present study extends the findings by investigating previously disparate factors which seem to point to a proneness for psychosis. These factors are: a) perceptual aberration and magical thinking as measured by the Per-Mag scale developed by Chapman, Chapman, and Raulin (1978), b) dissociative experiences as measured by the Dissociation Experiences Scale (Bernstein, et al. 1986), and c) distorted time perception directly measured by a computerized time production/estimation task program. The goal of this research was to show an interrelation between these three factors in a sub-clinical population, which might provide a more comprehensive screening battery for psychosis proneness.

Hypotheses

The hypotheses are stated as follows:

Hypothesis 1. Participants scoring high on the Per-Mag will obtain higher scores on the DES than participants scoring low on the Per-Mag.

Hypothesis 2. Per-Mag scores will correlate with DES scores across all participants from phase-I of the study.

Hypothesis 3. Participants scoring high on the Per-Mag will have higher error rates on a time estimation task than participants scoring low on the Per-Mag.

Hypothesis 4. Participants scoring high on the Per-Mag will have higher error rates on a time production task than participants scoring low on the Per-Mag.

Hypothesis 5. Time estimation and time production errors will predict DES scores across all participants in phase-II of the study.

CHAPTER II

METHOD

Participants

Participants for phase-I consisted of 227 male and 369 female right-handed college undergraduates taking psychology courses at the University of North Texas. They were volunteers who received extra credit for their participation. Phase-II consisted of a subset of 65 males and 139 females from the phase-I pool.

Instruments

The Dissociative Experiences Scale (DES) and Per-Mag were administered to all participants in phase-I of the study. The Per-Mag is a screening measure combining both the Perceptual Aberration Scale (PAS) and Magical Ideation Scale (MIS). In a long term follow-up study conducted over a 25 month period (Chapman & Chapman, 1987), the Per-Mag successfully differentiated participants who experienced psychotic-like symptoms from controls ($p < .01$) and successfully predicted differences in serious signs of psychopathology in Per-Mag participants from controls ($p < .001$) during the follow-up period. Twenty-two percent of the Per-Mag participants had sought professional help during the follow-up period, although only three of these participants experienced their first treatment for psychosis. Also, the Per-Mag identified significant levels of schizotypal sypmtoms ($p < .01$) for males and females. The Perceptual Aberration Scale (PAS) alone was reported to have coefficient alpha estimate of reliability scores from .89 in controls to .94 in male clinical participants (Chapman et al., 1978). The Magical Ideation Scale alone was reported to have a coefficient alpha of .82 for male college students and .85 for females (Chapman, Chapman, & Miller, 1982). Test/retest reliability was .80 for males and .82 for females. The correlation with the PAS was .70. In another study (Eckblad & Chapman, 1983), mean MIS scores were 8.56 for males and 9.69 for females.

Bernstein and Putnam (1986) found the DES score test-retest reliability coefficient to be .84 ($p < .0001$); and Kendall coefficient of concordance was .70 ($p < .0001$) agreement among DES test items. A Spearman correlation of .78 was found and replicated in several studies (Putnam, Chu, & Dill, 1992).

Another study (Steinberg, Rounsaville, & Cicchetti, 1991) evaluating DES scores used the Structured Clinical Interview for DSM-III-R Dissociative Disorders (SCID-D) scores as the dependent variable and found the DES distinguished normal participants and dissociative-disordered participants. The range of sensitivity was 62% - 95%, while specificity remained at 100%. False positives remained at 0% and false negatives ranged between 5% and 38%.

A Time Estimation and Production (TEP) computer program was developed and administered in phase-II of the study. The TEP was written with MacProbe, a programming language designed for conducting psychological research (Appendix A). MacProbe is designed to present audio/visual stimuli on a Macintosh personal computer. Data is gathered on-line and ready for analysis immediately. SPSS/PC+ 4.0 version statistical analysis software program running on an MS-DOS based personal computer was used for all statistical analyses.

Response bias is a common problem in experimental conditions. The Marlowe-Crowne Social Desirability Scale (MCSD; Crowne & Marlowe, 1960) was originally conceived to be a measure of the tendency in some people to respond in a socially desirable way. However, Paulhus (1991) determined that the scale more accurately measured the avoidance of disapproval. The MCSD scale demonstrated good alpha coefficients from .73 to .88 across various studies surveyed, and test-retest reliability was .88 after one month. Means were reported at 15.5 (SD = 4.4) in the original Marlowe-Crowne study as well in Paulhus' follow-up study in public exposure conditions.

The M Test (Beaber, Marston, Michelli, & Mills, 1985) is a 33 item true-false scale that was used to screen participants who may be feigning psychotic symptoms. Rogers, Bagby, and Gillis (1992) found the M Test to be an effective screening measure for individuals determined to be malingering in both hospital and forensic settings. The M-test was found to correctly classify 70.6% of actual patients while identifying 95.2% of the malingerers in the Rogers et al. (1992) study.

An abbreviated PTSD screening questionnaire (Appendix B) was used to determine if participants had ever experienced what they believed to be a traumatic experience. This was done in order to determine the relation of possible clinical levels of dissociation which may have an effect on the experimental participants' scores on the Per-Mag or DES scales. This was necessary because all participants came from a non-clinical setting, yet may have been experiencing clinical levels of dissociation, or other PTSD symptoms if they had experienced some past traumatic event.

Due to the previously discussed link between intelligence and time regulation (Kaufman, 1990), the Shipley Institute of Living Scale (SILS) was used because several studies have demonstrated it to be a good estimator of intelligence (Weiss & Schell, 1991; Frisch, & Jessop, 1989; Jacobsen, & Tamkin, 1988; Schear, & Harrison, 1988; Dalton, Pederson, & McEntyre, 1987).

Procedure

The Per-Mag and DES were group administered to all participants in phase-I of the study. Phase-I screening took approximately 40-45 minutes for each subject. In phase-II of the study, participants who scored at least 1.5 SD above the mean for their gender or no more than .5 SD from the mean on the Per-Mag were contacted by phone and asked to participate in a study of "visual information processing" in exchange for two experimental credits. Those participants with deviantly high scores were considered psychosis-prone and comprised the experimental group. Participants scoring no more than .5 SD from the mean on the Per-Mag were considered not to be psychosis-prone and served as the control group. Participants were asked to perform the TEP tasks in small groups on computers in a lab setting in phase-II. The lab contained no clocks or windows. Participants were instructed to remove their watches upon entering the lab and to disable any alarms programmed on their watch. In the time estimation task, participants estimated how long they believed a red square had stayed on the screen. In the time production task, participants were asked to press a button to begin the task. A red square appeared on the screen and the participants would press the button again to end the task when they believed the requested time had elapsed. Times for both tasks ranged from one to twenty seconds, and eighty trials were performed for each task. Phase-II took approximately one hour for each subject. During phase-II, participants also completed the MCSD, the M Test, the SILS, the abbreviated PTSD questionnaire, and a demographic questionnaire (Appendix C).

<u>Analyses</u>

Participants were screened over the course of three semesters, and completed phase-II before the end of their respective semester. Therefore seperate male and female means and standard deviation scores were calculated based on available data as selection criteria for phase-II participation. Before final analysis was complete, new means and standard deviations were calculated on all phase-I data, and new selection criteria were utilized for final hypotheses analysis. Participants not meeting the new criteria were dropped from phase-II data sets used for Hypotheses 3, 4, and 5.

After the assumptions for the F test were demonstrated, ANOVAs were performed between the experimental and control groups for Hypotheses 1, 3, and 4. Pearson Product Moment Correlations were computed on Per-Mag and DES scores for all participants from phase-I for Hypothesis two. For Hypothesis three and four, a total error score was calculated for each participant for both the time estimation and time production tasks. The absolute difference scores were summed from each of the 80 trials for both tasks. This total value was then divided by the total number of trials for that task yielding an absolute average estimation error score and an absolute average production error score. Multiple regression was performed on time estimation and time production absolute average error scores to see if they predicted DES scores across all participants from phase-II (Hypothesis five).

CHAPTER III

RESULTS

Phase-I

A total of 608 participants were screened during phase-I of the study. Twenty-two participants were dropped from the study because of missing information, leaving a total of 586 participants. Of those participants, 369 were female and 227 were male. The mean age for all participants was 22.16 years and the standard deviation was 6.07 years.

Hypothesis one stated that participants scoring deviantly high on the Per-Mag will obtain higher scores on the DES than participants scoring low on the Per-Mag. For Hypothesis one, DES scores in the experimental group were significantly higher than DES scores in the control group, $F(1, 204) = 35.56$, $p < .001$. Table 1 shows the means and standard deviations for the control and experimental groups.

Hypothesis two stated that Per-Mag scores will correlate with DES scores across all participants from phase-I of the study. There was a positive significant correlation of DES scores and PAS scores across all participants from phase-I of the study, $r = .50$, $p = .001$. There was also a positive significant correlation of DES scores and MIS scores across all participants from phase-I of the study, $r = .51$, $p = .001$.

Table 1

Means and Standard Deviations of Phase-I.

Var.	Experimental M	Experimental SD	Control M	Control SD
	Males (N=32)		Males (N=33)	
PAS	15.31	4.61	5.03	4.49
MIS	17.31	4.58	7.97	1.63
DES	21.34	11.69	14.41	7.90
	Females (N=53)		Females (N=86)	
PAS	12.26	3.91	3.58	1.19
MIS	18.07	4.33	7.24	1.98
DES	19.64	9.04	12.18	7.76

Phase-II

Eighty-three participants completed phase-II of the study. Table 2 has the demographic breakdown of participants. Due to the final mean and standard deviation re-calculations of Per-Mag scores following all phase-I data collection, 27 participants were dropped from final analysis, leaving 30 participants in the experimental group and 26 participants in the control group for a total of 56 phase-II participants.

Table 2

Demographic Variable Frequencies and Percentages.

	Exp. Grp.		Cont. Grp.		Total	
	f	%	f	%	f	%
Sex						
Males	8	26.7	5	19.2	13	23.2
Females	22	73.3	21	80.8	43	76.7
Ethnicity						
Caucasian	27	90.0	20	76.9	47	83.9
Black	1	3.3	3	11.5	4	7.1
Hispanic	1	3.3	2	7.7	3	5.3
Asian	0	0.0	1	3.8	1	1.7
Other	1	3.3	0	0.0	1	1.7
Currently taking Meds?						
Yes	3	10.0	1	3.6	4	7.1
No	27	90.0	25	96.4	52	92.8

Chi-Square analysis revealed no significant difference in the attrition rate of participants asked to return for phase-II testing between groups, $X^2 = 2.52$, $p = .11$. Also, chi-square analysis revealed no significant difference in the attrition rate between genders, $X^2 = .006$, $p = .93$.

Hypothesis three stated that participants scoring deviantly high on the Per-Mag will have higher error rates on a time estimation task than participants scoring low on the Per-Mag. Average absolute time estimation scores did not significantly vary between the control and experimental groups $F(1, 55) = .159$, $p = .691$. Table 3 shows means and standard deviations.

Hypothesis four stated that participants scoring deviantly high on the Per-Mag will have higher error rates on a time production task than participants scoring low on the Per-Mag. Average absolute time production scores did not significantly vary between the control and experimental groups $F(1, 53) = .427$, $p = .516$. Refer to Table 3 for means and standard deviations. As with hypothesis three, raw errors and proportional errors also did not differ between the groups (see Table 3).

Hypothesis five stated that time estimation and time production errors will predict DES scores across all participants in phase-II of the study. Absolute average time estimation and time production scores did not predict DES scores in phase-II of the study. A stepwise regression analysis was performed on DES score, using average absolute estimation error score and average absolute production score as predictors. No variables passed tolerance test and entered into the equation. The variables were allowed to enter by liberalizing tolerance requirements; the resulting multiple R of .12 was not significant.

<u>Post Hoc Analyses</u>

Because participants were screened over the course of three semesters and completed phase-II before the end of their respective semester, ANOVA was performed again on all phase-I Per-Mag scores after all data was collected. This was done to determine if the seperate male and female Per-

Table 3

Mean Error Scores in Seconds.

	M	SD	F	p
ESTIMATION ERRORS				
Absolute Error				
Experimental:	2.270	2.850	.159	.691
Control:	2.530	1.710		
Raw Error				
Experimental:	-.210	3.510	.051	.823
Control:	-.013	2.950		
Proportional Error				
Experimental:	.438	.413	.070	.792
Control:	.464	.313		
PRODUCTION ERRORS				
Absolute Error				
Experimental:	3.070	1.550	.427	.516
Control:	2.790	1.570		
Raw Error				
Experimental:	-.142	3.380	.055	.815
Control:	-6.330	3.040		
Proportional Error				
Experimental:	.300	.134	.269	.606
Control:	.281	.139		

Mag cut-off scores used to assign participants to phase-II groups were really necessary. ANOVA revealed that PAS scores varied significantly between males and females for all phase-I participants, $F = 5.958$, $p = .015$. However, MIS scores did not significantly vary between males and females for all phase-I participants, $\underline{F}$, = 1.313, $\underline{p}$ = .252. Nonetheless, the decision to use separate criteria for males and females for phase-II selection appears to have been supported based on PAS scores. Refer to Table 1 for means and standard deviations.

In the experimental group, a total of 21 participants (70%) were considered to be possible malingerers according to M Test option B criteria. In the control group, a total of 14 participants (54%) were considered to be possible malingerers according to M Test option B criteria. Chi-Square analysis found no significant difference in malingering response set between the experimental and control groups, $\underline{X}^2 = 1.55$ $\underline{p}$ = .21.

In the experimental group, a total of 12 participants (40%) reported having experienced a traumatic event sometime in their lives. In the control group, a total of 7 participants (27%) reported having experienced a traumatic event sometime in their lives. Chi-Square analysis revealed no significant difference in past trauma between the experimental and control groups,
$\underline{X}^2 = 1.06$ $\underline{p}$ = .30.

In the experimental group, a total of 22 participants (73%) were female and 8 participants (27%) were male. In the control group a total of 21 participants (81%) were female and 5 participants (19%) were male. Chi-Square analysis revealed no significant difference in sex between the experimental and control groups, $\underline{X}^2 = .43$ $\underline{p} = .51$. ANOVA revealed that participants chosen for the experimental group from phase-I was significantly higher in age than the participants chosen for the control group from phase-I. Refer to Table 4 for ANOVA values on Age, Marlow-Crowne, and Shipley IQ scores.

Table 4

Post Hoc Variable Statistics.

	EXP. GROUP		CONT. GROUP		ANOVA	
Measure	Mean	SD	Mean	SD	F	p
Marlowe-Crowne	12.86	5.77	12.50	4.61	.04	.83
Shipley IQ	106.50	8.01	107.61	6.22	.38	.54
Age	22.73	7.62	20.46	2.61	8.30	.00

As stated earlier, DES scores were significantly higher in the experimental group than in the control group (Hypothesis one). Refer to Table 1 for DES means and standard deviations for each group. Although there was no main effect for gender on the DES, $\underline{F} = 2.145$, $\underline{p} = .144$, males did tend to score higher than females (see Table 1). Therefore gender was used as a covariate to see if the group (experimental vs. control) effect would remain with gender variance removed. The group effect remained significant, $F = 4.465$, $p = .03$.

The hypothesis that participants scoring high on the Per-Mag will have higher error rates on a time estimation task than participants scoring low on the Per-Mag (Hypothesis three) was originally found not to be significant. However, when participants from phase-II who may have been malingering according to M-test scoring criteria were excluded from the analysis, absolute average time estimation scores did vary significantly in the positive direction between experimental and control groups, $F = 5.136$, $p = .035$. Ten participants were left in the experimental group and twelve left in the control group after excluding possible malingerers. The mean average absolute estimation error score for the experimental group was 3.15 seconds with a standard deviation of 1.32 seconds. The mean average absolute estimation error score for the control group was 2.09 seconds with a standard deviation of .82 seconds.

Finally, the possibility that intrasubject (i.e., trial-to-trial) variability might have differed between the groups was investigated via a series of analyses of variance using within-subject standard deviation error scores as the dependent variables. As shown in Table 5, the experimental group had consistently higher mean variability than controls, although the ANOVA fell short of significance.

Refer to Appendix D for a list of all significant correlations found in phase-II of the study. These are provided for hypothesis generative rather than testing purposes.

Table 5

Within-Subject Standard Deviation Scores in Seconds.

	M	SD	F	p
ESTIMATION ERRORS				
Absolute Error				
Experimental:	5.75	20.000	.797	.376
Control:	2.24	.952		
Raw Error				
Experimental:	5.96	19.970	.807	.373
Control:	2.43	.909		
Proportional Error				
Experimental:	1.210	2.210	.570	.454
Control:	.873	.489		
PRODUCTION ERRORS				
Absolute Error				
Experimental:	2.32	.893	1.00	.322
Control:	2.07	.971		
Raw Error				
Experimental:	2.52	.898	.667	.418
Control:	2.31	.979		
Proportional Error				
Experimental:	.158	.053	.828	.367
Control:	.145	.054		

CHAPTER IV

DISCUSSION

Participants scoring high on the Per-Mag obtained higher scores on the DES than participants scoring low on the Per-Mag, confirming hypothesis one. Also, Per-Mag scores correlated with DES scores across all participants from phase-I of the study, confirming hypothesis two.

The DES was developed as a continuous measure of dissociation (Bernstein & Putnam, 1986). Participants indicate the percentage of time they experience various types of dissociative experiences. Also, the Per-Mag was developed in order to measure sub-clinical levels of perceptual aberration and magical ideation because Chapman et al. (1987) believed that psychopathology lies on a continuum, and therefore sub-clinical populations could be theoretically experiencing psychotic symptoms.

Given that the DES and Per-Mag correlated with each other in the present study, it seems to lend support to Chapman (1990) and others' (Holzman, 1990; Muntaner, et al. 1988; Widiger, 1990) theories and research which indicate that psychopathology lies on a continuum, at least at sub-clinical levels.

However, this may or may not be true for clinical levels of psychopathology. On the one hand, at the sub-clinical level, symptoms may all lie along the same continuum, but as individual symptoms begin to strengthen and emerge, they cluster together and eventually form one of the DSM-IV disorders at the clinical level. On the other hand, the psychotic disorders such as schizophrenia may be more similar to the dissociative disorders than previously believed at the clinical level as well as the sub-clinical level. The present study does lend support to this hypothesis also.

Clinicians should be aware that individuals presenting for assessment or psychotherapy who are having dissociative experiences may also be experiencing sub-clinical levels of Axis-I psychotic symptomatology. The reverse is also likely to be true, that those presenting with clinical or sub-clinical levels of psychosis may also be experiencing dissociative symptomatology. Lenzenweger et al. (1989) stated that schizotypal, schizoid, borderline, avoidant, dependent, and obsessive-compulsive may present with dissociative symptomatology. Therefore, dissociative and/or psychosis-prone individuals may also present with these Axis-II personality traits.

The significant findings of the present study appear to be relevant to diagnostic issues, particularly when considering individuals who claim to have experienced some past traumatic event in their lives. PTSD is known to often manifest following traumatic events (Watson, 1991). Many sufferers of traumatic experiences appeared to be experiencing sub-clinical levels of dissociative experiences in the present study. However, control and experimental groups each had 12 individuals who claimed to have had experienced some past traumatic event. Given that there were no significant correlations between the Dissociative Experiences Scale, Perceptual Aberration, or Magical Ideation with prior experience of traumatic events in the control group, it would appear that past traumatic events do not necessarily lead to sub-clinical levels of psychotic or dissociative symptomatology.

The M Test appears to be related to magical ideation as well as to dissociative experiences (see Appendix D). This makes sense when considering the types of questions asked on the M Test. They are very similar to the questions taken from the Magical Ideation portion of the Per-Mag scale and to the questions on the DES. Thus, there might be a problem with the breadth of the construct measured by the M Test.

Designed to be a screening measure, the M Test may not be ruling out some individuals who actually are experiencing an appropriate level of symptoms. One possibility is that the Rule Out/Rule In criteria for the M Test may need to be re-evaluated for sub-clinical populations. The M Test may not be ruling out individuals who are experiencing clinically psychotic or dissociative symptoms (i.e., too sensitive).

After excluding participants who appeared to be malingering according to M Test criteria, participants scoring high on the Per-Mag had higher error rates on the time estimation task than participants scoring low on the Per-Mag (Hypothesis three). However, participants scoring high on the Per-Mag did not have higher error rates on a time production task than participants scoring low on the Per-Mag (Hypothesis four). If these individuals were actually malingering, then it makes sense that excluding them from the analysis for Hypothesis three would result in significance. College undergraduates may be able to successfully feign on both the Per-Mag and DES, which have a high degree of face validity. Even though the Per-Mag questions were embedded within distractor items, participants could be responding to any questions which may make them look "crazy". Undergraduates might attempt to do this in order to get more extra credit for participating in the second phase of the study. They may have rightly assumed that by looking "crazy", that they would get called back for more testing.

When these possibly malingering individuals' scores were kept in the phase-II analysis, the correlation of time estimation errors is not significant. This may be due to (a) a lack of incentive to perform poorly on the TEP, (b) the demand characteristics of the task, (c) participants simply did not think to malinger on such an esoteric task, or (d) faking psychotic symptoms is unrelated to performance on cognitive/perceptual tasks. Therefore, their performances skewed the data for the experimental group. Also, malingering was positively correlated with intelligence.

Intelligence was found to be significantly negatively correlated with the desire to avoid negative evaluation by the examiner. This is interesting because WAIS-R Picture Arrangement and Comprehension subtests together and separately were found to be good measures of "social intelligence" compared to California Psychological Inventory subscale measures of social intelligence (Sipps, Berry, & Lynch, 1987). In the present study, as participants' intelligence increased, their desire to avoid negative evaluation by the examiner decreased. As the Marlow-Crowne score increased, the absolute average time estimation error score significantly increased. Kaufman (1990) stated that anticipation of events, planning, sequential abilities, social causality, and temporal sequencing are a few of the historically measured abilities attributed to intelligence. This seems to be in agreement with the statement made in the opening paragraph of this thesis, that these measures of intelligence may also be regarded as our ability to conceptualize and/or exercise time.

Response set bias as measured by the Marlow-Crowne scale did not have a significant effect on Per-Mag scores in this study. This is likely because we used "normal" undergraduate college students who were simply completing a "College Experiences and Attitudes" questionnaire for extra credit. They may not have been aware that the PER-MAG was a measure for hypothetical psychosis-proneness because the items were embedded within distractor questions.

Merritt and Balogh (1986) stated that there was a false-positive problem with the Per-Mag. Actual psychotic participants were said to be only psychosis-prone according to Per-Mag scores. This does not appear to have been a problem in the current study because the DES scale correlated positively with PER-MAG scores. Furthermore, participants used were relatively "normal" college undergraduates.

Although the experimental group had a higher overall age than the control group (refer to Table 4), age did not appear to affect performance on the time estimation or production tasks. This supports the findings of Salthouse et al. (1979) that perceptual and motor speed differences associated with increasing age could not be attributed to a slower rate of internal time, even though a slower rate of internal time naturally occurs with increasing adult age. This also supports the Gallant et al. (1991) finding that the estimate of subjective time does not appear to be related to aging in adults. Furthermore, age did not significantly correlate with any other variable in the present study.

TEP error scores did not predict DES scores in phase-II (Hypothesis five). Therefore, time estimation nor time production appear to be reliable screening measures of dissociative experiences in sub-clinical populations. Also, it appears that time production is a similar process to time estimation in normal and sub-clinical populations. Time production appears to be an intact ability in sub-clinical (experimental) individuals who may be experiencing some symptoms.

Because time estimation and production error rates did not differ between the experimental and control groups in the present study, Meehl's (1990) concept of "hypokrisia" was not supported from a cognitive investigation of time perception within the present study. This does not mean that a specific neuronal genotype for schizotaxia, which is essentially the same thing as psychosis-proneness, does not exist. It just means that this study did not find the genotype to be related to time perception in a sub-clinical population.

In many of the previous studies, clinical populations were used and many of these participants were known to be or may have been on some psychotropic medications (Rammsayer, 1990). The effect of medications in previous studies may be confounding the results of the temporal discrimination, estimation, and production tasks in those various studies. Therefore, temporal distortion occurring in schizophrenic and other clinical populations may be a function of the medications they were taking at the time of the studies, and not due to some cognitive deficit. This study used subclinical participants and thus avoided this potential confound.

Future studies should include a general measure of memory functioning in order to determine the role of recall in time perception and psychopathology. It may be that individuals in the experimental group in this study have intact time perception abilities because there is no cognitive processing or memory deficit in these populations. It is possible, that time perception per se is not the problem in clinical populations used in the previous studies. It may be a memory storage or recall problem which effects their ability to perceive ongoing time accurately. This would be related to how Fraisse (1963) conceptualized Piaget's (1927) work, yet the present study did not attempt to account for this. Therefore, measuring an individual's ability to estimate or produce time fragments may not be tapping into an underlying memory deficit which may exist.

Looking at much longer intervals than those used in this study may yield significant correlations between time processing and dissociation or psychosis-proneness. It is possible that in sub-clinical populations, longer times than those used in previous studies using clinical populations need to be measured in order to get the same effect.

Piaget stated that "...operational time is constructed as soon as the order of successions is deduced from the colligation of durations and vice versa." (p. 472). Sequential ability was not measured in this study. Future studies should include a measure of sequential ability, such as the sequential ability sub-test (picture arrangement) of the Weschler Adult Intelligence Scale-Revised. It may be that although the ability to perceive, produce, or recall time is intact, distorted sequencing ability prohibits sub-clinical individuals falling within the experimental group of the present study from functioning as highly as the participants in the control group. Therefore, they may look worse on the DES and Per-Mag scales, yet similar on measures of time estimation and production.

Another possibility for the lack of significant differences between the two groups of the present study in their measurement of time may be related to the difference between quantitative time and qualitative time which Piaget (1927) described. He stated that quantitative time is similar to measurement with numbers, and that qualitative time is central to ego and object development. The time estimation and production tasks of the present study were probably only measuring quantitative time ability, which Piaget did not appear to be ascribing to overall psychological functioning. Therefore, future studies looking at the role of time in psychosis should investigate further into how to measure qualitative time and attempt to correlate it with measures of dissociation and psychosis-proneness.

In the present study, time tasks were performed in a computer lab in small groups. The lab was open and usually contained other college students doing computer work within visual and auditory range of the participants in the present study. Therefore, there may have been confounding external time cues available to the participants which enabled them to perform better on the time tasks. This would have the effect of eliminating any possible significant discrepancies between the groups, because all participants were able to perform equally well. Also, for the same reasons, participants may have performed equally poorly because they were distracted by noise or other cues. Future studies may consider having participants perform the TEP tasks individually in an isolated area, away from any external cues which may confound the results.

In summary, future studies should a) control for malingering on Per-Mag and DES scales for phase-II selection, b) include a measure of general memory and long-term memory, c) include a measure of sequential ability, d) incorporate intervals greater than 20 seconds on time estimation and production tasks, e) control for intelligence on time tasks, and f) control more for external cues and distractors during time tasks.

It appears that there is sparse data on focal brain sites with clinically diagnosed populations. Future studies may consider using Electroencephalogram (EEG) data to further investigate the role of hemispheric specialization in time perception and psychopathology. Epileptic patients about to undergo neurosurgical procedures to remove focal leison sites in the brain are routinely given EEG's in order to localize the leison site. Sometimes, depth probe EEG recordings are obtained in order to more precisely locate the leison site. These patients are considered "normal" in evoked potential studies looking at cognitive performance and EEG data. However, some of these patients may be experiencing sub-clinical levels of psychosis or dissociation. Because depth probe recordings are very rarely obtained on schizophrenic or other clinical populations of psychopathology, this would allow researchers a more precise measure of interhemispheric functioning in individuals who may later become psychotic. This may help to determine the role of the right hemisphere in psychosis. Also, researchers utilizing this population may be able to correlate measures of malingering with the Per-Mag to help identify symptoms which are unique to epileptics and symptoms which are shared with non-epileptic individuals experiencing psychotic symptoms.

APPENDIX A

TEP PROGRAM

In the estimation portion of the Time Estimation and Production (TEP) computer program, participants' estimations of the duration of a stimulus presented onto a computer screen in blocks of random time sequences ranging from 1 to 20 seconds was gathered. The estimations were compared to actual stimulus durations, and deviations of estimation to actual durations were calculated. The production part of the program asked participants to produce a random, specified duration of time ranging from 1 to 20 seconds. The program asked the participants to press a button to start, and then press again at the end of the duration which they were being asked to produce. Produced times were compared to the actual time duration which was produced, and deviations were calculated. Also, following the completion of the last task block, participants were asked to estimate the total time they had been doing TEP tasks since the first task block. Deviations were calculated for this estimation also. An ASCII output file was produced for each participant which contains actual, estimated, produced, and deviation times. This data file was downloaded into SPSS/PC for data analysis.

APPENDIX B

PTSD QUESTIONNAIRE

Subject # _____

A-1 "Have you ever experienced something that is both very uncommon and so horrible that would be very distressing to almost anyone - such as substantial military combat, rape, seeing someone killed, etc.?"

Y or N __________

If "**yes**", what was it? ____

____

____

____

A-2 Interviewee says "**no**." Then ask, "What was the most horrible or frightening thing that you have experienced?"

____

____

____

____

APPENDIX C

DEMOGRAPHIC QUESTIONNAIRE

Subject # ________

Please answer the following questions (2 pages). All informationwill be kepy strictly **confidential.** Please do not write your name on this form.

1. Age: ________

2. Height: ________

3. Handedness: (please check one) right _____ left _____

4. Mother's Ethnic origin: ______________________________

5. Father's Ethnic origin: ______________________________

6. Your Ethnicity: ______________________________

7. Have you ever taken medication for psychological reasons? (Y or N) ______

If "yes", please list all medications and your diagnosis: ______________________________

____

____

8. Are you; currently taking any other medications? (Y or N) _____

If "yes", please list: ______________________________

____

9. Have you ever been hospitalized? (Y or N) ________

If "yes": a) reason: ______________________________

b) length of stay (in days): ______________

c) when released (month/year): ______________

10. Please list any physical disabilities: ______________

____

____

APPENDIX D

POST HOC CORRELATIONS

Within all Phase-II Subjects Exploratory Correlation ($p < .01$):

- Average Absolute Estimation Error with Average Absolute Production Error, r = .5052.
- Average Absolute Estimation Error with Marlow-Crowne score, r = .3843.
- PAS with MIS, r = .7105.
- PAS with DES, r = .4874.
- PAS with group type[1], r = .8683.
- MIS with DES, r = .4553.
- MIS with group type[1], r = .8115.
- MIS with Malingering[2], r = .3363.
- DES with Malingering[2], r = .3442.
- DES with Past Trauma[2], r = .3948.
- DES with group type[1], r = .4373.
- Marlow-Crowne with Shipley IQ score, r = -.3574.

Within Experimental Group Only ($p < .01$):

- Average Absolute Estimation Error with Average Absolute Production Error, r = .4996.
- Average Absolute Estimation Error with Marlow-Crowne score, r = .4530.
- Average Absolute Production Error with Sex, r = .3567.
- PAS with Sex[3], r = .3244.
- MIS with Age, r = -.5110.
- DES with Past Trauma[2], r = .4285.

Footnotes:

[1]. Control Group = 0, Experimental Group = 1.
[2]. No = 0, Yes = 1.
[3]. Female = 0, Male = 1.

- Marlow-Crowne score with Malingering[2], *r* = -.4385.

- Shipley IQ score with Malingering[2], *r* = .4756.

Within Control Group Only:

- Average Absolute Estimation Error with Average Absolute Production Error, *r* = .5821.

- PAS with Sex[3], *r* = .6581.

- PAS with Height, *r* = .5640.

- DES with Age, *r* = -4716.

Footnotes:

[1]. Control Group = 0, Experimental Group = 1.
[2]. No = 0, Yes = 1.
[3]. Female = 0, Male = 1.

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