NOTICE

The quality of this microform is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us an inferior photocopy.

Reproduction in full or in part of this microform is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30, and subsequent amendments.

AVIS

La qualité de cette microforme dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de qualité inférieure.

La reproduction, même partielle, de cette microforme est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30, et ses amendements subséquents.

Attentional Performance in Young Adults Considered at Risk for Schizophrenia

Hélène Lamoureux

A Thesis

in

The Department

of

Psychology

Presented in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy at
Concordia University
Montréal, Québec, Canada

February 1992

ISBN 0 315 73634-8

ABSTRACT

Attentional Performance in Young Adults Considered at Risk for Schizophrenia

Hélène Lamoureux, Ph.D.
Concordia University, 1992

Disordered attention is a central characteristic of the schizophrenic syndrome. Investigators have sought to determine whether this feature is a marker of vulnerability to schizophrenia or whether it represents an episodic marker. The evidence to date is consistent with the conceptualization of attentional deficit as an indicator of vulnerability. The majority of studies which support this notion have defined risk status using a genetic criterion. The central purpose of this study was to extend the work of high-risk researchers by assessing attentional efficiency in a sample defined on the basis of deviant patterns of behavior during childhood. The Continuous Performance Task (CPT), a measure of vigilance, was used to examine attentional performance in young adults who had been peer-identified fifteen years earlier as aggressive, withdrawn, aggressive and withdrawn, or socially normative. It was predicted that the aggressive-withdrawn group, considered at risk for schizophrenia, would show a deficit relative to normative controls. In the second part of the study, the sample was reclassified on the basis of personality features closely related to those which characterize full-blown positive and negative schizophrenic symptoms. Two factor structures were used which represented precursors of each type of symptomatology. On the basis of empirical evidence demonstrating an association between (1) positive symptoms and distractibility and

(2) negative symptoms and slow processing, in already diagnosed schizophrenic individuals, it was predicted that a similar relationship would be found at the symptom precursor level. The results provided partial support for the hypothesis that attentional deviance is a vulnerability marker for schizophrenia. That is, when attentional performance on the CPT required verbal processing, only the aggressive-withdrawn group performed more poorly than normative controls. However, for spatial processing of stimuli, the deficit characterized both the aggressive-withdrawn and aggressive groups. The predicted associations between precursors of positive symptoms and distractibility, and between precursors of negative symptoms and slow processing, were not supported by the data. The negative findings are discussed in relation to measurement issues and the developmental course of specific attentional problems.

ACKNOWLEDGEMENTS

I wish to express my gratitude to all those who have supported me in their own very special ways throughout the process of writing my thesis. I am indebted to Dr. Alex Schwartzman, my supervisor, who has taught me a great deal about research over the years. His unique way of thinking about schizophrenia and his impressive knowledge of the field were fundamental to the development and completion of this project. The support with which he provided me both financially and technically was considerable and much appreciated. I also thank my committee members, Dr. Bukowski and Dr. Conway, whose intelligent criticisms have helped me to improve the quality of my work. I am very grateful to Cloée Tessier, my research assistant, for her professional attitude in the delicate task of interacting with subjects and for her sincere concern regarding all of her responsibilities. I would also like to express my appreciation to Claude Senneville and Linda Prenoveau of the High-Risk project, who have kindly made themselves available in so many ways, and who always came up with a solution to my seemingly insolvable problems. I owe very special thanks to Jacky Boivin, my statistics consultant, who has guided me in a most conscientious manner during the phase of data analysis. Her genuine interest in my work and her devotion to teaching led me to discover a previously unsuspected fact: statistics can be a whole lot of fun. My gratitude also extends to Lauraine Gagnon, my secretary, for her patience and excellent work in typing endless copies of this manuscript. Her commitment went beyond that of typing, for she has taken intelligent initiative in improving each version. She has made herself truly available whenever I needed

her. The emotional support I received from two very special persons in my life, Gloria Smith and Dr. Gaby Weiss, has been extremely precious to me. Above all, I want to thank my husband, Donald Sproule, who always believed in me in spite of his occasional worry that our baby daughter Catherine would graduate before her mother did. The joy of sharing my life with them has been the most important motivator in bringing this project to an end. I want to dedicate this thesis to my dear father whose life was so tragically interrupted during the course of this work. His soul remains within me and gives me the determination to become who I want to be.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES (Continued)

Page

LIST OF APPENDICES

The amazing complexity of schizophrenia as a mental disorder has fascinated researchers and has led to the elaboration of increasingly sophisticated explanatory theories over the last century. The definition of the illness alone has required considerable effort due to the heterogeneity of its clinical manifestations. The consensus achieved at the present time among investigators singles out the following characteristics as the essential features of schizophrenia: profound disturbances in the content (e.g., delusions) and form of thought (e.g., incoherence), perception (e.g., hallucinations), affect (e.g., blunting, inappropriateness), sense of self, volition, relationship to the external world (e.g., extreme withdrawal), and psychomotor behavior (e.g., mannerisms, catatonia). Typically, there is a deterioration from a previous level of functioning in the areas of work, social relations and self-care. The onset of schizophrenia usually occurs in early adulthood (American Psychiatric Association, 1987).

Etiological models of schizophrenia can be divided along two lines. On the one hand, biological models emphasize genetic, biochemical and neurophysiological factors. On the other hand, environmental models focus on the role of experience in the development and behavior of the individual. The earliest theories on schizophrenia implicated the construct of attention in the development of schizophrenic symptoms (Bleuler, 1911; Kraepelin, 1913). On a phenomenological level, reports of patients' subjective experience clearly demonstrate their difficulties in attending to the world in a normal fashion (Chapman & McGhie, 1962;

Freedman & Madison, 1974; McGhie & Chapman, 1961; McGrath, 1984). In a classic publication by Chapman (1966), reported introspections of schizophrenic patients indicate that their sensory apparatus is often "flooded" with stimulation. Too many ideas, sounds, and images invade the patient's mind at once, leading to an inability to organize a train of thought. The opposite is also reported whereby patients describe having no thoughts, as if their head were an empty vessel. Both hypoattention and hyperattention appear to be characteristic of schizophrenia. In some cases, both disturbances are present within the same individual, while in other cases, patients manifest only one of the two extremes.

The subjective experience of disturbed attention reported by schizophrenic individuals has been repeatedly reflected in their performance in experimental studies on attention. A consistent finding across studies using a variety of paradigms is that, when compared to normals, schizophrenics show a deficit in attentional performance. Although attentional problems affect other types of psychiatric patients, there is evidence to suggest that, at least for some aspects of attention, the deficit is specific to schizophrenia (Walker, 1981).

In recent years, an important question which has been addressed by researchers in the field of schizophrenia is whether any of the deficits observed in clinical samples are the consequences of the pathological state per se (e.g., medication, institutionalization), or whether they are present prior to the development of the disorder. The latter would suggest that these deficits may be viewed as important

markers. However, in order for any deficit to be viewed as a vulnerability marker for schizophrenia, it must meet more than the early onset criterion. It must also be shown to differentiate pre-schizophrenic individuals, not only from normal people but from individuals considered at risk for other types of mental disorders. Without the inclusion of such psychiatric controls (e.g., individuals at risk for affective disorders) in research studies, it is not possible to determine whether the deficit is a vulnerability marker specific to schizophrenia, or whether it is a general marker of psychopathology. If our true aim lies in the prevention of this terrible illness, we must focus our energy on acquiring an understanding of the developmental course of the disorder. By implication, we must study individuals who are likely to develop this particular form of pathology prior to its actual onset. Otherwise, it is not possible to disentangle the secondary effects of the illness from its antecedent causes. High-risk research strategies allow us to differentiate between those factors which are the result of the schizophrenic condition from those which potentially lead to its onset.

The present study was designed to assess whether some of the attentional deficits which have been observed in individuals already diagnosed as schizophrenic would also be present in a population considered at risk for the disorder. The selection of the specific attentional parameters to be examined was based on a review of the literature dealing with both schizophrenic patients and individuals hypothetically at risk for schizophrenia.

Three variables in research on information-processing in the adult schizophrenic population have produced sufficiently reliable results to warrant their exploration in a population at risk. These variables are reaction time, selective attention, and sustained attention. The following is a review of recent findings for each of these constructs. The first group of findings pertains to already diagnosed schizophrenics and the second group, to individuals hypothetically at risk for the disorder. Emphasis is placed on studies which include appropriate psychiatric controls, so that the specificity issue can be clearly assessed.

Schizophrenic patients

a) Reaction time

Simple reaction time (RT) paradigms involve asking subjects to press a button as quickly as possible in response to a suprathreshold auditory or visual stimulus appearing in a series of trials. The preparatory interval, that is, the length of time between stimuli, is varied and may be regular or irregular. Literature reviews of RT studies indicate that overall slowing of simple RT is typical of schizophrenics when compared to normal controls (Nuechterlein, 1977; Mannuzza, 1980). However, slowing of simple RT also characterizes other diagnostic groups such as brain-injured patients (Olbrich, 1972) and individuals with affective disorders (Bruder, Yozawitz, Berenhaus, & Sutton, 1980; Rosofsky, Levin, & Holzman, 1982). Hence, it appears that a deficiency in speed of processing, as it is assessed in the context of RT paradigms, cannot be viewed as specific to schizophrenia.

A well documented finding in the literature is the specificity of the crossover pattern to schizophrenics. The RT crossover pattern refers to the fact that these patients perform worse when the preparatory interval is regular, and better when the interval is irregular. This effect is particularly robust as the interstimulus interval lengthens (Bellissimo & Steffy, 1972). It seems as though schizophrenics are unable to take advantage of the regularity and in fact, perform more poorly under such circumstances. Crossover is absent in normal controls and, if present in non-schizophrenic patients, the effect is much weaker (Greiffenstein, Milberg, Lewis, & Rosenbaum, 1981; Strauss, Wagman, & Quaid, 1983). In summary, RT studies indicate that slow processing is typical of several types of psychiatric patients but that the crossover pattern is more specifically related to schizophrenia.

b) Selective attention

Selective attention refers to the process which operates when multiple stimuli are presented simultaneously. More specifically, it refers to the individual's capacity to separate irrelevant from relevant stimuli such that the former are ignored and the latter are attended to. Distractibility, or the difficulty in maintaining heightened awareness of only a limited range of stimuli, reflects a difficulty in selective attention. Paradigms used to study selective attention capacity typically involv . asking subjects to focus their attention on one type of stimulus (e.g., a male voice) or on one stimulus location (e.g., the right ear) and to ignore the irrelevant distractors (e.g., a female voice or stimuli to the left ear). The

degree of distractibility, as measured by the decrease in performance under distraction conditions relative to no-distraction conditions, can be taken as an index of selective attention capacity.

In dichotic listening studies, subjects are asked to attend to a message delivered in one channel (e.g., the right ear) and to ignore material coming from the other channel. They are asked to "shadow" or repeat the attended message as it is presented. Two indices of distractibility can be derived from this procedure. First, the extent to which stimuli from the unattended channel are reported during shadowing yields an intrusion error score. Second, the extent to which stimuli from the monitored ear are omitted by the subject yields an omission error score.

Studies which administer dichotic listening tasks to schizophrenic individuals and to appropriate psychiatric and normal control groups typically find that schizophrenics are more distractible than comparison groups, and that errors of omission rather than intrusion characterize their lower performance (Hemsley & Richardson, 1980; Korboot & Damiani, 1976; Payne, Hochberg, & Hawks, 1970; Rappaport, 1967; Schneider, 1976; Spring, Lemon, Weinstein, & Haskell, 1989; Wishner & Wahl, 1974). Pogue-Geile and Oltmanns (1980) however, failed to find increased distractibility in schizophrenic patients. Oltmanns (1978) noted that, relative to controls, greater distractibility characterized both schizophrenic and manic patients in a digit and word-span task. These latter results contradict the findings reported above which suggest a specific vulnerability to distraction in

schizophrenics relative to psychiatric controls. Differences in sample selection may account for this apparent contradiction: Oltmanns (1978) used manic patients as a psychiatric control group while researchers who found a specificity effect have used depressed patients or individuals with personality disorders.

Overall, the bulk of the research suggests that a selective attention deficit characterizes schizophrenics. The particular nature of the errors observed, namely omission errors, is taken as evidence that the deficit lies in the difficulty in ignoring irrelevant material rather than in an inability to distinguish relevant from irrelevant stimuli. If the latter were the case, intrusion errors would be noted.

c) Sustained attention

The Continuous Performance Test (CPT) was developed by Rosvold, Mirsky, Sarason, Bransome, and Beck (1956) to study attentional performance in brain-injured patients. Later, it was used widely in schizophrenia research concerned with the process of vigilance or sustained attention. The original version of the task required the subject to attend to the rapid presentation of a long series of visual stimuli and to press a button whenever the target stimulus "X" appeared among continuously presented non-target letters. Wohlberg and Kornetsky (1973) introduced a new version which required responding to the "X" target whenever it was preceded by the letter A (A-X). In spite of their relative simplicity, these tasks have proven sensitive enough to detect deficits in some samples of schizophrenic patients (Asarnow & MacCrimmon, 1978; Orzack & Kornetsky, 1966; Pass,

Klorman, Salzman, Klein, & Kaskey, 1980; Wohlberg & Kornetsky, 1973). Findings are inconsistent however, as other researchers failed to find group differences on equally simple versions of the CPT (Erickson, Yellin, Hopwood, Realmuto, & Greenberg, 1984; Wagner, Kurtz, & Engel, 1989). Interestingly, Walker (1981) found that the performance of schizophrenic individuals on the CPT was inferior to that of schizo-affective and affective disordered patients only when a distractor was introduced in the AX version, presumably making the task more difficult. Her results suggest that, at least under complex conditions, a vigilance deficit may be more characteristic of schizophrenic disorders than of psychopathology in general. More studies using appropriate psychiatric control groups are needed to clarify the specificity issue in the domain of sustained attention.

To summarize, the majority of research studies conducted with adult schizophrenics indicate that all three aspects of attention, reaction time, selective attention, and sustained attention are deficient in this patient population relative to normal individuals. While slow processing characterizes individuals with various types of psychopathology, the research literature suggests that the crossover effect as well as selective and sustained attention deficits may be more specific to schizophrenic illness per se. With respect to vigilance or sustained attention, this is particularly true when the processing demands are increased.

In order to determine whether the attentional disturbances observed in the already diagnosed schizophrenic population constitute a consequence of their illness

or whether these disturbances can be viewed as vulnerability markers, researchers have explored the parameters reviewed above in populations considered at high-risk for schizophrenia. The following is a review of findings in the field of attention for individuals at risk.

High-risk methods

Several approaches have been taken in high-risk research on schizophrenia. One major division among studies pertains to the time at which data are collected. Retrospective studies are based mainly on information derived from childhood records of adults schizophrenics, or on recall of memories by patients and their families. The potential for distortion of information in these studies (Garmezy & Streitman, 1974) led researchers to use prospective methods. The most widely used strategy for subject selection in prospective research consists in following children who are at genetic risk, that is, children who have one or both biological parents diagnosed as schizophrenic. Epidemiological studies have shown that such children have a higher lifetime risk of becoming affected, compared to the general population risk of about one per cent. Being born in a family with one schizophrenic parent yields a morbidity risk of 10 to 16%; the risk to offspring with two affected parents ranges from 35 to 50% (Bleuler, 1978; Gottesman & Shields, 1982; Hanson, Gottesman & Meehl, 1977). Healthy first-degree relatives of schizophrenic patients have also been used in risk studies because they have a genetic background similar to that of the affected individual.

While the frequency of occurrence of the illness is much greater in the offspring of affected parents than in the general population, only 10 to 15% of individuals diagnosed as schizophrenic have a parent who is similarly affected (Rosenthal, 1970). Hence, the findings obtained in studies using children of schizophrenics may not be relevant to schizophrenics whose parents are not affected by the illness. In fact, there is evidence that these two groups differ in important ways: schizophrenics with a family history are more chronically ill and present primarily non-paranoid symptomatology (Kety, Rosenthal, Wender, Schulsinger & Jacobsen, 1978; Tsuang & Winokur, 1974). Consequently, the use of the genetic criterion may not provide us with a comprehensive picture of the antecedents of schizophrenia.

An alternative approach to the selection of children at risk consists in identifying deviant patterns of behavior. Aggression and social withdrawal are two fundamental patterns which have emerged repeatedly from studies of deviant behavior in children (Achenbach & Edelbrock, 1978; Quay, 1979; 1986) and are recognized as major categories of childhood psychiatric disorder (Achenbach & Edelbrock, 1984; American Psychiatric Association, 1987). Both patterns are found consistently throughout the retrospective literature dealing with childhood characteristics of young adults with a diagnosis of schizophrenia (Bower, Shellhammer & Daily, 1960; Watt, Stolorow, Lubensky & McClelland, 1970). Moreover, two studies have shown that having a mixed aggressive and withdrawn

behavior pattern in combination increases the probability of later schizophrenia more than having either type of behavior alone (Michael, Morris & Soroker, 1957; Robins, 1966). The aggression-withdrawal combination as a sampling strategy represents a potentially useful alternative which overcomes the limitations of the genetic risk criterion discussed earlier.

A third approach to sample selection in high-risk research involves the identification of individuals on the basis of personality traits postulated to predispose toward schizophrenia. Two such traits are anhedonia and perceptual aberration (L.J. Chapman, J.P. Chapman, & Raulin, 1976; 1978). Anhedonia is defined as a lifelong characterological inability to experience pleasure. Numerous examples in the clinical literature point to the frequent loss of drive, blunted affect, and social withdrawal in hospitalized schizophrenic patients (Bleuler, 1911; Kraepelin, 1919). Perceptual aberration refers to deviant perceptions, feelings, and beliefs about one's own body, and is also a well-documented feature of the schizophrenic experience (Arieti, 1974; Blatt & Wild, 1976). L.J. Chapman, Edell, and J.P. Chapman (1980) showed that individuals who score deviantly on the anhedonia and perceptual aberration scales also manifest other symptoms of schizophrenia such as hallucinations and delusions. More recently, Claridge and Broks (1984) developed a scale to measure what they refer to as the "schizotypal personality trait". This scale correlates with Chapman's perceptual aberration scale (Muntaner, Garcia-Sevilla, Fernandez, & Torrubia, 1988) and is viewed as a potentially useful tool to

identify individuals at risk for schizophrenia.

In summary, three main types criteria have been used in an attempt to identify individuals at risk for schizophrenic breakdown. The genetic criterion is valid but imposes restrictions on the generalizability of findings. Deviant behavioral patterns such as the co-occurrence of aggression and withdrawal within the same individual, and abnormal personality traits such as anhedonia, perceptual aberration and schizotypy offer a promising alternative to the genetic criterion. However, the vast majority of high-risk studies on attention to date have used samples of children of schizophrenic parents and few of these studies have included appropriate comparison groups. As mentioned in the previous section concerning already diagnosed schizophrenics, the inclusion of non-schizophrenic psychiatric patients enhances the quality of studies since it allows one to determine whether any observed deficits are specific to schizophrenia. The issue of specificity is equally critical in high-risk research when evaluating the hypothesis that attentional deviance plays a specific precursive role in the development of schizophrenia. In studies using the genetic criterion, children of non-schizophrenic, psychiatrically ill parents should be included in order to clarify the specificity issue. Unfortunately, few studies to date have taken this important point into consideration. The following is a review of studies of attention in individuals at risk for schizophrenia.

a) Reaction time

As reviewed above, the results of studies conducted with adult schizophrenics

show that RT is frequently slower in these patients, although this finding is not restricted to schizophrenic populations. RT studies in samples of high-risk children yield mixed results. A study by Marcus (1972) showed that children of schizophrenic mothers display slow simple RTs. However, negative findings were obtained with adopted-away offspring of schizophrenics (Asarnow, MacCrimmon, Cleghorn & Steffy, 1978; Van Dyke, Rosenthal, & Rasmussen, 1975) as well as with children living with their ill parents (Erlenmeyer-Kimling & Cornblatt, 1978; Rutschmann, Cornblatt, & Erlenmeyer-Kimling, 1977). First degree relatives of schizophrenic patients have been found to show the RT crossover pattern on reaction time tasks when compared to non-relative controls (DeAmicis & Cromwell, 1979). Healthy siblings of adult schizophrenics showed significantly slower overall RT responses (Wood & Cook, 1979) but Spring (1980) was unable to replicate these results. Finally, the RT crossover pattern has also been observed in a sample of subjects selected on the basis of schizotypic features, that is, anhedonia and perceptual aberration (Simons, MacMillan, & Ireland, 1982).

In summary, the results of RT studies in populations considered at risk for schizophrenia are inconsistent. The wide variety of paradigms used as well as the variability in criteria for sample selection contribute to the confusion. Standard procedures and direct comparisons of different types of samples are required to clarify whether a deficit in speed of processing, as measured by RT, can be considered a valid and reliable marker for schizophrenic disorder.

b) Selective attention

There is some evidence from a few dichotic listening studies that a deficit in selective attention may be a marker of vulnerability to schizophrenia. When children of schizophrenic mothers were asked to report random digits presented binaurally, but to ignore digits presented only to one ear, they showed a marginally significant tendency to make more errors relative to children of nonpsychiatric parents, especially under the more difficult conditions of the task (i.e. when there were a high number of irrelevant voices) (Asarnow, Steffy, MacCrimmon, & Cleghhorn, 1978). First degree relatives of schizophrenic patients have also been found to make more errors in a shadowing task involving word strings presented to each ear (Spring, Levitt, Briggs, & Benet (1983), in Nuechterlein and Dawson (1984)).

In a combined auditory-visual selective attention task, Cornblatt and Erlenmeyer-Kimling (1984) asked subjects to point to one of four pictures which corresponded to a word dictated by a tape-recording under auditory distraction conditions. The results showed that at-risk adolescents of schizophrenic parents performed more poorly than normal controls under distraction. Negative findings in the area of selective attention are usually obtained when the task selected is too simple to detect potentially subtle differences (i.e. Grunebaum, Weiss, Gallant, & Cohler, 1974; Orvaschel, Mednick, Schulsinger, & Rock, 1979).

c) Sustained attention

When children of schizophrenic parents are compared to offspring of normal controls on simple versions of the Continuous Performance Task (CPT), a consistent finding is that such easy vigilance tasks do not differentiate the groups. Investigators using clearly focused target stimuli such as one digit in a random sequence of single digits, or one target letter preceded by another pre-defined one, were unable to show a vigilance deficit in high-risk children when compared to children of normal controls (Asarnow et al., 1977; Cohler, Grunebaum, Weiss, Gamer & Gallant, 1977; Cornblatt & Erlenmeyer-Kimling, 1984; Herman, Mirsky, Ricks, & Gallant, 1977; Nuechterlein, 1983).

In contrast to the above studies, those using more complex versions of the CPT have consistently yielded significant group differences. For example, Rutschmann et al. (1977) developed the "playing card" CPT which increases task difficulty by substituting images of playing cards for the traditional letter stimuli, and also by defining the target sequence differently (i.e. from a fixed "A-X" type of sequence to any sequence in which two identical stimuli are presented consecutively). Studies which have used the playing-card version have found it effective in differentiating children of schizophrenic parents from children of psychiatric and normal controls (Cornblatt & Erlenmeyer-Kimling, 1985; Erlenmeyer-Kimling & Cornblatt, 1978; Nuechterlein, 1983; Rutschmann et al., 1977). Presumably, it is the greater cognitive load of the playing-card version

which leads to inferior performance in high-risk children.

The complexity of the CPT task has also been increased by adding to the load of perceptual rather than cognitive processing. Nuechterlein (1983) degraded the stimuli of the CPT by blurring them on the screen and by superimposing visual noise (in the form of plus signs) over the target numbers; this gives the impression that the target is surrounded by multiple stars. The use of these two modifications, which are referred to as visual distractors, was effective in differentiating high-risk from normal comparison children.

Other types of high-risk groups have also been studied using complex versions of sustained attention tests. Siblings of schizophrenic patients have shown inferior performance, relative to normal controls, on a difficult auditory vigilance task (Wood & Cook, 1979). Individuals considered at risk for schizophrenia on the basis of schizotypal characteristics have also been found to perform less well on the CPT than subjects who do not show these presumed pre-schizophrenic features (Nuechterlein & Dawson, 1984)

To summarize, the literature on attention in populations at risk for schizophrenia indicates that selective and sustained attention are deficient in individuals at risk as compared to normal and psychiatric controls. These deficits are detectable under the complex conditions of the tasks administered, suggesting a limitation in high-risk subjects' capacity for high levels of effortful processing.

The relationship of attentional deficits to symptomatology

Although attentional deficits have been repeatedly observed in both high-risk and schizophrenic samples, the complexity of the construct of attention, and the heterogenous nature of schizophrenia, have led to seemingly contradictory findings. For example, some studies have demonstrated that not all, but only a subsample of patients are deficient on attentional measures when compared to controls (Asarnow & MacCrimmon, 1981; Chapman, 1979; Kornetsy & Orzack, 1978; Orzack & Kornetsky, 1966). Other studies have shown that high-risk children are deficient on some, but not all measures of attention. The absence of attentional deficits in some schizophrenic patients as well as the lack of correlation among measures of attention indicate that a more fine-grained analysis of both the construct of attention, and that of schizophrenia is needed if we are to obtain a more coherent picture of their true relationship. In other words, we must ask "What type of patients or high-risk individuals are deficient on what aspects of attentional tasks?". Such an empirical orientation has been adopted recently by researchers and has yielded interesting preliminary results. Individual differences in symptomatology in schizophrenic samples were associated with differences in the type of attentional deficit experienced. For example, a disturbance in selective attention was found to occur in patients with hallucinations and delusions (e.g., Green & Walker, 1986a) while a deficit in speed of processing characterized the chronic types of schizophrenics who have a less florid symptom picture. Before describing further the nature of these

relationships, a brief discussion of the symptom classification commonly employed in schizophrenia research is called for.

Positive and negative symptoms

In the last decade, the distinction between positive and negative symptoms has been the most frequently used subtyping scheme in schizophrenia research (Andreasen, 1985; Andreasen & Olsen, 1982; Berrios, 1985; Crow, 1985; Lewine, Fogg, & Meltzer, 1983). Positive symptoms refer to impairment in cognitive functioning. They include hallucinations, delusions, and thought disorder. Negative symptoms consist of poverty of speech, affective flattening, apathy, and social withdrawal. Here, the functioning at the affective and motivational level is disturbed (Crow, 1980). Although the terminology of "positive" and "negative" implies an opposition between the two symptom clusters, they are not mutually exclusive. On the contrary, positive and negative symptoms may co-occur in the same patient and may fluctuate independently of one another (Pogue-Geile & Harrow, 1984; 1985). Positive symptomatology has been shown to occur more frequently in patients with good rather than poor premorbid adjustment (Crow, 1985). The opposite pattern is true of patients with a predominant negative symptom picture.

The important point here is that each type of symptom is thought to reflect a specific pathological process, and hence a different etiology. Crow (1980) has proposed that a neurochemical disturbance of the dopaminergic system may be

responsible for the development of positive symptomatology, whereas a structural defect would account for the appearance of negative symptoms. While a detailed review of Crow's hypothesis is beyond the scope of this thesis, suffice it to say that the proposed model has been considered useful in schizophrenia research because it attempts to unite phenomenology, cognition, pharmacology, and pathology into a single comprehensive hypothesis (Andreasen, 1985). The relevance of the positive-negative subtyping scheme to the domain of attention is discussed in the following section.

Experimental studies using the positive-negative scheme

The positive-negative classification scheme has proven meaningful in delineating specific attentional correlates which may be relevant to our understanding of the etiology of the disorder. Two aspects of attention have been explored in relation to symptomatology: speed of processing and distractibility. Researchers have used the backward masking paradigm to study speed of processing in schizophrenics. This paradigm involves the tachistoscopic presentation of a target stimulus (e.g., single letter) followed by a powerful, noninformational masking stimulus (e.g., a series of X's). The interval between the target and the mask is varied. The mask is thought to prevent the target stimulus from reaching awareness by limiting the duration or the quality of information in iconic memory (Braff, 1981; Spencer & Shuntich, 1970). In other words, when presented too rapidly, the mask does not permit the first stimulus to be transferred from iconic

storage to conscious registration in short-term memory for processing. By determining the interstimulus interval necessary for correct identification of the target letter, it becomes possible to estimate an individual's rate of information transfer from iconic storage to the more permanent short-term memory. This rate of transfer is taken as an index of the person's speed of processing. Studies which have used the backward masking paradigm in schizophrenic samples have repeatedly found evidence for a positive relationship between negative symptomatology and slow processing speed (Braff, 1981, Green & Walker, 1984, 1986b; Knight, Elliot, & Freedman, 1985; Knight, Youard, & Wooles, 1985; Saccuzzo & Braff, 1981).

Studies of selective attention using the dichotic listening paradigm suggest a specific relationship between positive symptomatology and distractibility in schizophrenic patients (Hemsley & Zawada, 1976; Payne et al., 1970; Schneider, 1976). Studies using the digit-span task also indicate an association between distractibility and positive symptoms (Green & Walker, 1986a; Oltmanns, Ohayon, & Neale, 1978). Using the Information Overload Task, Cornblatt, Lenzenweger, Dworkin and Erlenmeyer-Kimling (1985) have also found that a selective attention deficit characterized positive symptom schizophrenic individuals. The uniformity of these findings is particularly impressive when we consider that the criteria selected by researchers to rate the degree of positive and negative symptomatology vary considerably between studies. The more recent experiments (e.g., Green &

Walker, 1986b) have used standardized scales. On the other hand, several studies conducted prior to the development of this subtyping scheme (e.g., Hemsley & Zawada, 1976; Payne et al., 1970) relied on other forms of classification such as poor versus good premorbid adjustment. In spite of these different criteria, the consistent picture which emerges from these studies is that differences in the phenomenology of schizophrenia are reflected in the types of attentional difficulties manifested by patients.

Comparable information concerning the attentional correlates of the precursors of positive and negative symptoms among high-risk individuals is still rare. Our current knowledge of attention deficits in preschizophrenic samples is almost exclusively limited to studies demonstrating a global relationship between attentional capacity and high-risk status without further differentiation of risk in terms of behavioral or personality precursors. The next section will concern how our knowledge of specific associations between attentional deficits and schizophrenic symptoms could be applied to a population at risk.

Precursors of schizophrenic symptomatology

The very nature of high-risk research makes it impossible to explore the relationship of symptomatology to various deficits, since the essence of this methodology is to study individuals in their pre-symptomatic state. What is possible however is to classify preschizophrenic personality features used in risk research according to their resemblance to full-blown positive or negative

symptoms. In other words, it could be fruitful to use the positive-negative subtyping scheme as a model and to determine what the corresponding features would be at the pre-symptomatic level.

A close examination of the traits tapped by the Perceptual Aberration Scale (Chapman et al., 1978; see Appendix A) reveals their close association to the positive symptoms of hallucinations, delusions and thought disorders. A study by Chapman et al. (1980) provides empirical support for this relationship. They found that, when compared to controls, subjects who scored deviantly high on the Perceptual Aberration Scale were significantly more likely to have experienced auditory and visual hallucinations. These subjects also reported significantly more delusional episodes (e.g., ideas of reference, paranoid ideation) and thought disorders (e.g., mixed up speech, deviant vocalization, odd communication) than controls.

The Schizotypal Personality Trait questionnaire (Claridge & Broks, 1984) also consists of items which tap experiences analogous to positive symptoms, at a subclinical level (see Appendix A for item description). This scale correlates highly (r = .59) with the Perceptual Aberration scale, suggesting that the constructs identified by these two scales are similar to a certain degree. On the other hand, the fact that the correlation is not perfect suggests that each scale may also contribute in a unique way to the identification of precursors of positive symptoms.

With respect to potential precursors of full-blown negative symptoms, two

scales used to identify individuals at risk for schizophrenia are relevant here. They are the Physical and Social Anhedonia scales (Chapman et al., 1976). As will be recalled, the central features of negative symptomatology are poverty of speech, affective flattening, avolition, apathy, and social withdrawal (Andreasen, 1985). The essence of the anhedonic individual is his or her inability to derive pleasure from physical and social situations (See Appendix A for item description). The conceptual leap from anhedonia to negative symptoms is not difficult to make. It seems reasonable to assume that schizophrenic patients who suffer from extreme social isolation and an inability to experience affect would indeed show signs of anhedonia in the premorbid state. One would expect them to be deprived of friends, disconnected from pleasurable physical contact, and uninterested in social interactions.

To summarize, there is an apparent continuity between different types of preschizophrenic personality traits, as defined by high-risk researchers, and full-blown positive and negative symptoms of schizophrenia. Moreover, there is evidence that variations in these preschizophrenic traits are rooted in individual differences in normal personality features. Indeed, a recent factor analytic study shows that the three basic dimensions of personality (Neuroticism, Extraversion, Psychoticism), as outlined in Eysenck's model (Eysenck, 1967; H.J. Eysenk & S.B. Eysenck, 1976) bear specific relationships to different preschizophrenic traits (Muntaner et al., 1988). The study showed that Eysenck's Neuroticism scale is

positively related to the Schizotypal Personality Questionnaire, while the Extraversion scale is negatively related to both the Physical and Social Anhedonia scales. The third dimension of Eysenck's model, Psychoticism, correlates positively with both Anhedonia scales, as well as with the Perceptual Aberration and the Schizotypal Personality questionnaire. This study supports the notion elaborated by Zubin and his co-workers who argued that personality acts as a moderator variable which modifies the clinical expression of schizophrenic disorders (Zubin & Spring, 1977; Zubin, Magaziner & Steinhauser, 1983). The idea of a continuum between normal and abnormal personality traits and schizophrenic symptoms will be developed further in the present study in order to classify individuals in a meaningful manner, thereby permitting to explore whether the associations observed between symptoms and attentional deficits in schizophrenic patients have their parallel in a population at risk.

The present study

The sample used in the present study was drawn from the Concordia Longitudinal High-Risk project (Ledingham, 1981; Schwartzman, Ledingham & Serbin, 1985). The investigators of this study hypothesized that the co-occurrence of highly aggressive and withdrawn behaviors within an individual during childhood increases his or her chance to develop schizophrenia in adulthood As will be recalled, a review of studies of deviant behavior in children (Bower et al., 1960) indicated that aggression and withdrawal were the two fundamental factors

consistently emerging as being characteristic of preschizophrenics, and two studies in particular (Michael et al., 1957; Robins, 1966) have demonstrated that having both aggressive and withdrawn behavior components in combination increases the probability of later schizophrenia over that of having either type alone. The first question addressed here was whether individuals who were identified as aggressive and withdrawn during childhood by their peers would show attentional deficits relative to normative controls. Individuals identified as only aggressive, and another group, identified as only withdrawn, were included in order to determine whether the deficits observed, if any, were specifically related to the group hypothetically at risk for schizophrenia (i.e. Aggressive-Withdrawn) or whether they also characterized other types of deviant groups. In other words, individuals classified as only withdrawn and another group, as only aggressive, served as "deviant control" groups.

The second question addressed in this study was whether the specific associations observed in schizophrenic patients between speed of processing and negative symptoms on the one hand, and distractibility and positive symptoms on the other hand, would also manifest themselves in a preschizophrenic sample. In order to answer this question, the same sample was thus reclassified on the basis of personality features considered to be closely related to those which characterize full-blown negative and positive symptomatology. Through a principal component analysis of response to several relevant personality questionnaires, a factor structure

was obtained which represented precursors of negative and positive schizophrenic symptoms. This factor structure led to the formation of four groups: a group who was high on precursors of positive symptoms; a second group who was low on this dimension; a third group who was high on precursors of negative symptoms; and finally a fourth group who was low on this second dimension. The details concerning the development of these four groups is described in Appendix B.

To summarize, attentional performance was examined in a subsample of the cohort originally selected for the Concordia Longitudinal High-Risk project. All subjects for the present investigation were grouped according to two classification systems. The first classification reflected the behavioral characteristics of aggression and withdrawal during childhood, and led to the identification of four groups (Aggressive, Withdrawn, Aggressive-Withdrawn, and Normal Controls). The rationale for using a group design is based on the assumption that the combination of aggressive and withdrawn behaviors within the individual which places him or her at risk for schizophrenia, is a unique pattern representing more than the interactive effect of aggression and withdrawal, that is, the independent contribution of each behavioral factor alone. The second classification pertained to current personality features and also led to the formation of four groups, two of which represented high levels of preschizophrenic characteristics, and two other groups which represented low levels. All analyses were first conducted using the childhood behavioral classification, and were then repeated using the classification

on the basis of current personality features. Because of the potential influence of intelligence on attentional performance, the Vocabulary subtest of the Barbeau and Pinard (1963) Intelligence test was administered as an estimate of global intelligence to assess its contribution.

A modified version of the Continuous Performance Task (CPT) (Cornblatt, Risch, Faris, Friedman & Erlenmeyer-Kimling, 1989) was selected as the instrument to assess attentional performance. The rationale for selecting the CPT is that it has been a useful tool to detect attentional deficits in both schizophrenic patients and individuals at risk. The version modified by Cornblatt et al. (1989) was chosen because it contained subtests which allow comparisons between slow and fast rates of stimulus presentation, and between subtests with and without distraction. Both factors, speed and distraction, place higher processing demands on the subject and hence, were viewed as relevant parameters to answer the first question of this study. Moreover, since each factor has been associated with a specific type of symptom structure in patients already diagnosed as schizophrenic, these parameters were thought to be pertinent to the second question, i.e. whether parallel associations would be found in a preschizophrenic sample. The following predictions were tested:

Peer classification

Aggressive-Withdrawn subjects will perform more poorly than normal controls on the CPT. The deficit in performance will be more pronounced on subtests

requiring greater processing demands, that is, when the rate of stimulus presentation is high, and when distractors are included.

Symptom precursor classification

1. Subjects who score high on precursors of negative symptoms will perform more poorly on the fast version of the CPT than subjects who score low on this dimension.

2. Subjects who score high on precursors of positive symptoms will perform more poorly under distraction than subjects who score low on this dimension.

METHOD

Subjects

The sample consisted of 181 young adults between the ages of 18 and 27 years whose maternal language is French. These individuals were part of a large sample originally selected in 1977 to participate in the Concordia Longitudinal High Risk Project (Schwartzman et al., 1985). They were rated for aggression and withdrawal by classmates using a French translation of the Pupil Evaluation Inventory (PEI), a peer nomination instrument (Pekarik, Prinz, Liekert, Weintraub, & Neale, 1976). The PEI contains 35 items which load on three factors: aggression, withdrawal, and likability. Using this measure, the original sample was divided into four groups: Aggressive, Withdrawn, Aggressive-Withdrawn, and Normative Controls. The PEI was administered to children in the first, fourth and seventh grades. These students were asked to nominate those boys and girls in their class who best fitted the description of each of the 35 items on the questionnaire. Children could nominate up to four classmates of each sex. Boys and girls were rated in separate PEI administrations.

The total number of nominations received by each child was calculated separately for items loading on the aggression factor and for items loading on the withdrawal factor. Raw scores for each factor were transformed using a square root transformation to reduce skew. They were then converted to z scores for each sex within each class to remove the effects of age and sex on baseline rates of

aggression and withdrawal, and the effect of differences in class size on total scores.

Those subjects who obtained a z score on the aggression factor exceeding the 95th percentile and withdrawal z scores below the top quartile were designated as aggressive. Similarly, those assigned to the withdrawn group obtained z scores on the withdrawal factor exceeding the 95th percentile and aggression z scores below the top quartile. Those scoring in the top quartile on both aggression and withdrawal were assigned to the Aggressive-Withdrawn group. Nondeviant subjects were chosen from among those children below the 75th percentile and above the 25th percentile on both aggression and withdrawal (Ledingham, 1981). The rationale for excluding individuals who fell below the 25th percentile from the nondeviant group was that a very low score on aggression and withdrawal may be as unusual and peculiar as a very high score on these factors. Hence, in order to identify a group who was truly non-deviant, it was necessary to select subjects from the middle of the distribution.

In the present study, the number of subjects and the number of males and females in each of the four groups were approximately equal. The frequency distribution of the sample by grade and PEI classification is described in Table 1. Preliminary analyses were performed in order to assess whether the subgroup of subjects selected for this study was representative of the original sample on relevant parameters. It was found that the proportion of males and females did not differ

Table 1

Sample frequency distribution (and percentage of original sample) by Peer Classification Group, Grade and Sex

	Peer Classification Group			
	Aggressive	Withdrawn	Aggressive-Withdrawn	Controls
Sex = male				
Grade 1	6 (50)	5 (33)	10 (19)	7 (5)
Grade 4	6 (17)	8 (23)	7 (23)	11 (8)
Grade 7	9 (18)	10 (17)	5 (20)	10 (4)
Total	21 (22)	23 (21)	22 (20)	28 (5)
Sex = female				
Grade 1	5 (46)	5 (42)	8 (11)	7 (4)
Grade 4	8 (29)	5 (17)	11 (23)	9 (5)
Grade 7	8 (13)	9 (13)	2 (18)	10 (5)
Total	21 (21)	19 (17)	21 (16)	26 (5)

Total N = 181 (10.2)

from that of the original sample. The proportion of subjects in each peer class also reflected the original distribution except for the Control group whose size was intentionally reduced when this study was designed. In contrast to the design of the original project, where the number of Control subjects largely exceeded the number of deviant subjects for epidemiological purposes, the present study was designed to include an approximately equal number of subjects in all four groups. Table 2 presents scores on the aggression and social withdrawal factors for the original sample as well as for the sample used in the present study. While the ranges of scores are slightly less extreme in the present sample than in the original one, inspection of the means and standard deviations for each peer classification group indicates that the two samples are very similar. Thus, the present sample can be considered representative of the original population of the Concordia project on the aggression and withdrawal dimensions.

Measures

1. Vocabulary (Barbeau Pinard)

The vocabulary subtest of the Barbeau-Pinard Intelligence test (Barbeau & Pinard, 1963) was administered to all subjects. It consists of 40 words of increasing difficulty which the subject is required to define. A correct answer earns a score of one, so that the maximum possible score is 40. A split-half reliability coefficient of .93 is reported by the authors. The vocabulary scale score correlates .84 with the global I.Q. scale and .91 with the verbal scale.

Table 2

Representativeness of the Classification Groups with respect to Original Aggressiveness and Social Withdrawal Scores.

	Aggressive Group	Withdrawn Group	Agg-with Group	Control Group
Aggressiveness Scores				
	Mean SD Range	Mean SD Range	Mean SD Range	Mean SD Range
Current sample	2.17 .38 1 67 to 3 05	-.54 .46 -1.52 to .41	1.57 .51 .74 to 2.96	-.25 .31 -.66 to .61
Original sample	2.14 .38 1.65 to 3.57	-.61 .49 -1.75 to .67	1.60 .61 .68 to 3.59	-.13 .37 -.67 to .67
Social Withdrawal Scores				
	Aggressive Group	Withdrawn Group	Agg-with Group	Control Group
	Mean SD Range	Mean SD Range	Mean SD Range	Mean SD Range
Current sample	-.30 .60 -1.60 to .66	2.10 .27 1.69 to 2.69	1.46 .53 .74 to 2.64	.04 .34 -.57 to .66
Original sample	-.32 .55 -1.84 to .65	2.14 .36 1.65 to 3.81	1.42 .58 .68 to 3.28	-.10 .37 -.67 to .67

2. Eysenck Personality Questionnaire (EPQ)

The EPQ (H.J. Eysenck & S.B.G. Eysenck, 1975) was translated into French for the present study using the following procedure. Items were first translated by the author and then independently back-translated to English by a colleague. Items judged to be ambiguous were revised. The following three scales were administered: Extroversion (E) (21 items), Neuroticism (N) (23 items), and Psychoticism (P) (25 items). The first two scales, E and N, are essentially identical to those included in an earlier version of the EPQ, the Eysenck Personality Inventory (H.J. Eysenck & S.B.G. Eysenck, 1968). The third scale, P, was first introduced when the EPQ was published. The validity of the instrument is well established (H.J. Eysenck & S.B.G. Eysenck, 1968; 1975). Although the scales are not completely orthogonal, the correlations are low. Test retest reliability is satisfactory for all three scales, with values of .89, .86, and .78 for the E, N, and P scales respectively. Internal consistency is also satisfactory. The authors report alpha coefficients of .85 (E), .84 (N), and .71 (P) for a group of normal males and females. Similar figures were obtained with a group of prisoners (H.J. Eysenck & S.B.G. Eysenck, 1975). In the present study, the alpha coefficients were found to be .79, .87, and .60 for the E, N. and P scales respectively. Each item requires a yes or a no answer and each scale is scored such that the higher the score, the more the subject corresponds to the factor measured by each scale (see Appendix A for the French version of the EPQ scales).

3. Schizotypal Personality Questionnaire (STQ)

A French translation of the STQ (Claridge & Broks, 1984) was done by the author, using the procedure described above for the EPQ translation. The questionnaire contains 37 items which are symptom-based and are designed to tap those characteristics which predispose the individual to psychotic disorders. Psychometric information derived from a large study of normal subjects (N = 735) indicated that Cronbach alpha reliability coefficients were .87 and .89 for males and females respectively (Muntaner et al., 1988). In the present study, the alpha coefficient for the STQ was .89 for the total sample. Muntaner et al. (1988) also reported test-retest reliability checks at 6 weeks and 2 years which yielded values ranging from .64 to .90. A higher score on the STQ indicates a more pathological personality structure (See Appendix A for the French version of the STQ scale).

4. The Chapman Psychosis Proneness Scales

This questionnaire consists of three scales developed by L.J. Chapman and associates (Chapman et al., 1976; 1978; Eckblad, L.J. Chapman, J.P. Chapman, & Mishlove, 1982).

A) Physical Anhedonia Scale:

The scale contains 61 true-false items which assess the capacity to derive pleasure from physical experiences. It yields a maximum score of 61; the higher the score, the more anhedonic the subject. Alpha coefficients are .83 and .78, and test-retest reliability coefficients are .79 and .78 for males and females respectively

(L.J. Chapman, J.P. Chapman & Miller, 1982). The French version used in the current study was developed and tested for psychometric equivalence to the original scale by Duhamel (1982) who reported alpha coefficients of .82 for males and .79 for females. The alpha coefficient for the current sample was .70.

B) Revised Social Anhedonia Scale:

This scale is made up of 40 true-false items assessing the inability to derive pleasure from social situations. The items were selected to tap schizoid withdrawal (Eckblad et al., 1982) and yield a maximum score of 40, indicating a high degree of social anhedonia. Test-retest reliability information has not been reported but an alpha coefficient of .79 is reported for both sexes (Mishlove & Chapman, 1985). In the current sample, the alpha coefficient was .57 A correlation of .24 is reported between this scale and the Physical Anhedonia Scale (Misholve & Chapman, 1985). The French translation was done by Bergeron (1990) according to the procedure described previously.

C) Perceptual Aberration Scale:

This scale consists of 35 items, 28 of which deal with transient aberrant perceptions of one's body. The remaining items pertain to aberrant perceptions of the environment. Items are keyed either true of false and yield a maximum score of 35, indicating a high degree of abnormal perceptions. The alpha coefficients for the English version are .88 and .90 for male and female college students respectively (Chapman et al., 1978). Alpha coefficients reported by Duhamel

(1982) for the French version are .87 for males and .88 for females, and .81 for the current sample. Test-retest reliability coefficients are .76 for males and .75 for females (Chapman et al., 1978) (See Appendix A for the French version of the Chapman scales).

5. Attentional Performance

Attentional performance, the dependent measure, was assessed using a modified version of the Continuous Performance Task (CPT) (Cornblatt et al., 1989). The task was administered using an Apple II compatible computer system which generated visual stimuli on a standard video monitor placed at a comfortable viewing distance (approximately 48 cm). It required subjects to attend to several series of stimuli presented briefly one at a time in a continuous sequence. The subject was asked to use the dominant hand, to keep the index finger down on a response key, and to release the button whenever the stimulus displayed was identical to the previous one. In other words, the task involved responding only when two consecutive stimuli were exactly the same. The rate of presentation of the stimuli was not influenced by the subject's performance.

A total of six subtests, each containing three blocks of 50 stimuli, was presented to subjects (see Table 3). Each subtest lasted two and a half minutes, and contained 30 stimuli (20%) requiring a response. The subtests varied along three dimensions: stimulus type, speed, and distraction. There were two types of stimuli presented on the screen: either four-digit numbers (e.g., "6432") or nonsense

Table 3

Description of the CPT subtests.

Subtest	Block A	Block B	Block C
	50 trials	50 trials	50 trials
Condition: no distraction			
1. Stimulus type:	Numbers	Numbers	Numbers
Speed:	Fast	Fast	Fast
2. Stimulus type:	Shapes	Shapes	Shapes
Speed:	Fast	Fast	Fast
3. Stimulus type:	Numbers	Numbers	Numbers
Speed:	Slow	Slow	Slow
4. Stimulus type:	Shapes	Shapes	Shapes
Speed:	Slow	Slow	Slow
Condition: with distraction			
5. Stimulus type:	Numbers	Numbers	Numbers
Speed:	Fast	Fast	Fast
Distractor:	Degraded stimulus	Pleasant tape	Stars
6. Stimulus type:	Shapes	Shapes	Shapes
Speed:	Fast	Fast	Fast
Distractor:	Pleasant tape	Unpleasant tape	Stars

geometric shapes. The four-digit numbers are referred to as essentially verbal stimuli because subjects "read out" these stimuli silently while performing the task. In contrast, the nonsense shapes are resistant to verbal labelling. Instead, they require a holistic mode of processing and hence, are viewed as primarily spatial stimuli. Shapes and numbers were always presented independently (i.e. in separate subtests) and each type was presented under a fast as well as a slow condition. The fast condition consisted of a stimulus presentation time of 50 milliseconds followed by a dark time of 950 milliseconds, whereas in the slow condition, the stimulus remained on the screen for 150 milliseconds with a dark time of 850 milliseconds. Thus, variations in the nature of the stimulus and the speed of presentation led to four possible combinations which formed the first four subtests administered: (1) fast numbers, (2) fast shapes, (3) slow numbers, (4) slow shapes.

The fifth and sixth subtests were similar to the first and second subtests in that they contained the same stimulus types and speeds (fast numbers and fast shapes respectively). What differed in Subtests 5 and 6 was the addition of various types of distractors. In Subtest 5 (fast numbers), the first 50 stimuli (Block A) were visually degraded, such that each of the four digits overlapped and their contours were blurred. The next 50 stimuli (Block B) were presented with an auditory tape playing in the background. The content of the tape consisted of a scenario written by the present author, in which a mother kindly inquires about h aughter's activities over the week-end. The daughter describes in a relaxed voice that she

went skiing, and then went to a restaurant and later, to a movie. This scenario was created to parallel the auditory distraction condition of the original version (Cornblatt et al., 1989) which presented subjects with an excerpt from an English movie sound-track. In order for the auditory tape to produce the same potential distracting effect in a Francophone sample, it was necessary to use French background voices. Otherwise, it would have been impossible to control for the differences in subjects' familiarity with the English language, and therefore, a possibly different impact of the auditory distractor on attentional performance. The last block of 50 stimuli (Block C) consisted of randomly distributed stars (asterisks) surrounding each stimulus. To summarize, there were three different types of distractors in Subtest 5: two were visual (degraded numbers and stars) and one was auditory.

In Subtest 6, the first and second blocks were presented with auditory material in the background. During the first block of 50 stimuli (Block A), the auditory distractor consisted of a relaxed, pleasant, and everyday type of conversation between a mother and an adolescent. The tone of the conversation was essentially similar to that contained in the previously described auditory distraction condition. The content pertained to the daughter's school activities of the day and her questioning the mother about the upcoming meal. In contrast, during the second block of 50 stimuli (Block B), the subject heard an excerpt from a French documentary on problems of adolescence called "Les enfants de la rue" (Tétreault,

1987). The excerpt consisted of an unpleasant conversation between mother and son in which they are arguing loudly, with the mother threatening to punish the adolescent and he, in turn, screaming back at her and insulting her. This excerpt was selected in order to assess whether attentional performance would deteriorate more drastically when the auditory distractor consisted of an apparently emotionally disturbing content. Finally, the last block (Block C) consisted of randomly distributed stars (asterisks) surrounding each stimulus. In both Subtests 5 and 6, subjects were instructed to perform as usual, and to ignore extra material they might hear in the background, or see on the screen. When the CPT was completed, subjects were asked two sets of five multiple-choice questions. These questions pertained to the pleasant and unpleasant stories of Subtest 6, and yielded scores ranging from 0 (for no correct answer) to 5 (for all answers correct) for each story. The purpose of this procedure was to examine the relationship between recall of the auditory material and attentional performance.

To summarize, the CPT consisted of six subtests, each containing three 50-trial blocks, for a total of 150 stimulus presentations, each of one second duration. The division of stimuli into blocks is arbitrary for the first four subtests but necessary for the last two subtests since the distractor varies with each block. The order of presentation of stimulus type (i.e. shape vs numbers) was counterbalanced in the first four subtests such that half of the sample received numbers before shapes, and the other half received shapes before numbers. Order of presentation

of the pleasant and unpleasant auditory distractors in Subtest 6 was also conterbalanced such that half received the pleasant tape first and half received the unpleasant tape first.

The CPT version used in the present study provides two indices of relevance here: (1) correct de. ctions or "hits" (responses to target trials); (2) false alarms (responses to "catch" trials). Catch trials refer to trials in which the stimulus presented is very similar to that of the preceding trial, but not identical with it (e.g., "6432" followed by "6832"). In addition to these two indices, a D' signal detection statistic, an index of discriminability, was calculated by a computer program developed by McGowan and Appel (1977). The D statistic summarizes performance in terms of subjects' proportion of hits to false alarms. The higher the D' value, the better the discriminability. Although early studies of sustained attention have traditionally reported "number of correct detections" as the index of vigilance, there has been a shift in the more recent research to report vigilance results in terms of signal detection indices (Davis & Parasuraman, 1982; Parasuraman, 1979; Swets, 1973). Test-retest reliability coefficients ranging from .56 to .73 have been reported for the D' score of the CPT, when administered to normal subjects 18 months after initial testing (Cornblatt et al., 1989).

Procedure

All the measures were administered to the subject in the same day except for the Pupil Evaluation Inventory (Pekarik et al., 1976) which was administered 14

years earlier. Subjects were tested over a 10-month period. The initial contact was made by telephone to invite the subject to participate in the study. A brief description of the tasks to be performed was provided at this time. Upon arrival at the laboratory, subjects were given a more detailed explanation of the tasks involved and asked if they wished to sign a consent form (see Appendix C). All testing was done individually by the author or a research assistant.

The first test administered was the Vocabulary subtest of the Barbeau-Pinard (Barbeau & Pinard, 1963) battery. The subject was then introduced to the CPT (Cornblatt et al., 1989) which takes approximately 40 minutes to complete. Prior to the first subtest, a practice test was given in order to ensure that the subject understood the task instructions clearly. The six subtests were then administered in a continuous fashion, with only a brief interruption for specific instructions before each subtest (see Appendix D for description of CPT instructions). After a short pause, the subject was invited to complete the following questionnaires: the Psychosis Proneness Scales of Chapman and associates, the Eysenck Personality Questionnaire, and the Schizotypal Personality Questionnaire. These measures were presented on a video monitor, such that the subject pressed either digit "1" for true or digit "2" to indicate false as his or her response. Each subject was then presented with a list of drugs and asked to identify which, if any, they had taken in the last 24 hours. The total length of the procedure was approximately two and a half hours. Subjects received $40.00 for their participation.

RESULTS

The results were analyzed in two parts. First, differences in performance on the attentional task between the four peer-identified groups were examined. Second, differences in attentional performance were examined in relation to presumed precursors of positive and negative symptoms.

In preliminary analyses, the effects of handedness and time of testing on the dependent variable were examined and found to be non-significant. Drug intake did not appear relevant as a factor affecting performance. Less than 5% (N =3) of the sample reported drug use within the last 24 hours prior to testing. The performance of these three subjects was found to be within the range obtained for the rest of the sample. As will be recalled, two factors were counterbalanced: order of presentation of stimulus type (shapes vs. numbers) and order of presentation of the pleasant and unpleasant auditory distractors in Subtest 6. Only the first counterbalanced factor was found to have an effect: if subjects were presented with shapes first, performance on the first subtest with shapes was poorer than on the first subtest with numbers ($t(179) = 3.35$, $p \leq .001$). However, when numbers were presented first, differences in performance between shapes and numbers were not obtained. These results suggest that shape stimuli are slightly more difficult to process than number stimuli since subjects do better when they have a chance to practice with numbers first. However, when all the shapes subtests were compared to the number subtests, no significant differences emerged, indicating that these two

types of stimuli were equivalent on a global level in terms of task difficulty. For all analyses which included more than two levels of a repeated measure, the assumption of sphericity was verified and if violated, the Greenhouse-Geisser probability values were used.

A) Peer classification

A preliminary analysis of variance (ANOVA) was computed to determine whether the four Peer Classification groups differed on the Barbeau-Pinard Vocabulary subtest (Barbeau & Pinard, 1963). A significant main effect of group was found ($F(3,177)=2.71$, $p \leq .05$) although Tukey post hoc tests failed to differentiate the groups: Aggressive: ($M=21.45$, $SD=5.0$); Withdrawn ($M=22.98$, $SD=6.3$); Aggressive-Withdrawn ($M=20.93$, $SD=4.7$); Control ($M=23.54$, $SD=4.5$). An analysis of covariance (ANCOVA) was considered also because of the moderate correlations between Vocabulary raw scores and the dependent measure. These correlations ranged from .30 to .40 for the six subtests and all were significant. However, the regression slopes between Vocabulary raw scores and the dependent variable differed significantly among the groups. The transformation of raw scores into scaled scores also resulted in unequal regression slopes. Because this difference violates its major assumption, the ANCOVA could not be computed. Therefore all hypotheses pertaining to Peer Classification were tested using ANOVA. There were slight variations in sample size because of occasional technical difficulties in the computerized recording of the CPT data.

The first hypothesis pertaining to peer classification was as follows: The Aggressive-Withdrawn group will show a deficit in attention relative to normal controls. In order to assess whether performance was related to different types of processing demands, the parameters of speed, stimulus type, and distraction were examined. It was predicted that the differences between the two groups would be more evident under the fast stimulus presentation condition and when distractors were included in the task.

In the initial analysis, the first four subtests administered were represented in a 2 (Speed) x 2 (Stimulus Type) x 3 (Block) x 4 (Group) x 2 (Sex) analysis of variance (ANOVA) with Speed, Stimulus Type and Block as the repeated measures. The term "Block" refers to each of the 50-trial series. Block was included here as a factor to examine changes in task performance over time (vigilance effects) in relation to peer classification groups. The results showed a significant main effect for Speed ($\underline{F}(1,170) = 160.22$, $p \leq .001$). Overall, subjects performed worse under the fast condition ($\underline{M} = 1.68$, $\underline{SD} = .48$) than under the slow condition ($\underline{M} = 2.04$, $\underline{SD} = .54$) of the CPT (see Appendix E.1 for ANOVA summary table). In addition, a significant interaction between Stimulus Type, Block, and Peer Classification Group was obtained ($\underline{F}(6,340) = 2.57$, $p \leq .05$). Table 4 presents the respective means and standard deviations for Number and Shape stimuli by Block and Group, and Figure 1 displays these results graphically. Tukey post hoc tests showed that, for Number stimuli, the significant group differences emerged in

Table 4

Mean D' values (and standard deviations) as a function of Peer Classification Group, Stimulus Type, and Block

	Peer Classification Group*			
Stimulus Type/Block	A (n=42)	W (n=42)	A W (n=43)	C (n=54)
Numbers				
Block A	2.03 (.62)	2.08 (.64)	1.80 (.64)[a]	2.25 (.59)[b]
Block B	1.71 (.75)	2.00 (.68)[b]	1.50 (.79)[a]	1.94 (.63)[b]
Block C	1.74 (.75)	1.86 (.80)	1.51 (.60)	1.89 (.65)
Shapes				
Block A	1.55 (.60)	1.82 (.47)	1.59 (.44)	1.69 (.49)
Block B	1.88 (.81)	1.98 (.77)	2.02 (.69)	2.08 (.70)
Block C	1.73 (.67)[b]	2.15 (.59)[a]	1.70 (.65)[b]	2.01 (.59)

Note. Means with different superscripts are significantly different ($p \leq .05$).

* A=Aggressive

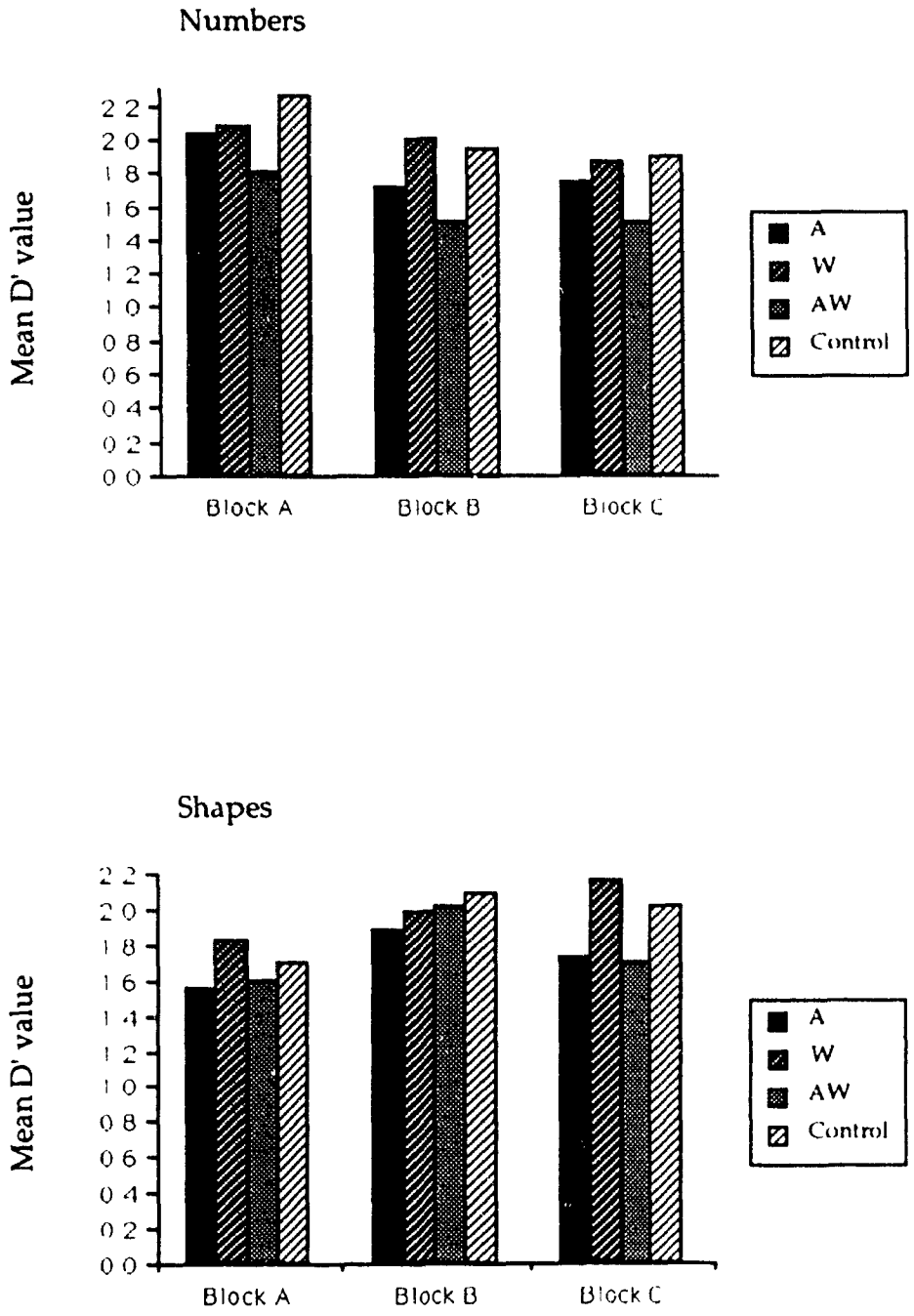
W=Withdrawn

AW=Aggressive-Withdrawn

C= Control

Figure 1

Mean D' values as a function of Peer Classification Group, Stimulus Type and Block



Blocks A and B, but not in Block C. The Aggressive-Withdrawn group performed more poorly than the Control group in Block A and performed more poorly than both the Withdrawn and Control groups in Block B. In contrast, for Shape stimuli, significant group differences emerged only at a later point, that is, in Block C. Tukey post hoc tests showed that the performance of both the Aggressive and Aggressive-Withdrawn groups on the Shape stimuli became poorer than that of the Withdrawn group in Block C.

In the second analysis, data from the first (Fast Numbers) and fifth (Fast Numbers with distraction) subtests were considered. Thus, a 2 (Condition) x 3 (Block) x 4 (Group) x 2 (Sex) ANOVA for repeated measures was computed. The term "Condition" refers to whether stimuli were presented with or without distraction, and thus has two levels. The nature of the distractors presented during the fifth subtest was different for each of the three Blocks of 50 trials. As described in the Method section (See Table 3), the distractor in Block A consisted of visually degraded stimuli. In Block B, the distractor was an auditory tape of pleasant content which is played in the background. In Block C, the distractor consisted of stars dispersed around the stimulus on the screen.

A significant main effect of Peer Classification Group ($\underline{F}(3,171) = 4.95$, $p \leq .05$) was obtained as well as a significant Block by Condition interaction ($\underline{F}(2,342) = 23.06$, $p \leq .001$) (see Appendix E.2 for ANOVA summary table). Tukey post hoc tests revealed that the performance of the Aggressive-Withdrawn group was

significantly poorer (M = 1.47, SD = .59) than that of the Withdrawn (M = 1.96, SD = .84) and Control (M = 2.04, SD = .69) groups. Repeated measures post hoc t-tests (with Bonferroni correction) indicated that, for the Block by Condition interaction (See Figure 2), subjects performed worse under distraction (i.e., degraded stimuli) than under no distraction for Block A. The reverse pattern occurred in Block C. That is, performance was better under distraction (stars) than under no distraction. There was no difference in performance in Block B between the No-Distraction and Distraction (pleasant tape) conditions. Means and standard deviations as well as significance values for post hoc t-tests are reported in Table 5. Because the regression slopes for Vocabulary and the two subtests used in the present analysis were not unequal, an ANCOVA was performed with Vocabulary score as the covariate. This yielded similar results, that is, the Peer Classification group main effect remained significant (see Appendix E.3 for ANCOVA summary table).

A third analysis, similar to the previous one, was conducted using subtests with Shape stimuli (Subtests 2 and 6). As will be recalled, the nature of the distractor across the three blocks was also different in the sixth subtest. In Block A, the distractor was an auditory tape of pleasant content, in Block B, it was an auditory tape with unpleasant content; and in Block C, the distractor consisted of multiple stars surrounding the stimulus. The results showed two significant interactions, Group by Block ($F(6,346)) = 2.15$, $p \leq .05$) and Condition by Block

Table 5

Mean D' values (and standard deviations) for Number stimuli as a function of Condition and Block

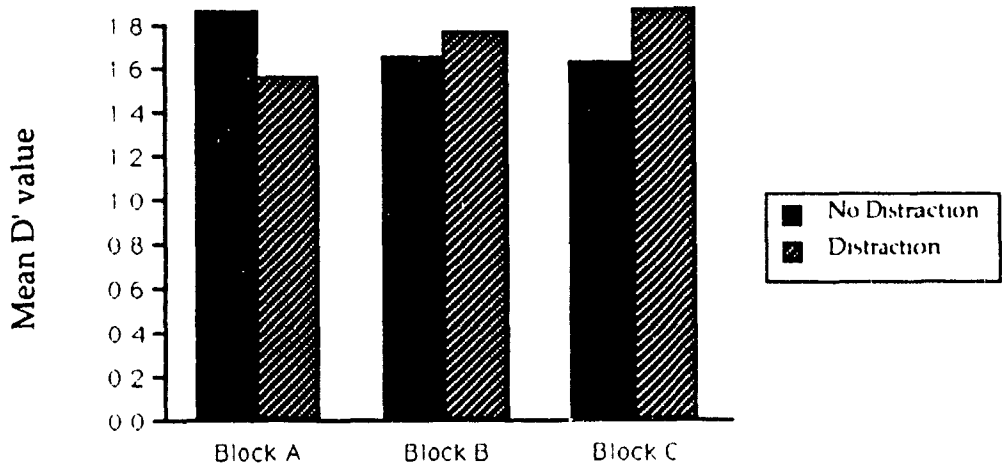
Block	Condition: Baseline	Condition: Distraction
Block A (Degraded)	1.86 (.73)	1.55 (.78)***
Block B (Auditory Tape)	1.65 (.83)	1.77 (.89)
Block C (Stars)	1.62 (.83)	1.87 (.88)***

Note. N=179. The type of distractor used for each block is indicated in parentheses.

*** $p \leq .001$ (with Bonferroni correction)

Figure 2

Mean D' values for Number stimuli as a function of Condition and Block



Note. In Block A, the distractor was degraded numbers.
In Block B, the distractor was an auditory tape.
In Block C, the distractor was stars around the stimulus.

($F(2,346) = 6.97$, $p \leq .001$) (see Appendix E.4 for ANOVA summary table). Means and standard deviations for the Group x Block interaction are shown in Table 6 and graphically represented in Figure 3. Tukey post hoc tests indicated that, regardless of Condition (Distraction or none), the Aggressive group performed more poorly than the Withdrawn group during Block A whereas both the Aggressive and Aggressive-Withdrawn groups performed more poorly than the Withdrawn group during Block C. There were no differences between the groups during Block B.

The means and standard deviations for the Block by Condition interaction are shown in Table 7 and presented in Figure 4. Repeated measures post hoc t-tests (Bonferroni corrected) indicated that subjects' performance was poorer under no-distraction than under distraction for both Blocks A (pleasant tape) and C (multiple stars). There was no difference between these two conditions for Block B (unpleasant tape).

As will be recalled, subjects were asked questions concerning the content of the two auditory tapes in Subtest 6. It was found that, overall, there was a significant difference ($t(177)=2.62$, $p \leq .01$) between the proportion of questions answered correctly about the pleasant ($M=.75$, $SD=.21$) and the unpleasant ($M=.80$, $SD=.18$) tapes. However, the relationship between the mean number of items recalled and performance on the CPT was not significant for either the pleasant ($r(180)=-.07$) or the unpleasant ($r(178)=.12$) tapes.

Table 6

Mean D' values (and standard deviations) for Shape stimuli as a function of Peer Classification Group and Block

	Peer Classification Group*			
Block	A (n=42)	W (n=42)	A W (n=43)	C (n=54)
Block A	1.51 (.69)[a]	1.81 (.40)[b]	1.57 (.50)	1.75 (.45)
Block B	1.78 (.73)	1.91 (.68)	1.92 (.63)	1.97 (.66)
Block C	1.65 (.76)[b]	2.09 (.67)[a]	1.69 (.59)[b]	1.99 (.54)

Note. Means with different superscripts are significantly different ($p \leq .05$).

* A=Aggressive

W=Withdrawn

AW=Aggressive-Withdrawn

C=Control

Figure 3

Mean D' values for Shape stimuli as a function of Peer Classification Group and Block

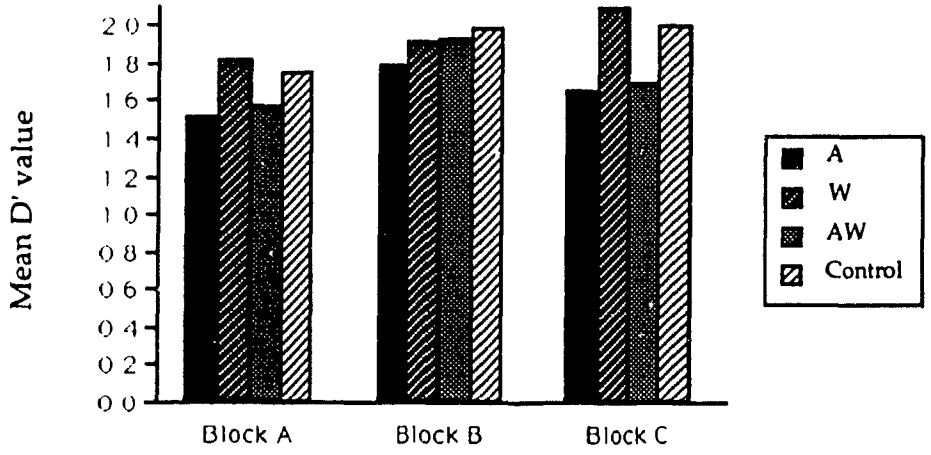


Table 7

Mean D' values (and standard deviations) for Shape stimuli as a function of Condition and Block

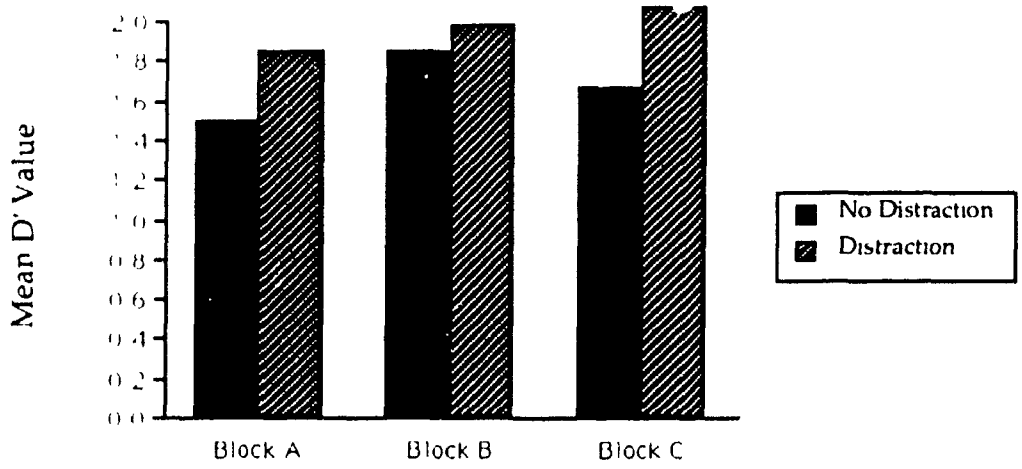
	Condition	
Block	No Distraction	Distraction
Block A (Pleasant Tape)	1.49 (.64)	1.84 (.58)***
Block B (Unpleasant Tape)	1.84 (.85)	1.97 (.72)
Block C (Stars)	1.66 (.71)	2.07 (.84)***

Note. N=179. The type of distractor used for each block is indicated in parentheses.

*** $p \leq .001$ (with Bonferroni correction)

Figure 4

Mean D' values for Shape stimuli as a function of Condition and Block



Note. In Block A, the distractor was a pleasant auditory tape.
In Block B, the distractor was an unpleasant auditory tape.
In Block C, the distractor was stars around the stimulus.

B) Factor structure classification

A principal component analysis with Varimax rotation was computed through SPSS-X (SPSS-X Inc., 1988) on the total subscale Z-scores of each of the three questionnaires administered: the Eysenck Personality Questionnaire containing the extroversion, neuroticism and psychoticism subscales; the Claridge Schizotypal Personality Questionnaire, and finally the Chapman Psychosis Proneness Scales containing the physical anhedonia, social anhedonia and the perceptual aberration subscales. From these 7 subscales, a maximum of two factors were requested and accounted for 57.4% of the variance.

The resulting rotated factor matrix is shown in Table 8. Interpretation of factors was based on a consideration of those variables with loadings of at least .30 as suggested by Tabachnick and Fidell (1983). Factor 1 grouped together the neuroticism, schizotypal, and perceptual aberration subscales, and was labelled a "positive symptom" factor. High loadings on the psychoticism, extroversion, physical and social anhedonia subscales led to Factor 2 being identified as a "negative symptom" factor.

The first goal of the principal-component analysis was to extract two sufficiently distinct factor structures which could be conceptualized as precursors of positive and negative schizophrenic symptomatology. The second goal was to use these two factor structures as grouping variables in order to explore the relationship between different types of attentional deficit and two pre-schizophrenic symptom

Table 8

Matrix of correlations between factors and scales (rotated factor loading matrix)

Scales	Factor 1 (positive symptom) precursor	Factor 2 (negative symptom) precursor
Eysenck Personality Questionnaire		
Psychoticism	-	.50
Extraversion	.-	-.48
Neuroticism	.75	.-
Schizotypal Personality Questionnaire	.91	.-
Psychosis Proneness Scales		
Physical anhedonia	.-	.81
Social anhedonia	.-	.76
Perceptual aberration	.84	.-

Note. Only loadings with absolute values greater than .30 are shown. N=176.

structures. Thus, factor scores were created using the unit-weighting method (J. Cohen & P. Cohen, 1983). The distribution of scores was divided in three parts for each factor. Subjects within the upper and lower third of the distributions were retained and formed the groups used to test the hypotheses concerning the symptom precursor classification (see below). This trilevel division differentiated sufficient numbers of subjects who scored high and low on characteristics measured by the factors to permit group comparisons. The sample sizes and sex distribution for these groups are presented in Table 9 (see Appendix F for more details on the distribution of the factor scores, the grouping procedure, and the relationship between the two factors).

The relationship between the peer and symptom classification systems was examined through chi-square analyses. There was a significantly greater proportion of Withdrawn subjects represented in the group who scored high than in the group who scored low on the Negative Symptom Factor (X^2 (3) = 10.79, $p \leq .01$) Although 70% of the Aggressive-Withdrawn subjects were represented in the high Positive Symptom Factor group, the chi-square analysis did not reach significance (X^2 (3) = 5.21, $p > .05$) (see Appendix B for more details) The three statistical analyses used previously to examine the effects of Peer Classification Group on attention were repeated using the newly formed Positive and Negative Symptom Factor groups. The first analysis was conducted with the Negative Symptom Factor groups and the second and third analyses were conducted with the Positive

Table 9

Sample sizes and sex distribution for Positive and Negative Symptom Groups

	Symptom Group			
	Positive		Negative	
Sex	Low	High	Low	High
Male	57.9 (33)	49.2 (30)	42.9 (24)	67.7 (42)
Female	42.1 (24)	50.8 (31)	57.1 (32)	32.3 (20)

Note. Percentages are indicated first; n's are listed in parentheses.

Symptom Factor groups. In order to control for the potential influence of one factor over the other, an analysis of covariance was considered. However, correlations between the Positive and Negative Symptom Factor scores and the dependent variable ranged from -.01 to -.18 and were not significant for any of the six subtests. Because the inclusion of a non-significant covariate reduces power, the analyses were conducted without this covariate.

Analyses were computed to determine whether there were any differences in Vocabulary scores for the high and low groups on each factor. No differences were found between the high and low Positive Symptom Factor groups ($t(116) = .31$, $p > .05$). The high Negative Symptom Factor group had significantly poorer Vocabulary scores ($M = 21.74$, $SD = 5.6$) than the low Negative Symptom Factor group ($M = 23.98$, $SD = 4.1$) ($t(117) = 2.49$, $p \leq .05$.) Correlations between the Vocabulary scores and the dependent variable ranged from .30 to .40 and were significant for all the CPT subtests. Therefore an ANCOVA using Vocabulary as a covariate was considered for analyses using the Negative Symptom Factor group. Regression slopes between the high and low Negative Symptom Factor groups were equal and indicated that the ANCOVA could be computed for this group. In order to avoid redundancy in the results, the only effects which will be reported here are those which are specifically related to the hypotheses, that is, those effects involving the grouping factor.

There were two main hypotheses pertaining to the Factor groups. First, it

was predicted that subjects who scored high on the Negative Symptom Factor would perform more poorly under the fast conditions of the CPT than subjects who scored low on this factor. A 2 (Speed) x 2 (Stimulus Type) x 3 (Block) x 2 (Group) x 2 (Sex) ANCOVA with Speed, Stimulus Type, and Block as the repeated measures and Vocabulary as the covariate was performed. The first hypothesis which predicted a group effect in relation to processing speed was not supported by the results, that is, no group by speed interaction was obtained. (See Appendix G.1 for ANCOVA summary table).

Second, it was predicted that subjects who scored high on the Positive Symptom Factor would perform more poorly under distraction conditions than low scorers. Two separate analyses, one using Number stimuli and the other using Shape stimuli, were conducted. A 2 (Condition) x 3 (Block) x 2 (Group) x 2 (Sex) ANOVA with Condition and Block as the two repeated measures was computed for the Number stimuli. The results did not support the hypothesis, that is, there was no Group by Condition interaction. (See Appendix G.2 for ANOVA summary table).

The same analysis repeated for the Shape stimuli yielded a significant Group by Condition interaction ($F(1,114) = 3.97$, $p \leq .05$) (See Appendix G.3 for ANOVA summary table). As shown in Figure 5, the performance of the low and high Positive Symptom Factors groups improved from the no-distraction condition to the distraction condition. The interaction was due to the fact that the magnitude

Table 10

Mean D' values (and standard deviations) for Shape stimuli as a function of Condition and Positive Symptom Factor Group

	Condition	
Group	No Distraction	Distraction
Low Positive	1.59 (.55)	1.97 (.55)***
High Positive	1.69 (.58)	1.88 (60)*

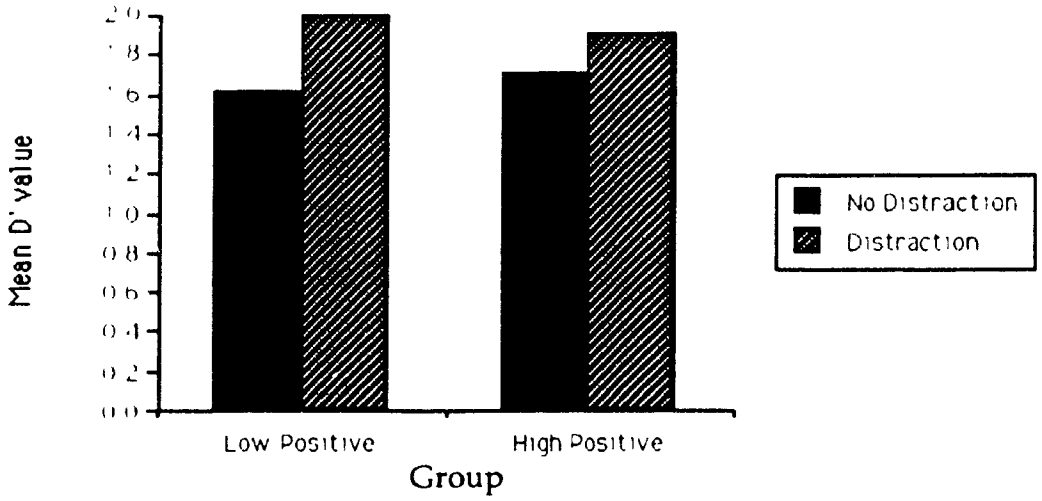
Note. N=179.

* $p \leq .05$ (with Bonferroni correction)

*** $p \leq .001$ (with Bonferroni correction)

Figure 5

Mean D' values for Shape stimuli as a function of Condition and Positive Symptom Factor Group



of the improvement was greater for the low Positive Symptom Factor group than for the high Positive Symptom Factor group. The means and standard deviations as well as significance values for post hoc t-tests are shown in Table 10. In summary, the second hypothesis pertaining to the Factor group classification was not supported. That is, the high Positive Symptom Factor group did not perform worse under distraction than under no distraction.

DISCUSSION

The first goal of this study was to determine whether individuals considered at elevated risk for schizophrenia on the basis of having had a childhood pattern of frequent aggression and frequent withdrawal would show deficits in attentional performance on the Continuous Performance Task, relative to individuals with normative childhood backgrounds. Two additional groups of subjects who showed behavioral deviance in childhood (either aggression or withdrawal) but who were not considered at risk for schizophrenia were included in order to answer questions about the specificity of the deficit as a risk marker for schizophrenia.

The results provided partial support for the notion that attentional deviance is an important risk marker for schizophrenic disorder. That is, the Aggressive-Withdrawn group performed significantly more poorly than normal Controls. This finding was specific to subtests requiring verbal processing of visual stimuli. When spatial processing was required however, poor performance was no longer restricted to the Aggressive-Withdrawn group; the deficit was also observed in Aggressive subjects. Thus, it appears that the nature of the attentional impairment in individuals at risk for schizophrenia consists of a specific deficiency in their capacity to process verbal rather than spatial types of visual stimuli. This finding is consistent with neuropsychological theories which have proposed a specific left hemispheric dysfunction in schizophrenia (Flor-Henry, 1969; 1983). Although no unified theory for lateral asymmetry in schizophrenia is yet available, there is

nonetheless a plethora of empirical evidence demonstrating abnormalities in language-related functions in schizophrenics (Gruzelier, 1983; Gur, 1978).

The prediction that attentional deviance in the Aggressive-Withdrawn group would be more obvious when the processing demands were increased was not supported by the findings. Neither increased speed nor distraction yielded significantly poorer performance in this group. Rather, the poorer performance of the Aggressive-Withdrawn subjects occurred regardless of processing load. Previous research with individuals at genetic risk for schizophrenia has shown that attentional deviance could be detected in these samples only when the CPT was administered under complex conditions (Cornblatt & Erlenmeyer-Kimling, 1985; Erlenmeyer-Kimling & Cornblatt, 1978; Nuechterlein, 1983; Rutschmann et al., 1977). Simple versions of the CPT, however, failed to detect a deficit in these children (Asarnow et al., 1977; Cohler et al., 1977, Cornblatt & Erlenmeyer-Kimling, 1984; Herman et al., 1977; Nuechterlein, 1983). The fact that a CPT deficit was observed in the Aggressive-Withdrawn group even when additional processing demands were not included suggests that their capacity for effortful processing is sufficiently impaired to be detected even in the absence of additional difficulty components. Moreover, these findings provide support for the validity of the CPT version revised by Cornblatt et al. (1989) as an index of attentional deficit in high-risk samples defined on the basis of childhood behavioral deviance as well as genetic criteria.

The results also showed interesting contrasts among the four peer classification groups. In certain instances, the Aggressive-Withdrawn group differentiated itself not only from normative Controls but also from the Withdrawn group. The similarity in performance between Withdrawn and Control subjects is not unusual. Indeed, previous studies conducted within the Concordia Longitudinal Risk Project indicate that these two groups perform equally well on several parameters including intellectual functioning and academic achievement (Ledingham & Schwartzman, 1984). On the basis of the present findings, it can be concluded that attentional functioning is not negatively affected when childhood behavioral deviance consists of extreme withdrawal.

The aggression component however, appears to contribute more significantly to disturbances in attention. Indeed, when spatial processing of visual stimuli was required, the Aggressive group performed significantly more poorly than the Withdrawn group. This contrast highlights the polarity between the two groups. At the behavioral level, the Aggressive group has been characterized by conduct problems, poor academic achievement and early school dropout (Schwartzman & Moskowitz, 1991). Impulsivity, which seems to be a common feature of the behavior of these individuals, probably accounts for their poor performance on the CPT because this task requires a specific capacity for prolonged, sustained attention. The opposite behavioral style of Withdrawn subjects, who tend to lack self-confidence, to be overly controlled and performance-oriented, seems to play in

their favor on a sustained attention task. Their behavioral deviance produces detrimental effects in spheres other than attention. It is primarily in the domain of social competence and interpersonal functioning that these individuals are at a disadvantage (Schwartzman & Moskowitz, 1991).

In summary, the findings of the present study indicate that attentional deviance, as measured by the CPT, characterizes individuals theoretically at risk (Aggressive-Withdrawn) for schizophrenia. The specificity of the deficit was restricted to the verbal processing of visually presented stimuli. A difficulty in spatial processing was found for both Aggressive and Aggressive-Withdrawn subjects, suggesting that it may be viewed more as an indicator of general psychopathology rather than a specific risk marker for schizophrenia.

The second goal of this study was to reclassify the sample in such a way that it highlighted two distinct patterns of pre-schizophrenic symptomatology, thereby permitting an examination of the relationship between these patterns and specific types of attentional difficulties. More precisely, the potential association between precursors of negative symptoms and speed of processing was explored, and then, the potential association of positive symptoms precursors to distractibility.

The findings did not support the notion of a specific relationship between processing speed and precursors of negative symptoms. One possible explanation for the lack of significant findings is that the evidence for a specific deficit in processing speed in patients with negative symptoms comes largely from studies

using the backward masking paradigm. While both the backward masking and CPT paradigms demand efficient and rapid processing of visually presented stimuli, they differ in terms of the output requirements. The former requires that subjects verbally report each stimulus presented while the latter requires a motor response, and this, only to target stimuli. It is possible that the deficit in speed of processing in schizophrenic patients is more intimately linked to their inability to provide frequent verbal rather than motor responses. An adequate test of this hypothesis would be to administer both the CPT and the backward masking tasks to the same sample

An alternative explanation for the lack of significant findings is that a deficit in processing speed constitutes a consequence of the pathological state of schizophrenic patients rather than a vulnerability marker for the illness. Since neither the peer classification nor the symptom precursor categorization in this study yielded significant group differences in relation to processing speed, this second explanation is certainly possible. Moreover, the CPT task is cognitively and perceptually more complex than the backward masking task, and the two rates of presentation of CPT stimuli led to different levels of performance for the overall group in the present study, with the slow condition yielding better scores than the fast condition. Hence, had a deficit in processing speed been present in individuals at risk, it should have been detected by the CPT task. Thus, it seems reasonable to argue that the present data do not support the notion that a deficit in processing

speed is an important risk marker for schizophrenic disorder.

The predicted relationship between precursors of positive symptoms and distractibility was not supported by the data. It was found that, for subjects who scored low (i.e. in the normal direction) on the Positive Symptom Factor, distraction functioned to improve performance. This finding is consistent with previous research showing that normal subjects perform better on the CPT when distraction components are included (Cornblatt et al., 1989). It seems as though the presence of distractors provides a challenging aspect to an essentially monotonous task. However, subjects who scored in a pathological direction on the Positive Symptom Factor also improved their performance, but the magnitude of their improvement was smaller here than it was for the low (normal) scorers. The relatively minor improvement observed in the high Positive Symptom group can be interpreted as an inability to benefit from the additional challenge provided by distracting conditions. To summarize, the present data did not support the hypothesis that distractibility characterizes individuals with a high level of precursive positive symptomatology.

The frequently reported findings of increased distractibility in schizophrenic patients with positive symptoms come largely from studies using classic selective attention paradigms such as dichotic listening (Hemsley & Zawada, 1976; Payne et al., 1970; Schneider, 1976) and digit-span tasks (Green & Walker, 1986b, Oltmanns et al., 1978). By contrast, the present study assessed the degree of

distractibility by superimposing distractors onto a task requiring sustained attention. It is possible that this paradigm variation obscured the presence of a selective attention deficit in our sample. Alternatively, given that neither the dimension of childhood peer classification nor the symptom precursor categorization yielded significant results vis-à-vis the effect of distraction, it is also plausible that distractibility itself becomes more manifest only at a more advanced stage of the pre-schizophrenic process or when clinical symptoms are present.

Methodological considerations

The notion that a deficit in sustained attention is an important marker of liability to schizophrenia rests on the assumption that some of the individuals at theoretical risk for the disorder will indeed develop the disorder It is still too early for this final outcome to be assessed in our sample At the time of testing, a majority of the subjects were not past the peak risk age-period for the first clinical signs of the illness Whereas it would be premature to conclude that attentional deviance, as defined by poor performance on the CPT for verbal stimuli, is a clear risk marker for schizophrenia, the current findings with the Aggressive-Withdrawn group are consistent with such a conclusion. However, whether childhood aggression-withdrawal constitutes a reliable construct which clearly foreshadows schizophrenia will be determined only through clinical assessments in the near future.

Likewise, the hypothesized continuity between normal personality traits, pre-

schizophrenic features and full-blown symptomatology deserves more exploration in future high-risk studies. The development of the factor structure classification system and its potential association to specific attentional problems in the present study was based on several extrapolations of findings in different domains. What is needed now is a rigorous analysis of the developmental pathway from normal personality structure to schizophrenic symptomatology, and their associated attentional correlates, using a variety of attentional tasks in the same sample.

The particular pattern of relationship observed in the present study between the peer and symptom classification systems, in spite of a fifteen year interval, underscores the value of longitudinal work and provides directions for future research. On the one hand, the finding that the aggression-withdrawal construct was more closely related to positive than to negative symptom precursors suggests that behavioral criteria to define high-risk status may be useful specifically as a predictor of positive symptom schizophrenia. In light of the evidence that heredity plays a greater role in negative than in positive symptomatology, genetic criteria on the other hand, may be best conceptualized as predictors of predominantly negative symptom schizophrenia. If indeed the genetic and behavioral risk criteria reflect two distinct developmental pathways to schizophrenia, it would be worthwhile to evaluate whether clinical strategies designed to reduce deviant behaviors in childhood could significantly alter the course of the disorder in high-risk individuals defined on the basis of aggression-withdrawal.

Another important methodological issue raised by the present study concerns the relationship of intelligence to attention. Previous high-risk research has most often ignored the intimate link between these two constructs. Rather than assessing the influence of intelligence on attentional performance, investigators have dealt with the question by excluding from their samples those individuals who score too low on IQ measures The fact that the current results showed a positive correlation between intelligence and attentional performance underscores the importance of considering this variable in attention studies. The approach taken here was to assess the effect of intelligence by using Vocabulary scores as a covariate whenever possible However, the notion that attention is an essential component of the construct of intelligence complicates the picture. It is easy to imagine how a disturbance in the individual's capacity to attend will inevitably have negative consequences on his or her ability to assimilate the information required to perform well on a measure of intelligence. Likewise, it seems reasonable to assume that an individual of low intelligence will have limited attentional capacity. The impact of this factor in studies of attentional deficit in schizophrenia needs further clarification.

In addition to intelligence, the potential influence of drug consumption on attentional performance has been overlooked by high-risk researchers. In the present study, drug intake was assessed only for the 24-hour period which preceded laboratory testing. In view of recent findings from the Concordia Longitudinal

High-Risk Project (Schwartzman & Moskowitz, 1991) which demonstrate a high frequency of substance use disorders in Aggressive-Withdrawn subjects, it would appear important to obtain information on drug intake beyond a 24-hour time period. The prolonged use of drugs may have a significant impact on attentional capacity.

In summary, our knowledge of the status of attentional deficit as an important vulnerability marker for schizophrenia would be increased by taking into consideration the following points: the confirmation of the aggression withdrawal construct as a predictor of schizophrenia, the establishment of a developmental pathway from personality structure to schizophrenic symptomatology, and the potential contribution of intelligence and prolonged substance abuse to attentional performance.

Theoretical considerations

If indeed Bleuler (1911) and Kraepelin (1919) were correct when they postulated, almost a century ago, that disordered attention contributes to the development of schizophrenia, a tremendous amount of work still remains for contemporary researchers. The presence of attentional deficit in individuals at risk for schizophrenia does not, in and of itself, confirm the etiological status of disordered attention in schizophrenia. Rather, it demonstrates its importance as a vulnerability marker for the disorder. The assumption that any vulnerability marker is not merely a correlate of the pre-schizophrenic state but plays a specific

etiological role in the development of the illness must be empirically tested.

Perhaps the most important question which remains to be answered concerns the mechanisms by which disordered attention may produce such a devastating condition. Through decades of experimental research, the construct of attention itself has become operationalized in such a narrow manner that its centrality to survival is most often overlooked When a human being suffers from disordered attention, all aspects of his or her life may be negatively affected. We learn about our world by attending to our surroundings, and then, by deriving vital information from what we register. Profound deficiencies in the knowledge we need in order to survive may result from an inability to attend efficiently to surrounding cues. Such deficiencies may manifest themselves in an impaired capacity for normal intellectual, social, and interpersonal functioning. Ultimately, the adverse consequences of severely disordered attention can be equated with conditions of sensory deprivation, such as blindness of deafness. Both phenomena, disordered attention and sensory deprivation, can lead to protective strategies such as extreme social isolation, or compensatory mechanisms such as paranoid ideation, delusional fantasies, and hallucinatory experiences. What is suggested here is that specific schizophrenic symptoms may be the direct result of disordered attention. Kahneman's (1973) attentional capacity theory is a useful conceptual framework to explore the link between attentional dysfunctions and the various clinical expressions of schizophrenia. Briefly stated, capacity theory defines attention as a

limited resource that can be allocated to specific processing tasks. Allocation policy is flexible and is determined by a variety of factors including the nature of the stimulus to be processed, the nature of the task, and the individual's arousal level. The relevance of capacity theory to schizophrenia has been explored by Gjerde (1983) who has proposed that differences in information processing between schizophrenic and normal subjects may be mediated by differences in arousal. Furthermore, he has suggested that positive and negative symptoms may represent two different phenotypic modes of coping with a genotypically similar condition of hyperarousal which produces a subjective state of capacity overload. Positive symptoms such as hallucinations and delusions are viewed as an attempt to cognitively reorganize information which has become confusing due to flooding. Negative symptoms of withdrawal, apathy, and affective flattening are viewed as a narrowing of attention to protect against the threatening intensity of internal and external simulation.

To speculate on the mechanisms by which disordered attention can lead to symptoms is only half of the answer, however. We must also search for the biological factors which underlie disturbances in attentional function. While the grounding of psychological abnormality in the biology of the individual remains a controversial viewpoint (e.g., Szasz, 1974; 1976), there exists convincing evidence from genetic studies which point to a hereditary component in both the constructs of schizophrenia (Claridge, 1985) and attention (Cornblatt et al., 1989). It is hoped

that the concentrated efforts of schizophrenia researchers will succeed in the near future in providing a unified theory which will explain the missing links in the pathway from brain activity to schizophrenic symptoms. The presence of an attentional deficit in individuals at risk for schizophrenia in this and previous work suggests that the study of attention as the interface between central nervous system abnormalities and schizophrenia is a worthwhile endeavor.

References

Achenbach, T.M., & Edelbrock, C.S. (1978). The classification of child psychopathology: A review and analysis of empirical efforts. Psychological Bulletin, 85, 1275-1301.

Achenbach, T.M., & Edelbrock, C.S. (1984). Psychopathology of childhood. Annual Review of Psychology, 35, 227-256.

American Psychiatric Association (1987). Diagnostic and statistical manual of mental disorders. (3rd ed.). Washington: American Psychiatric Association.

Andreasen, N.C. (1985). Positive vs. negative schizophrenia: A critical evaluation. Schizophrenia Bulletin, 11, 380-389.

Andreasen, N.V., & Olson, S. (1982). Negative vs. positive schizophrenia: Definition and validation. Archives of General Psychiatry, 39, 789-794.

Arieti, S. (1974). Interpretation of schizophrenia. New York: Basic Book.

Asarnow, R.F., Steffy, R.A., MacCrimmon, D.J., & Cleghorn, J.M. (1977). An attentional assessment of foster children at risk for schizophrenia. Journal of Abnormal Psychology, 16, 267-275.

Asarnow, R.F., MacCrimmon, D.J., Cleghorn, J., & Steffy, R.A. (1978). The McMaster-Waterloo Project: An attentional and clinical assessment of foster children at risk for schizophrenia. In L. Wynne, R.L. Cromwell, & S. Matthysse (Eds.), The nature of schizophrenia: New approaches to research and treatment. New York: Wiley.

Asarnow, R.F., & MacCrimmon, D.J. (1978). Residual performance deficit in clinically remitted schizophrenics. Journal of Abnormal Psychology, 87, 597-608.

Asarnow, R.F., & MacCrimmon, D.J. (1981). Span of apprehension deficits during post-psychotic stages of schizophrenia. Archives of General Psychiatry, 38, 1006-1011.

Barbeau, G.L., & Pinard, A. (1963). Epreuve individuelle d'intelligence générale. Institut de Recherches Psychologiques Inc. Montréal.

Bellissimo, A., & Steffy, R.A. (1972). Redundancy-associated deficit in schizophrenic reaction time performance. Journal of Abnormal Psychology, 80, 299-307.

Bergeron, A.M. (1990). Psychophysiological and attentional response patterns in hypothetically psychosis-prone adolescents. Unpublished Doctoral Thesis. Montreal: Concordia University.

Berrios, G.E. (1985). Positive and negative symptoms and Jackson. A conceptual history. Archives of General Psychiatry, 42, 95-97.

Blatt, S.J., & Wild, C.M. (1976). Schizophrenia: A developmental approach. N.Y.: Academic Press.

Bleuler, E. (1911). Dementia praecox or the group of schizophrenias. Translated by J. Zinkin. New York: International Universities Press Inc., reprinted 1950).

Bleuler, M. (1978). The schizophrenic disorders: Long term patient and family studies. New Haven: Hale University Press.

Bower, E.M., Shellhammer, T.A., & Daily, J.M. (1960). School characteristics of male adolescents who later become schizophrenic. American Journal of Orthopsychiatry, 30, 712-729.

Braff, D.L. (1981). Impaired speed of information processing in nonmedicated schizotypal patients. Schizophrenia Bulletin, 7, 499-508

Bruder, G., Yozawitz, A., Berenhaus, I., Sutton, K.S. (1980). Reaction time facilitation in affective psychotic patients. Psychological Medecine, 10, 549-554.

Chapman, L.J., Chapman, J.P., & Miller, E N (1982). Reliabilities and intercorrelations of eight measures of proneness to psychosis. Journal of Consulting and Clinical Psychology, 50, 187-195

Chapman, L.J., Edell, W.S., & Chapman, J.P (1980) Physical anhedonia, perceptual aberration, and psychosis proneness. Schizophrenia Bulletin, 6, 639-653.

Chapman, L.J. (1979). Recent advances in the study of schizophrenic cognition. Schizophrenia Bulletin, 5, 568-580.

Chapman, L.J., Chapman, J.P., & Raulin, M L (1978). Body-image aberration in schizophrenia. Journal of Abnormal Psychology, 87, 399-407

Chapman, L.J., Chapman, J.P., & Raulin, M.L. (1976). Scales for physical and social anhedonia. Journal of Abnormal Psychology, 85, 374-382.

Chapman, J.P. (1966). The early symptoms of schizophrenia. British Journal of Psychiatry, 112, 225-251.

Chapman, J.P., & McGhie, A. (1962). A comparative study of disordered attention in schizophrenia. Journal of Marital Science, 108, 487-500.

Claridge, G., & Broks, P. (1984). Schizotypy and hemisphere function-1. Theoretical considerations and the measurement of schizotypy. Personality and Individual Differences, 5, 633-648.

Claridge, G. (1985). The origins of mental illness: Temperament, deviance and disorder. Oxford: Basil Blackwell Inc.

Cohen, J., & Cohen, P. (1983). Applied multiple regression/correlation analysis for the behavioral sciences. Hillsdale: Lawrence Erlbaum Associates, Publishers.

Cohler, B.J., Grunebaum, H.U., Weiss, J.L., Gamer, E., & Gallant, D.H. (1977). Disturbances of attention among schizophrenic, depressed and well mothers and their children. Journal of Child Psychology and Psychiatry, 18, 115-135.

Cornblatt, B., & Erlenmeyer-Kimling, L. (1984). Early attentional predictors of adolescent behavioral disturbances in children at risk for schizophrenia. In: Watt, N.F., Anthony, E.J., Wynne, L.C., & Rolf, J.E., eds. Children at risk for schizophrenia: A longitudinal perspective. Cambridge University Press, New York, pp. 198-211.

Cornblatt, B.A., & Erlenmeyer-Kimling, L. (1985). Global attentional deviance as a marker of risk for schizophrenia: Specificity and predictive validity. Journal of Abnormal Psychology, 94, 470-486.

Cornblatt, B.A., Lenzenweger, F., Dworkin, R.H., & Erlenmeyer-Kimling, L. (1985). Positive and negative schizophrenic symptoms, attention, and information processing. Schizophrenia Bulletin, 11, 397-408.

Cornblatt, B.A., Risch, N.J., Faris, G., Friedman, D., & Erlenmeyer-Kimling, L. (1989). The continuous performance test, identical pairs version (CPI-IP): 1. New findings about sustained attention in normal families. Psychiatry Research, 26, 223-238.

Crow, T.J. (1985). The two-syndrome concept: Origins and future status. Schizophrenia Bulletin, 11, 471-486.

Crow, T.J. (1980). Molecular pathology of schizophrenia: More than one disease process? British Medical Journal, 280, 66-68.

Davies, D.R. & Parasuraman, R. (1982). The psychology of vigilance. London, Academic Press, Inc.

DeAmicis, L.A., & Cromwell, R.L. (1979). Reaction time crossover in process schizophrenic patients, their relatives, and control subjects. Journal of Nervous and Mental Disease, 167, 593-600.

Duhamel, J.R. (1982). Selective attention and social competence in college students at risk for schizophrenia. Unpublished master's thesis. Concordia University, Montreal, Canada.

Eckblad, M., Chapman, L.J., Chapman, J.P., & Mishlove, M. (1982). The revised social anhedonia scale. Unpublished test, University of Wisconsin, Madison.

Erickson, W.D., Yellin, A.M., Hopwood, J.H., Realmuto, G.M., & Greenberg, L.M. (1984). The effects of neuroleptics on attention in adolescent schizophrenics. Biological Psychiatry, 19, 745-753.

Erlenmeyer-Kimling, L., & Cornblatt, B. (1978). Attentional measures in a study of children at risk for schizophrenia. In L. Wynne, R.L. Cromwell, & S. Matthysse (Eds.). The nature of schizophrenia. New York: Wiley.

Eysenck, H.J., & Eysenck, S.B.G. (1976). Psychoticism as a dimension of personality. Hodder and Stoughton, London.

Eysenck, H.J., & Eysenck, S.B.G. (1975). The manual of the Eysenck Personality Questionnaire. San Diego: Ed ITS/Educational and Industrial Testing Service.

Eysenck, H.J., & Eysenck., S.B.G. (1968). The manual of the Eysenck Personality Inventory. San Diego: EDITS/Educational and Industrial Testing Service.

Eysenck, H.J. (1967). The Biological Basis of Personality. C.C. Thomas, Springfield.

Flor-Henry, P. (1969). Psychosis and temporal lobe epilepsy: A controlled investigation. Epilepsia, 10, 363-395.

Flor-Henry, P. (1983). Cerebral basis of psychopathology. Boston: John Wright/PSG Inc.

Freedman, B.J., & Madison, M.A. (1974). The subjective experience of perceptual and cognitive disturbances in schizophrenia: A review of autobiographical accounts. Achives of General Psychiatry, 30, 333-340.

Garmezy, N., & Streitman, S. (1974). Children at risk: The search for the antecedents of schizophrenia. Part I: Conceptual models and research methods. Schizophrenia Bulletin, 8, 14-90.

Gjerde, P.F. (1983). Attentional capacity dysfunction and arousal in schizophrenia. Psychological Bulletin, 93, 57-72.

Gottesman, I.I., & Shields, J. (1982). Schizophrenia, the epigenetic puzzle. New York: Cambridge University Press.

Green, M., & Walker, E. (1986a). Symptom correlates of vulnerability to backward masking in schizophrenia. American Journal of Psychiatry, 143, 181-186.

Green, M., & Walker, E. (1986b). Attentional performance in positive- and negative-symptom schizophrenia. The Journal of Nervous and Mental Disease, 174, 208-213.

Green, M., & Walker, E. (1984). Susceptibility tc backward masking in schizophrenic patients with positive or negative symptoms. American Journal of Psychiatry, 141, 1273-1275.

Greiffenstein, M , Milberg, W., Lewis, R., & Rosenbaum. G. (1981). Temporal lobe epilepsy and schizophrenia: Comparison of reaction time deficits. Journal of Abnormal Psychology, 90, 105-112.

Grunebaum, H., Weiss, J.L., Gallant, D., & Cohler, B.J. (1974). Attention in young children of psychotic mothers. American Journal of Psychiatry, 131, 887-891.

Gruzelier, J.H. (1983). A critical assessment and integration of lateral asymmetries in schizophrenia. In Hemisyndromes: Psychobiology, Neurology, and Psychiatry. Myslobodsky, M. Ed. New York: Academic Press.

Gur, R.E. (1978). Left hemisphere dysfunction and left hemisphere activation in schizophrenia. Journal of Abnormal Psychology, 87, 226-238.

Hanson, D.R., Gottesman, I.I., & Meehl, P.E. (1977). Genetic theories and the validation of psychiatric diagnoses: Implications for the study of children of schizophrenics. Journal of Abnormal Psychology, 86, 575-588.

Hemsley, D.R., & Richardson, P.H. (1980). Shadowing by context in schizophrenia. Journal of Nervous and Mental Disease, 168, 141-145.

Hemsley, D.R., & Zawada, S.L. (1976). "Filtering" and the cognitive deficit in schizophrenia. British Journal of Psychiatry, 128, 456-461.

Herman, J., Mirsky, A.F., Ricks, N.C. & Gallant, D. (1977). Behavioral and electrographic measures of attention in children at risk for schizophrenia. Journal of Abnormal Psychology, 86, 27-33.

Kahneman, D. (1973). Attention and effort. Englewood Cliffs, NJ: Prentice-Hall Inc.

Kety, S.S., Rosenthal, P., Wender, P.H., Schulsinger, F., & Jacobsen, B. (1978). The biologic and adoptive families of adopted individuals who became schizophrenic. Prevalence of mental illness and other characteristics. In L. Wynne, R. Cromwell & S. Matthysse (Eds.), The Nature of Schizophrenia. New York: Wiley.

Knight, R.G., Elliot, D.S., & Freedman, E.G. (1985). Short- term visual memory in schizophrenics. Journal of Abnormal Psychology, 94, 427-442.

Knight, R.G., Youard, P.J., Wooles, I.M. (1985). Visual information-processing deficits in chronic schizophrenic subjects using tasks matched for discriminating power. Journal of Abnormal Psychology, 94, 454-459.

Kornetsky, C., & Orzack, M.H. (1978). Physiological and behavioral correlates of attention dysfunction in schizophrenic patients. In: Wynne, L.C., Cromwell, R.L., & Matthysse, S. The nature of schizophrenia: New approaches to research and treatment. New York: J. Wiley and Sons, pp. 196-204.

Korboot, P.J., & Damiani, N. (1976). Auditory processing speed and signal detection in schizophrenia. Journal of Abnormal Psychology, 85, 287-295.

Kraepelin, E. (1919). Dementia praecox and paraphrenia. New York: R.E. Krieger.

Ledingham, J.E. (1981). Developmental patterns of aggressive and withdrawn behavior in childhood: A possible method for identifying preschizophrenics. Journal of Abnormal Child Psychology, 9, 1-22.

Ledingham, J.E., & Schwartzman, A.E. (1984). Three-year follow-up of aggressive and withdrawn behavior in childhood: Preliminary findings. Journal of Abnormal Child Psychology, 12, 157-168.

Lewine, R.R., Fogg, L., & Meltzer, H.Y. (1983). Assessment of negative and positive symptoms in schizophrenia, Schizophrenia Bulletin, 9, 368-376.

Manuzza, S. (1980). Cross-modal reaction time and schizophrenic attentional deficit: A critical review. Schizophrenia Bulletin, 6, 654-675.

Marcus, L.M. (1972). Studies of attention in children vulnerable to psychopathology. Unpublished doctoral dissertation, University of Minnesota.

McGhie, A., & Chapman, J. (1961). Disorders of attention and perception in early schizophrenia. British Journal of Medical Psychology, 34, 103-116.

McGowan, W.T., & Appel, J.B. (1977). An APL program for calculating signal detection indices. Behavior Research Methods & Instrumentation, 9, 517-521.

McGrath, M.E. (1984) First person account: Where did I go ? Schizophrenia Bulletin, 10, 638-640.

Michael, C.M., Morris, D.P., & Soroker, E. (1957). Follow-up studies of shy, withdrawn children. II: Relative incidence of schizophrenia. American Journal of Orthopsychiatry, 27, 331-337.

Mishlove, M. & Chapman, L.J. (1985) Social anhedonia in the prediction of psychosis proneness. Journal of Abnormal Psychology, 94, 384-396.

Muntaner, C., Garcia-Sevilla, L., Fernandez, A., & Torrubia, R. (1988). Personality dimensions, schizotypal and borderline personality traits and psychosis proneness. Personality and Individual Differences, 9, 257-268.

Nuechterlein, K. (1977). Reaction time and attention in schizophrenia. A critical evaluation of the data and theories. Schizophrenia Bulletin, 3, 373-428.

Nuechterlein, K.H. (1983) Signal detection in vigilance tasks and behavioral attributes among offspring of schizophrenic mothers and among hyperactive children. Journal of Abnormal Psychology, 92, 4-28.

Nuechterlein, K.H., & Dawson, M.E. (1984). Information processing and attentional functioning in the developmental course of schizophrenic disorders. Schizophrenia Bulletin, 10, 160-203.

Olbrich, R. (1972). Reaction time in brain-damaged and normal subjects to variable preparatory intervals. Journal of Nervous and Mental Disease, 155, 356-362.

Oltmanns, T.F. (1978). Selective attention in schizophrenic and manic psychoses: The effect of distraction on information processing. Journal of Abnormal Psychology, 87, 212-225.

Oltmanns, T.F., Ohayon, J., & Neale, J.M. (1978). The effect of antipsychotic medication and diagnostic criteria on distractability in schizophrenia. Journal of Psychiatric Research, 14, 81-91.

Orvaschel, H., Mednick, S., Schulsinger, F., & Rock, D. (1979). The children of psychiatrically disturbed parents: Differences as a function of the sex of the sick parent. Archives of General Psychiatry, 36, 691-695.

Orzack, M.H., & Kornetsky, C. (1966). Attention dysfunction in chronic schizophrenia. Archives of General Psychiatry, 14, 323-326.

Parasuraman, R.B. (1979). Memory load and event rate control sensitivity decrements in sustained attention. Science, 203, 924-927

Pass, H.L., Klorman, R., Salzman, L.F., Klein, R.H., & Kaskey, G.B. (1980). The late positive component of the evoked responses in acute schizophrenics during a test of sustained attention. Biological Psychiatry, 15, 9-20.

Payne, R.W., Hochberg, A.C., & Hawks, D.V. (1970). Dichotic stimulation as a method of assessing disorder of attention in overinclusive schizophrenic patients. Journal of Abnormal Psychology, 76, 185-193.

Pekarik, E.G., Prinz, R.J., Liebert, D.E., Weintraub, S., & Neale, J.M. (1976). The pupil evaluation inventory: A sociometric technique for assessing children's social behavior. Journal of Abnormal Child Psychology, 4, 83-97.

Pogue-Geile, M.F., & Oltmanns, T.F. (1980). Sentence perception and distractability in schizophrenic, manic, and depressed patients. Journal of Abnormal Psychology, 89, 115-124.

Pogue-Geile, M.F. & Harrow, M. (1985). Negative symptoms in schizophrenia: Their longitudinal course and prognostic importance. Schizophrenia Bulletin, 11, 427-439.

Pogue-Geile, M.F. & Harrow, M. (1984). Negative and positive symptoms in schizophrenia and depression: A follow-up. Schizophrenia Bulletin, 10, 371-387.

Quay, H.C. (1979). Classification. In H.C. Quay & J.S. Werry (Eds.). Psychopathological disorders of childhood. (2nd ed.). New York: Wiley.

Quay, H.C. (1986). Classification. In H.C. Quay & S.S. Werry (Eds.) Psychological disorders of childhood, 3rd Ed. (pp. 1-34). New York: John Wiley & Sons.

Rappaport, M. (1967). Competing voice messages: Effect of message load and drugs on the ability of acute schizophrenics to attend. Archives of General Psychiatry, 17, 97-103.

Robins, L.N. (1966). Deviant children grown up. Baltimore: Williams & Wilkins.

Rosenthal, D. (1970). Genetic theory and abnormal behavior. New York: McGraw-Hill.

Rosofsky, I., Levin, S., & Holzman, P.S. (1982). Psychomotility and functional psychosis. Journal of Abnormal Psychology, 91, 71-74.

Rosvold, H.E., Mirsky, A., Sarason, I., Bransome, E.D., Jr., & Beck, L.H. (1956). A continuous performance test of brain damage. Journal of Consulting Psychology, 20, 343-350.

Rutschmann, J., Cornblatt, B., & Erlenmeyer-Kimling, L. (1977). Sustained attention in children at risk for schizophrenia: Report on a continuous performance test. Archives of General Psychiatry, 34, 571-575.

Saccuzzo, D.P., & Braff, D.L. (1981). Early information processing deficit in schizophrenia. Archives of General Psychiatry, 38, 175-179.

Schneider, S.J. (1976). Selective attention in schizophrenia. Journal of Abnormal Psychology, 85, 167-173.

Schwartzman, A.E., & Moskowitz, D. (1991). Les comportements agressifs et renfermes de l'enfance comme facteurs de risque: Les sequelles psychosociales à l'âge adulte. Final report presented to Conseil quebequois de la recherche sociale. Montreal: Concordia University.

Schwartzman, A.E., Ledingham, J.E., & Serbin, L.A. (1985). Identification of children at risk for adult schizophrenia. International Review of Applied Psychology. 34, 363-380.

Simons, R.F., MacMillan, G.W., & Ireland, F.B. (1982). Reaction-time crossover in preselected schizotypic subjects. Journal of Abnormal Psychology, 91, 414-419.

Spencer, T.J., & Schuntich, R. (1970). Evidence for an interruption theory of backward masking. Journal of Experimental Psychology, 85, 198-203.

Spring, B.J. (1980). Shift of attention in schizophrenics, siblings of schizophrenics, and depressed patients. Journal of Nervous and Mental Disease, 168, 133-140.

Spring, B., Lemon, M., Weinstein, L., & Haskell, A. (1989). Distractability in schizophrenia: State and trait aspects. British Journal of Psychiatry, 155 (suppl. 5), 63-68.

SPSS-X Inc. (1988). SPSS-X User's guide (3rd ed.) Chicago: Author.

Strauss, M.E., Wagman, A.M.I., & Quaid, K.A. (1983). Preparatory interval influences on reaction-time of elderly adults. Journal of Gerontology, 38, 55-57.

Swets, J. (1973). The relative operating characteristic in psychology. Science, 182, 990-1000.

Szasz, T.S. (1976). Schizophrenia. Oxford: Oxford University Press.

Szasz, T.S. (1974). The myth of mental illness. New York: Harper & Row.

Tabachnik, B.G., & Fidell, L.S. (1983). Using multivariate statistics. New York: Harper & Row Publishers.

Tétreault, R. (1987). Les enfants de la rue: Fernand. Les Productions du Verseau et l'Office Nationale du Film du Canada.

Tsuang, M.Y., & Winukor, G. (1974). Criteria for subtyping schizophrenia: Clinical differentiation of hebephrenic and paranoid schizophrenia. Archives of General Psychiatry, 31, 43-47.

Van Dyke, J.L., Rosenthal, D., & Rasmussen, P.V. (1975). Schizophrenia: Effects of inheritance and rearing on reaction time. Canadian Journal of Behavioral Science, 7, 223-236.

Wagner, M., Kurtz, G., & Engel, R.R. (1989). Normal P300 in acute schizophrenics during a Continuous Performance Test. Biological Psychiatry, 25, 792-795.

Walker, E. (1981). Attentional and neuromotor functions of schizophrenics, schizoaffectives, and patients with other affective disorders. Archives of General Psychiatry, 38, 1355-1358.

Watt, N.F., Storolow, R.D., Lubensky, A.W., & McClelland, D.C. (1970). School adjustment and behavior of children hospitalized for schizophrenia as adults. American Journal of Orthopsychiatry, 40, 637-657.

Wishner, J., & Wahl, O. (1974). Dichotic listening in schizophrenia. Journal of Consulting and Clinical Psychology, 42, 538-546

Wolhlberg, G.W., Kornetsky, C. (1973). Sustained attention in remitted schizophrenics. Archives of General Psychiatry, 28, 533-537.

Wood, R.L., & Cook, M. (1979). Attentional deficit in the siblings of schizophrenics. Psychological Medicine, 9, 465-467

Zubin, J., Magaziner, J., & Steinhauser, S.R. (1983). The metamorphosis of schizophrenia: From chronicity to vulnerability. Psychological Medecine, 13, 551-571.

Zubin, J. & Spring, B. (1977). Vulnerability: A new view of schizophrenia. Journal of Abnormal Psychology, 86, 103-126.

APPENDIX A

Questionnaires

EYSENCK PERSONALITY QUESTIONNAIRE

FACTEURS: **E** - Extraversion

N - Neuroticism

P - Psychoticism

1.	As-tu plusieurs sortes de passe-temps?	**OUI**	non	E
2	T'arrêtes-tu pour penser avant de faire quelque chose?	oui	**NON**	P
3	As-tu souvent des hauts et des bas dans ton humeur?	**OUI**	non	N
4.	Es-tu une personne qui parle beaucoup?	**OUI**	non	E
5.	Est-ce que ça t'énerverait d'être endetté(e)?	oui	**NON**	P
6	Est-ce que ça t'arrive de te sentir malheureux(se) sans trop savoir pourquoi?	**OUI**	non	N
7	Est-ce que tu t'assures que toutes les portes sont bien barrées le soir avant de te coucher?	oui	**NON**	P
8	Es-tu une personne pleine d'énergie?	**OUI**	non	E
9	Est-ce que ça te dérangerait beaucoup de voir souffrir un enfant ou un animal?	oui	**NON**	P
10.	T'en fais-tu souvent à propos de choses que tu n'aurais pas dû dire ou faire?	**OUI**	non	N
11	Habituellement, es-tu capable de te laisser aller et d'avoir du plaisir dans un bon party?	**OUI**	non	E
12.	Es-tu une personne irritable?	**OUI**	non	N
13	Aimes tu rencontrer du nouveau monde?	**OUI**	non	E
14.	Est-ce que tu crois que c'est une bonne idée d'avoir des assurances?	oui	**NON**	P

15	Est-ce que tu as tendance à te sentir facilement blessé(e)?	**OUI**	non	**N**
16	As-tu tendance à te tenir à l'écart lorsque tu te retrouves en groupe?	oui	**NON**	**E**
17	Prendrais-tu des drogues qui pourraient avoir des effets étranges ou dangereux?	**OUI**	non	**P**
18	Sens-tu souvent que tu es tanné(e) ou que tu en as assez?	**OUI**	non	**N**
19	Aimes-tu beaucoup sortir?	**OUI**	non	**E**
20.	Prends-tu plaisir à faire du mal à des gens que tu aimes?	**OUI**	non	**P**
21	Est-ce que ça t'arrive souvent de te sentir coupable?	**OUI**	non	**N**
22	Préfères-tu rester seul(e) plutôt que de rencontrer du monde?	oui	**NON**	**E**
23	As-tu des ennemi(e)s qui te veulent du mal?	**OUI**	non	**P**
24	Dirais-tu que tu es une personne nerveuse?	**OUI**	non	**N**
25	As-tu plusieurs ami(e)s?	**OUI**	non	**E**
26	Aimes-tu jouer des tours qui peuvent parfois vraiment faire mal aux gens?	**OUI**	non	**P**
27	Es-tu le genre de personne qui s'inquiete beaucoup?	**OUI**	non	**N**
28	Dirais-tu que tu es le genre qui ne s'en fait pas avec la vie?	**OUI**	non	**E**
29	Est-ce que les bonnes manières et la propreté sont très importantes pour toi?	oui	**NON**	**P**
30	T'en fais-tu beaucoup à propos de mauvaises choses qui pourraient arriver?	**OUI**	non	**N**
31	Fais-tu habituellement les premiers pas pour te faire de nouveaux amis?	**OUI**	non	**E**
32	Dirais-tu que tu es une personne tendue ou sur les nerfs?	**OUI**	non	**N**
33	As-tu tendance à être tranquille quand tu te retrouves avec du monde?	oui	**NON**	**E**
34	Crois-tu que le mariage est vieux-jeu et que ça ne devrait plus exister?	**OUI**	non	**P**
35	Peux-tu facilement mettre de la vie dans un party ennuyant?	**OUI**	non	**E**
36	Est-ce que les gens qui conduisent prudemment t'énervent?	**OUI**	non	**P**
37	T'en fais-tu à propos de ta santé?	**OUI**	non	**N**

38.	Aimes-tu faire des farces et raconter des histoires drôles à tes ami(e)s?	**OUI**	non	E
39.	Est-ce que la plupart des choses goûtent à peu près la même chose pour toi?	**OUI**	non	P
40.	Aimes-tu te mêler aux gens?	**OUI**	non	E
41.	Est-ce que ça t'inquiète si tu sais qu'il y a des erreurs dans le travail que tu fais?	oui	**NON**	P
42.	As-tu de la difficulté à dormir?	**OUI**	non	N
43.	As-tu presque toujours "la réponse à tout" quand les gens te parlent?	**OUI**	non	E
44	Aimes-tu arriver bien à l'avance à tes rendez-vous?	oui	**NON**	P
45.	T'es-tu souvent senti(e) nonchalant(e) et fatigué(e) sans trop savoir pourquoi?	**OUI**	non	N
46.	Aimes-tu faire des choses qui te demandent de réagir vite?	**OUI**	non	E
47.	Est-ce que ta mère est (ou était) une bonne personne?	oui	**NON**	P
48.	As-tu souvent l'impression que la vie est "plate"?	**OUI**	non	N
49	Est-ce que ça t'arrive souvent de prendre plus d'activités que tu es capable d'en faire?	**OUI**	non	E
50.	Est-ce qu'il y a plusieurs personnes qui essaient toujours de t'éviter?	**OUI**	non	P
51.	T'en fais-tu beaucoup à propos de ton apparence?	**OUI**	non	N
52.	Penses-tu que les gens passent trop de temps à préparer leur retraite en économisant et en prenant des assurances?	**OUI**	non	P
53	As-tu déjà souhaité être mort(e)?	**OUI**	non	N
54.	Es-tu un(e) bout-en-train qui met de la vie dans un party?	**OUI**	non	E
55	Essaies-tu de ne pas être bête avec le monde?	oui	**NON**	P
56.	Est-ce que tu as tendance à t'en faire trop longtemps suite à une expérience embarrassante?	**OUI**	non	N
57.	Es-tu genre de personne qui arrive toujours à la dernière minute?	**OUI**	non	P
58.	As-tu des problèmes avec tes "nerfs"?	**OUI**	non	N

59	Est-ce que tes amitiés se terminent souvent sans que ce soit de ta faute?	**OUI**	non	**P**
60	Te sens-tu souvent seul(e)?	**OUI**	non	**N**
61	Aimes-tu parfois agacer les animaux?	**OUI**	non	**P**
62	Es-tu facilement blessé(e) quand les gens te font des reproches?	**OUI**	non	**N**
63	Aimes-tu que ça bouge et que ce soit mouvementé autour de toi?	**OUI**	non	**E**
64	Aimerais-tu que les autres aient peur de toi?	**OUI**	non	**P**
65	As-tu tendance à déborder d'énergie certains jours et puis à te traîner d'autres jours?	**OUI**	non	**N**
66.	Est-ce que les gens te voient comme une personne pleine d'énergie?	**OUI**	non	**E**
67	Est-ce que les gens te racontent beaucoup de mensonges?	**OUI**	non	**P**
68	Es-tu susceptible par rapport à certaines choses?	**OUI**	non	**N**
69	Eprouverais-tu de la pitié pour un animal pris dans un piège?	oui	**NON**	**P**

Schizotypal Personality Questionnaire

1.	Crois-tu à la télépathie?	OUI	NON
2.	As-tu souvent l'impression que les gens vont te tromper?	OUI	NON
3.	Est-ce que ça t'arrive souvent, quand tu es à la noirceur, de voir des ombres et des formes, même s'il n'y a rien?	OUI	NON
4.	As-tu parfois l'impression d'entendre ta voix comme si elle venait de loin?	OUI	NON
5.	Est-ce que ça t'arrive souvent de t'apercevoir que chacune de tes pensées déclanche automatiquement et immédiatement toute une série d'idées?	OUI	NON
6.	Est-ce qu'il t'arrive d'être hypersensible (très sensible) au bruit ou à la lumière?	OUI	NON
7.	As-tu souvent des rêves très clairs qui dérangent ton sommeil?	OUI	NON
8.	Quand tu es anxieux(se) ou troublé(e) par quelque chose, as-tu des problèmes d'intestins (constipation ou diarrhée, etc.?)	OUI	NON
9.	As-tu déjà eu l'impression, en te regardant dans le miroir, que ton visage avait l'air différent?	OUI	NON
10.	D'après toi, est-il plus prudent de ne pas faire confiance à personne?	OUI	NON
11.	Est-ce qu'il t'arrive d'avoir l'impression que les choses ne sont pas réelles?	OUI	NON
12.	Te sens-tu seul(e) la plupart du temps, même quand tu es avec du monde?	OUI	NON
13.	As-tu parfois l'impression que des objets ordinaires ont l'air beaucoup plus gros ou plus petits que d'habitude?	OUI	NON
14.	Es-tu souvent dérangé(e) par l'impression que les gens te surveillent?	OUI	NON

15.	As-tu l'impression que tu ne peux pas te sentir proche des gens?	OUI	NON
16.	As-tu des craintes à l'idée d'entrer seul(e) dans une pièce où des gens sont déjà regroupés et parlent ensemble?	OUI	NON
17.	T'arrive-t-il parfois d'être particulièrement sensible aux odeurs?	OUI	NON
18.	Es-tu parfois certain(e)s que d'autres peuvent deviner tes pensées?	OUI	NON
19.	As-tu déjà eu la sensation que ton corps, ou une partie de ton corps changeait de forme?	OUI	NON
20.	Est-ce que ça t'arrive d'être certain(e) que quelque chose va arriver, sans avoir vraiment de raison qui te porte à penser ça?	OUI	NON
21.	Est-ce qu'il t'arrive d'être distrait(e) par des sons ou des bruits lointains auxquels tu ne portes pas attention habituellement?	OUI	NON
22.	T'arrive-t-il d'avoir un vague sentiment de danger, d'inquiétude soudaine, sans trop comprendre pourquoi?	OUI	NON
23.	Est-ce que ça t'est déjà arrivé de penser que tu avais entendu des gens parler et de t'apercevoir que c'était seulement du bruit?	OUI	NON
24.	Est-ce que ça t'arrive que tes pensées s'arrêtent et que tu ne puisses plus continuer à parler, comme si tu avais complètement perdu le fil de ton idée?	OUI	NON
25.	Sens-tu que tu dois être sur tes gardes, même avec tes ami(e)s?	OUI	NON
26.	Est-ce qu'il t'arrive de sentir que tes propres pensées ne t'appartiennent pas?	OUI	NON
27.	As-tu souvent de la difficulté à suivre une conversation quand il y a beaucoup de monde alentour?	OUI	NON
28.	Sens-tu parfois que tes malchances sont causées par des forces mystérieuses?	OUI	NON

29.	As-tu l'impression de temps à autres que les gens parlent de toi?	OUI	NON
30.	Crois-tu que les rêves peuvent devenir réalité?	OUI	NON
31.	As-tu parfois l'impression que ce que tu dis est difficile à comprendre parce que les mots sont tout mélangés et n'ont pas d'allure?	OUI	NON
32.	Est-ce que tes pensées sont parfois si fortes que tu peux presque les entendre?	OUI	NON
33.	En vivant une nouvelle expérience, as-tu déjà eu l'impression que c'était une répétition de quelque chose que tu avais déjà vécu avant?	OUI	NON
34.	As-tu déjà senti que tu communiquais avec une personne par télépathie?	OUI	NON
35.	Pars-tu souvent dans la lune quand tu travailles?	OUI	NON
36.	Quand quelqu'un te fait un reproche, es-tu très blessé(e)?	OUI	NON
37.	Est-ce que ça t'arrive de te sentir nerveux(se) quand quelqu'un marche derrière toi?	OUI	NON

Chapman Scales

FACTEURS: ***Pa*** *- Perceptual aberration*
Pad *- Physical anhedonia*
Sad *- Social anhedonia*

1.	On surestime beaucoup la beauté des couchers de soleil.	**VRAI**	faux	Pad
2.	Avoir plusieurs ami(e)s n'est pas si important que les gens le disent.	**VRAI**	faux	Sad
3.	J'ai parfois dansé seul(e) uniquement pour sentir mon corps suivre la musique.	vrai	**FAUX**	Pad
4.	J'ai rarement eu envie de chanter sous la douche.	**VRAI**	faux	Pad
5.	J'attache peu d'importance au fait d'avoir des ami(e)s intimes.	**VRAI**	faux	Sad
6.	J'ai parfois eu la sensation de faire partie d'un objet près de moi.	**VRAI**	faux	Pa
7.	J'aime mieux écouter la télévision que de sortir avec des gens.	**VRAI**	faux	Sad
8.	Il m'est déjà arrivé qu'un de mes bras ou qu'une de mes jambes semble détaché du reste de mon corps.	**VRAI**	faux	Pa
9.	Après une grosse journée, j'ai souvent apprécié la détente qu'offre une marche lente.	vrai	**FAUX**	Pad
10.	C'est bien plus agréable d'aller faire un tour de bicyclette si quelqu'un m'accompagne.	vrai	**FAUX**	Sad
11.	J'apprécie une poignée de mains ferme et sincère.	vrai	**FAUX**	Pad
12.	Je n'ai jamais trouvé la musique de fanfare excitante.	**VRAI**	faux	Pad
13.	J'aime faire des appels interurbains à des ami(e)s ou à de la parenté.	vrai	**FAUX**	Sad
14.	A l'occasion, il m'arrive de devoir me pincer pour m'assurer que je suis toujours là.	**VRAI**	faux	Pa
15.	En mangeant un plat favori, j'ai souvent essayé de le manger longuement pour faire durer le plaisir.	vrai	**FAUX**	Pad

16.	A la vue d'un tapis moëlleux, j'ai déjà eu envie de retirer mes chaussures et d'y marcher pieds nus.	**VRAI**	faux	Pad
17.	A mon avis, quant au goût, tous les aliments se valent.	**VRAI**	faux	Pad
18.	Jouer avec des enfants est une véritable corvée.	**VRAI**	faux	Sad
19.	J'ai parfois eu la sensation qu'une partie de mon corps était plus grande que d'habitude.	**VRAI**	faux	Pa
20.	Je me suis déjà demandé(e) si mon corps était vraiment le mien.	**VRAI**	faux	Pa
21.	J'ai toujours pris plaisir à regarder des photos de mes ami(e)s.	vrai	**FAUX**	Sad
22.	Des parties de mon corps me semblent parfois mortes ou irréelles.	**VRAI**	faux	Pa
23.	Même si je préfère faire certaines choses tout(e) seul(e), d'habitude j'ai plus de plaisir quand je les fais avec d'autres.	vrai	**FAUX**	Sad
24.	Je n'ai jamais pris beaucoup de plaisir à des activités physiques comme la marche, la natation, ou d'autres sports.	**VRAI**	faux	Pad
25.	En passant à côté de fleurs, je me suis souvent arrêté(e) pour les sentir.	vrai	**FAUX**	Pad
26.	Le sexe est agréable, mais pas autant que la plupart des gens le prétendent.	**VRAI**	faux	Pad
27.	J'ai déjà eu l'impression passagère qu'une partie de mon corps était en train de pourrir.	**VRAI**	faux	Pa
28.	Il m'est déjà arrivé d'éprouver la sensation que mon corps n'existait pas.	**VRAI**	faux	Pa
29.	Je m'attache souvent aux gens avec qui je passe beaucoup de temps.	vrai	**FAUX**	Sad
30.	J'ai souvent pris des marches pour me délasser et me distraire.	vrai	**FAUX**	Pad
31.	Les gens pensent souvent que je suis gêné(e) alors que, dans le fond, je veux juste rester tout(e) seul(e).	**VRAI**	faux	Sad
32.	J'aime la sensation de me retrouver dans un endroit élevé et d'observer le panorama.	vrai	**FAUX**	Pad
33.	Je me rappelle avoir déjà eu l'impression de ne pas pouvoir discerner mon corps des autres objets autour de moi.	**VRAI**	faux	Pa
34.	Ça me fait plaisir quand les choses vont vraiment bien pour mes bon(ne)s ami(e)s.	vrai	**FAUX**	Sad

35.	Goûter des plats différents m'a toujours plu.	vrai	**FAUX**	Pad
36.	Je n'ai jamais trouvé qu'un orage puisse être excitant.	**VRAI**	faux	Pad
37.	Quand quelqu'un qui m'est cher est déprimé, je le suis moi aussi.	vrai	**FAUX**	Sad
38.	Il m'est arrivé à l'occasion de sentir mon corps se fondre dans l'espace environnant.	**VRAI**	faux	Pa
39.	Les lumières de la ville sont magnifiques à regarder.	vrai	**FAUX**	Pad
40.	Je me suis souvent senti(e) mal à l'aise quand des ami(e)s m'ont touché(e).	**VRAI**	faux	Pad
41.	Ma façon de réagir émotivement semble très différente des autres.	**VRAI**	faux	Sad
42.	Je n'ai jamais senti que mes bras ou mes jambes étaient momentanément devenus plus longs.	vrai	**FAUX**	Pa
43.	Je ne me suis jamais préoccupé(e) de la texture des aliments.	**VRAI**	faux	Pad
44.	En passant devant une boulangerie, l'odeur du pain frais m'a souvent ouvert l'appétit.	vrai	**FAUX**	Pad
45.	Quand je suis seul(e) à la maison, souvent je n'aime pas que les gens me téléphonent ou frappent à la porte.	**VRAI**	faux	Sad
46.	Les poètes exagèrent toujours la beauté et les joies de la nature.	**VRAI**	faux	Pad
47.	Les frontières de mon corps m'ont toujours semblé claires.	vrai	**FAUX**	Pa
48.	J'ai déjà éprouvé beaucoup de joie à admirer un paysage majestueux.	vrai	**FAUX**	Pad
49.	Je me sens bien, juste par le fait d'être avec des ami(e)s.	vrai	**FAUX**	Sad
50.	Je me rappelle avoir senti un de mes membres prendre une forme étrange.	**VRAI**	faux	Pa
51.	Je prends toujours plaisir à être touché(e) par quelqu'un que j'aime.	vrai	**FAUX**	Pad
52.	Quand quelque chose me dérange, j'aime en parler à d'autres personnes.	vrai	**FAUX**	Sad
53.	J'ai souvent ressenti un certain bien-être en massant mes muscles fatigués ou endoloris.	vrai	**FAUX**	Pad
54.	J'ai parfois eu l'impression que mon corps était anormal.	**VRAI**	faux	Pa

55.	J'aime mieux les passe-temps et les loisirs qui n'impliquent personne d'autre.	**VRAI**	faux	Sad
56.	J'ai déjà eu la sensation que l'intérieur de mon corps se décomposait.	**VRAI**	faux	Pa
57.	J'ai toujours aimé me faire masser le dos.	vrai	**FAUX**	Pad
58.	Il est agréable de chanter avec d'autres personnes.	vrai	**FAUX**	Sad
59.	La musique d'orgue m'a souvent fait vibrer intérieurement.	vrai	**FAUX**	Pad
60.	Le fait de savoir que j'ai des ami(e)s qui tiennent à moi me donne un sentiment de sécurité.	vrai	**FAUX**	Sad
61.	J'ai toujours trouvé que la première chute de neige de l'hiver était jolie.	vrai	**FAUX**	Pad
62.	Si je déménage dans un autre quartier, j'ai besoin de me faire de nouveaux amis, de nouvelles amies.	vrai	**FAUX**	Sad
63.	Il m'est arrivé d'avoir la sensation passagère que les choses que je touchais restaient collées à moi.	**VRAI**	faux	Pa
64.	Les gens sont pas mal mieux s'ils ne s'impliquent pas émotivement avec la plupart des gens.	**VRAI**	faux	Sad
65.	Faire voler un cerf-volant est un jeu stupide.	**VRAI**	faux	Pad
66.	Même si je sais que je devrais ressentir de l'affection pour certaines personnes, je n'en ressens pas.	**VRAI**	faux	Sad
67.	Le bruissement des feuilles des arbres ne m'a jamais particulièrement charmé(e).	**VRAI**	faux	Pad
68.	Il m'a déjà semblé que mon corps avait pris la forme de celui de quelqu'un d'autre.	**VRAI**	faux	Pa
69.	J'ai parfois l'impression que la pièce autour de moi est en train de pencher.	**VRAI**	faux	Pa
70.	Règle générale, j'ai toujours trouvé que la musique douce était plus ennuyante que reposante.	**VRAI**	faux	Pad
71.	Les gens s'attendent souvent à ce que je passe plus de temps à parler avec eux que j'en ai le goût.	**VRAI**	faux	Sad
72.	Je n'ai jamais aimé les bains de soleil, ça me donne trop chaud.	**VRAI**	faux	Pad

73.	J'ai déjà eu une impression de bien-être et de sécurité en entendant le crépitement de la pluie sur le toit.	vrai	**FAUX**	Pad
74.	Les odeurs qui s'échappent d'une cuisine à l'heure des repas ont rarement éveillé mon appétit.	**VRAI**	faux	Pad
75.	Je me sens content(e) et flatté(e) quand j'en apprends plus sur ce que mes ami(e)s vivent émotivement.	vrai	**FAUX**	Sad
76.	Je prends habituellement mon bain ou ma douche de façon à en finir au plus vite.	**VRAI**	faux	Pad
77.	Il m'arrive de trouver les couleurs ordinaires beaucoup trop éclatantes (sans être dû à l'effet d'aucune drogue).	**VRAI**	faux	Pa
78.	Quand les autres essayent de me parler de leurs problèmes ou de leurs "bibittes", j'écoute d'habitude attentivement et avec intérêt.	vrai	**FAUX**	Sad
79.	Je n'ai jamais eu l'impression que mes pieds ou mes mains étaient étrangement loin de moi.	vrai	**FAUX**	Pa
80.	J'aime caresser des chatons ou des chiots et jouer avec eux.	vrai	**FAUX**	Pad
81.	Il est arrivé qu'une partie de mon corps semblait ne plus m'appartenir.	**VRAI**	faux	Pa
82.	Je n'ai jamais vraiment eu d'ami(e) intime à l'école.	**VRAI**	faux	Sad
83.	Quand je me sens triste, chanter me remonte quelquefois le moral.	vrai	**FAUX**	Pad
84.	J'ai déjà eu la sensation qu'un objet, en réalité distinct de moi, faisait partie de mon corps.	**VRAI**	faux	Pa
85.	J'ai rarement eu envie d'essayer de nouveaux mets.	**VRAI**	faux	Pad
86.	Je ne comprends pas pourquoi les gens ont du plaisir à regarder les étoiles.	**VRAI**	faux	Pad
87.	Je n'en demande pas davantage que de rester assis(e) tout(e) seul(e) à rêver et à penser.	**VRAI**	faux	Sad
88.	J'ai toujours eu un certain nombre de mets favoris.	vrai	**FAUX**	Pad
89.	Je suis bien trop indépendant(e) pour m'impliquer avec d'autres personnes.	**VRAI**	faux	Sad
90.	S'étendre au soleil n'est vraiment pas plus agréable que de s'étendre à l'intérieur.	**VRAI**	faux	Pad

91.	Il m'a déjà semblé que mon corps et celui d'une autre personne ne formaient qu'un seul et même corps.	**VRAI**	faux	Pa
92.	De temps à autre, lorsque je me regarde dans un miroir, mon visage semble différent de ce qu'il est d'habitude.	**VRAI**	faux	Pa
93.	Il n'y a pas grand chose de plus fatiguant que d'avoir une longue discussion avec quelqu'un.	**VRAI**	faux	Sad
94.	J'ai toujours détesté la sensation d'épuisement après un exercice vigoureux.	**VRAI**	faux	Pad
95.	Je ne sais pas pourquoi les gens aiment tant la musique.	**VRAI**	faux	Pad
96.	Ça m'a rendu(e) triste de voir tou(te)s mes ami(e)s d'école s'en aller chacun de leur côté, à la fin du secondaire.	vrai	**FAUX**	Sad
97.	J'ai déjà eu le sentiment que, pour une raison ou pour une autre, ma tête ou mes membres ne m'appartenaient plus.	**VRAI**	faux	Pa
98.	On exagère toujours la beauté des fleurs.	**VRAI**	faux	Pad
99.	La chaleur d'un feu de foyer ne m'a jamais vraiment apporté apaisement et quiétude.	**VRAI**	faux	Pad
100.	J'ai souvent trouvé ça dur de ne pas pouvoir m'arrêter pour jaser avec un(e) bon(ne) ami(e), même quand j'avais autre chose à faire.	vrai	**FAUX**	Sad
101.	Le sexe est l'activité qui procure le plus intense plaisir imaginable.	vrai	**FAUX**	Pad
102.	Certains objets, tels une chaise ou une table, lorsque je les regarde me paraissent parfois étranges.	**VRAI**	faux	Pa
103.	Je n'ai jamais éprouvé la sensation dans mes bras ou mes jambes qu'ils étaient devenus plus longs que d'habitude.	vrai	**FAUX**	Pa
104.	Je me suis rarement préoccupé(e) de la couleur dont les choses sont peintes.	**VRAI**	faux	Pad
105.	Se faire de nouveaux amis ne vaut pas tout l'effort qu'il faut y mettre.	**VRAI**	faux	Sad
106.	J'ai rarement pris plaisir au sexe, d'aucune façon.	**VRAI**	faux	Pad
107.	J'ai parfois eu l'impression que différentes parties de mon corps n'étaient pas toutes rattachées à la même personne.	**VRAI**	faux	Pa
108.	Entendre une bonne chanson m'a rarement incité à la chanter en même temps.	**VRAI**	faux	Pad

109.	J'ai déjà senti, le temps d'un instant, que mon corps était devenu difforme.	**VRAI**	faux	Pa
110.	J'ai souvent aimé toucher de la soie, du velours, ou de la fourrure.	vrai	**FAUX**	Pad
111.	Il y a des choses plus importantes pour moi que l'intimité.	**VRAI**	faux	Sad
112.	J'aime beaucoup faire l'amour.	vrai	**FAUX**	Pad
113.	Une partie de mon corps m'a déjà semblée plus petite que d'habitude.	**VRAI**	faux	Pa
114.	Les gens qui essaient de mieux me connaître se tannent après un bout de temps.	**VRAI**	faux	Sad
115.	Je pourrais être heureux(se) de vivre tout(e) seul(e) dans un camp dans le bois ou dans les montagnes.	**VRAI**	faux	Sad
116.	Je n'ai jamais voulu monter dans les manèges à la Ronde.	**VRAI**	faux	Pad
117.	Mon ouïe est parfois si sensible que les sons usuels deviennent incommodants.	**VRAI**	faux	Pa
118.	Je n'ai jamais eu l'impulsion d'ôter mes souliers et de marcher pieds nus dans une flaque d'eau.	**VRAI**	faux	Pad
119.	Il y a des fois où des gens que je connais bien commencent à m'apparaître comme des inconnus.	**VRAI**	faux	Pa
120.	Si j'ai le choix, j'aime mieux être avec d'autres personnes qu'être tout(e) seul(e).	vrai	**FAUX**	Sad
121.	En vérité, il y a peu de choses que j'ai réellement pris plaisir à faire.	**VRAI**	faux	Pad
122.	Je trouve trop souvent que les gens s'attendent à ce que je m'intéresse à leurs opinions ou à leurs activités quotidiennes.	**VRAI**	faux	Sad
123.	J'ai parfois aimé sentir la puissance de mes propres muscles.	vrai	**FAUX**	Pad
124.	J'ai déjà ressenti une certaine confusion, ne sachant plus si mon corps m'appartenait vraiment.	**VRAI**	faux	Pa
125.	Je ne me sens pas vraiment proche de mes ami(e)s.	**VRAI**	faux	Sad
126.	Mes relations avec d'autres personnes ne deviennent jamais très fortes.	**VRAI**	faux	Sad
127.	Il y a des jours où la lumière d'une pièce est si vive qu'elle m'agace les yeux.	**VRAI**	faux	Pa

128.	J'ai toujours trouvé la musique d'orgue plate et ennuyante.	**VRAI**	faux	Pad
129.	D'une façon générale, je préfère être avec des animaux qu'être avec du monde.	**VRAI**	vrai	Sad
130.	J'ai parfois trouvé qu'un bon savonnage en prenant mon bain était rafraichissant et soulageant.	vrai	**FAUX**	Pad
131.	Il m'est arrivé que durant plusieurs jours de suite, je ressentais les sons et les lumières avec une telle intensité que je ne pouvais pas m'en défaire.	**VRAI**	faux	Pa
132.	Une marche vive et rapide m'a parfois donné une sensation de bien-être.	vrai	**FAUX**	Pad
133.	Les flammes qui dansent dans un foyer m'ont toujours fasciné(e).	vrai	**FAUX**	Pad
134.	J'ai toujours attaché de l'importance au gout des aliments.	vrai	**FAUX**	Pad
135.	Lorsque je vois une statue, j'ai souvent envie de la toucher.	vrai	**FAUX**	Pad
136.	Danser, ou la pensée de danser, m'a toujours paru ennuyant.	**VRAI**	faux	Pad

APPENDIX B

The Relationship between Peer Classification and Factor Groups

Appendix B

Two chi-square analyses were performed in order to examine the relationships between Peer Classification and each of the Factor groups. As can be seen in Table 1, the first analysis, which pertained to the Negative Symptoms factor was significant. The percentage distribution indicates that there were significantly more Withdrawn subjects in the group which scored high on the Negative Symptom factor. This finding confirms the stability of the withdrawal dimension since this factor is made up of high loadings on the Extraversion scale (in the negative direction) and the Physical and Social Anhedonia scales, all of which contain several items tapping the withdrawal component.

The fact that there is a much greater proportion of normal Controls in the Low Negative Symptom group provides additional validity for the original Peer Classification system. Both the Aggressive and Aggressive-Withdrawn groups are almost equally represented in the high and low Negative Symptom Factor groups. This suggests that neither of these patterns of childhood behavioral deviance bear a specific association to the later development of pre-schizophrenic negative symptomatology.

The relationship between Peer Classification and the Positive Symptom Factor groups was not significant. However, it is interesting to note that a much greater proportion (70%) of the Aggressive-Withdrawn group was represented in the high Positive Symptom group. It is possible that, as the Aggressive-Withdrawn subjects advance in age, their pathology will manifest itself more in terms of

Appendix B

Table 1

The relationship between Peer Classification Groups and Factor groups

	Peer Classification Group*			
	A	W	A W	C
Factor Group				
Negative Symptom				
Low	48.2 (13)	29.0 (09)	44.8 (13)	69.7 (23)
High	51.9 (14)	71.0 (22)	55.2 (16)	30.3 (10)
		$X^2(3)=10.79$, $p \leq .01$		
Positive Symptom				
Low	50.0 (14)	57.7 (15)	29.6 (08)	54.1 (20)
High	50.0 (14)	42.3 (11)	70.4 (19)	45.9 (17)
		$X^2(3)=5.21$, p=N.S.		

Note. Percentages are indicated first; n in parentheses.

*A=Aggressive

W=Withdrawn

AW=Aggressive-Withdrawn

C=Control

positive than negative types of schizophrenic symptoms. The fact that the other three groups were approximately equally distributed in the high and low Positive Symptom groups suggest that the factor extracted from the Principal Component Analysis taps experiences which are not specific to pre-schizophrenic individuals, Rather, a combination of high scores of the Neuroticism, Schizotypal, and Perceptual Aberration scales characterizes about half of the two deviant groups (Aggressive and Withdrawn subjects) as well as half the Controls. This finding is in keeping with Claridge's (1985) conceptualization of psychopathology. In developing the Schizotypal Personality Questionnaire, he has argued that there exists a continuity between normality and psychiatric conditions and that symptomatic features which characterize schizophrenia should find some expression, in muted form, in the personality and cognitive variation of clinically normal people. From his perspective, these features should be viewed as individual difference characteristics which potentially predispose to schizophrenia. Additional risk factors must evidently be present in order for the schizotypal individual to develop full-blown schizophrenia.

Perhaps the most fruitful avenue for future research would be to follow closely those individuals who are at theoretical risk for schizophrenia on the basis of both the Peer Classification system (Aggressive-Withdrawn) and the Symptom Precursor system (subjects who scored high on the Positive and Negative factors). Unfortunately, the sample size obtained for each of these groups in the present study did not permit an adequate examination of their performance on the CPT.

APPENDIX C

Consent Form

APPENDIX C

Formulaire de consentement

J'accepte de participer à une étude du projet "L'individu dans son milieu". On vérifiera ma capacité visuelle sur l'ordinateur. On me demandera de répondre verbalement et par écrit à plusieurs questions.

Toutes les informations obtenues à mon sujet seront absolument confidentielles.

Je recevrai une somme de $40.00 (quarante) pour ma participation. Je suis libre d'arrêter de participer à cette étude à n'importe quel temps.

Je _____ comprends clairement et j'accepte les
(Nom en majuscules)
conditions de ma participation à cette étude.

_____

(SIGNATURE)

_____

(j) (m) (a)

(DATE)

Département de psychologie

Expérimentatrice: _____

APPENDIX D

Instructions for the

Continuous Performance Task

CPT Instructions

Practice: "Je vais te faire faire une pratique sur l'ordinateur. Tu vas voir des séries de chiffres sur l'écran. Quand tu vois deux séries pareilles qui se suivent, tu lèves ton doigt et puis tu le rabaisses aussi vite que possible. La règle du jeu, c'est d'être aussi vite que tu peux mais en étant à la fois aussi juste et précis(e) que possible.

Subtest #1: (Fast numbers)

"Tu fais la même chose que durant la pratique: deux séries pareilles et tu lèves et rabaisses ton doigt aussi vite que possible. Ça dure deux minutes en tout."

Subtest #2: (Fast shapes)

Maintenant, tu vas voir des dessins. Deux dessins identiques, tu lèves et rabaisses ton doigt rapidement."

Subtest #3: (Slow numbers)

"Maintement, on revient aux chiffres comme tantôt mais ils vont rester un peu plus longtemps sur l'écran; tu fais comme d'habitude."

Subtest #4: (Slow shapes)

"On retourne maintenant aux dessins. Eux aussi restent un peu plus longtemps sur l'écran. Tu fais comme d'habitude."

Subtest #5: (Numbers with distraction)

"Là, ça change un peu. Tu vas voir que les chiffres ne sont pas tout à fait comme avant. Aussi, tu vas peut-être entendre du bruit dans

la pièce et voir des choses en plus sur l'écran. Peu importe ce qui se passe, gardes ton doigt sur le bouton et lèves-le dès que tu vois deux séries pareilles."

Subtest #6: (Shapes with distraction)

"Maintenant, tu vas voir des dessins encore mais il y aura peut-être encore des choses en plus sur l'écran ou du bruit comme tantôt. Tu fais comme d'habitude."

APPENDIX E

ANOVA and ANCOVA summary tables

pertaining to Peer Classification

Appendix E.1

Peer Classification: Subtests 1, 2, 3, 4. ANOVA Summary Table.

	SOURCE	SUM OF SQUARES	D. F.	MEAN SQUARE	F	TAIL PROB.
	MEAN	7292 19825	1	7292. 19825	2794 73	0. 0000
	PCLASS1	34. 15487	3	11. 38496	4. 36	0 0055
	GENDER	2 13313	1	2. 13313	0 82	0. 3672
	PG	5 06822	3	1. 68941	0. 65	0. 5856
1	ERROR	443. 57565	170	2. 60927		
	SPEED	66. 56759	1	66 56759	160 22	0 0000
	SP	0. 94693	3	0. 31564	0 76	0 5182
	SG	0. 01421	1	0. 01421	0 03	0 8535
	SPG	1 21127	3	0 40376	0 97	0 4074
2	ERROR	70. 63160	170	0. 41548		
	TYPE	0. 00350	1	0. 00350	0 00	0 9526
	TP	7. 34300	3	2. 44767	2. 48	0 0626
	TG	1 41308	1	1. 41308	1. 43	0 2329
	TPG	5. 38722	3	1 79574	1. 82	0 1451
3	ERROR	167. 58100	170	0. 98577		
	ST	0. 58000	1	0. 58000	1. 77	0. 1853
	STP	0. 35922	3	0. 11974	0 37	0 7782
	STG	0. 08532	1	0. 08532	0 26	0. 6106
	STPG	1. 17452	3	0. 39151	1 19	0 3136
4	ERROR	55. 73207	170	0. 32784		
	BLOCK	1. 54824	2	0 77412	2 10	0 1236
	BP	1. 28650	6	0. 21442	0 58	0 7441
	BG	0. 63607	2	0. 31803	0 86	0 4222
	BPG	3. 00618	6	0. 50103	1. 36	0. 2294
5	ERROR	125. 09720	340	0. 36793		
	SB	0. 54602	2	0. 27301	0. 88	0 4168
	SBP	1. 18146	6	0 19691	0 63	0 7040
	SBG	0. 29694	2	0. 14847	0. 48	0. 6210
	SBPG	1. 59413	6	0. 26569	0. 85	0 5292
6	ERROR	105. 80023	340	0. 31118		
	TB	36. 15629	2	18. 07814	46. 11	0. 0000
	TBP	6. 04259	6	1. 00710	2. 57	0 0190
	TBG	0. 03338	2	0. 01669	0. 04	0 9583
	TBPG	0. 62853	6	0. 10475	0. 27	0. 9520
7	ERROR	133. 31472	340	0. 39210		
	STB	1. 51787	2	0. 75893	2. 75	0 0656
	STBP	0. 29985	6	0 04998	0 18	0 9820
	STBG	1 22840	2	0. 61420	2 22	0 1099
	STBPG	0. 59947	6	0. 09991	0. 36	0. 9029
8	ERROR	93. 95171	340	0. 27633		

Appendix E.2

Peer Classification: Subtests 1 and 5. ANOVA Summary Table.

	SOURCE	SUM OF SQUARES	D. F.	MEAN SQUARE	F	TAIL PROB.
	MEAN	3114. 24038	1	3114. 24038	1442. 15	0. 0000
	PCLASS1	32. 07998	3	10. 69333	4. 95	0. 0025
	GENDER	0. 55933	1	0. 55933	0. 26	0. 6115
	PG	1. 16451	3	0. 38817	0. 18	0. 9100
1	ERROR	369. 26365	171	2. 15944		
	DISTRACT	0. 06001	1	0. 06001	0. 15	0. 7020
	DP	0. 35926	3	0. 11975	0. 29	0. 8303
	DG	0. 55962	1	0. 55962	1. 37	0. 2435
	DPG	0. 56909	3	0. 18970	0. 46	0. 7076
2	ERROR	69. 86435	171	0. 40856		
	BLOCK	0. 30074	2	0. 15037	0. 38	0. 6872
	BP	0. 46862	6	0. 07810	0. 20	0. 9781
	BG	0. 59611	2	0. 29805	0. 74	0. 4758
	BPG	3. 48068	6	0. 58011	1. 45	0. 1952
3	ERROR	136. 92494	342	0. 40037		
	DB	14. 37933	2	7. 18967	23. 06	0. 0000
	DBP	2. 67778	6	0. 44630	1. 43	0. 2017
	DBG	0. 23770	2	0. 11885	0. 38	0. 6834
	DBPG	1. 49248	6	0. 24875	0. 80	0. 5722
4	ERROR	106. 63908	342	0. 31181		

Appendix E.3

Peer Classification: Subtests 1 and 5. ANCOVA Summary Table.

	SOURCE	SUM OF SQUARES	D F.	MEAN SQUARE	F	TAIL PROB.
	PCLASS1	15.74388	3	5.24796	2.82	0.0405
	GENDER	0.86611	1	0.86611	0.47	0.4960
	PG	1.45579	3	0.48526	0.26	0.8535
	FIRST COVAR	53.02529	1	53.02529	28.50	0.0000
1	ERROR	316.23836	170	1.86023		
	DISTRACT	0.06001	1	0.06001	0.15	0.7020
	DP	0.35926	3	0.11975	0.29	0.8303
	DG	0.55962	1	0.55962	1.37	0.2435
	DPG	0.56909	3	0.18970	0.46	0.7076
2	ERROR	69.86435	171	0.40856		
	BLOCK	0.30074	2	0.15037	0.38	0.6872
	BP	0.46862	6	0.07810	0.20	0.9781
	BG	0.59611	2	0.29805	0.74	0.4758
	BPG	3.48068	6	0.58011	1.45	0.1952
3	ERROR	136.92494	342	0.40037		
	BB	14.37933	2	7.18967	23.06	0.0000
	BBP	2.67778	6	0.44630	1.43	0.2017
	BBG	0.23770	2	0.11885	0.38	0.6834
	BBPG	1.49248	6	0.24875	0.80	0.5722
4	ERROR	106.63908	342	0.31181		

Appendix E.4

Peer Classification: Subtests 2 and 6. ANOVA Summary Table.

	SOURCE	SUM OF SQUARES	D. F.	MEAN SQUARE	F	TAIL PROB.
	MEAN	3490. 12357	1	3490. 12357	2230. 32	0. 0000
	PCLASS1	15. 18776	3	5. 06259	3. 24	0. 0237
	GENDER	3. 05970	1	3. 05970	1. 96	0. 1638
	PG	7. 96242	3	2. 65414	1. 70	0. 1697
1	ERROR	270. 71977	173	1. 56485		
	DISTRACT	22. 72444	1	22. 72444	53. 23	0. 0000
	DP	0. 26977	3	0. 08992	0. 21	0. 8889
	DG	0. 00513	1	0. 00513	0. 01	0. 9128
	DPG	1. 40123	3	0. 46708	1. 09	0. 3531
2	ERROR	73. 85780	173	0. 42692		
	BLOCK	11. 40878	2	5. 70439	18. 16	0. 0000
	BP	4. 05290	6	0. 67548	2. 15	0. 0474
	BG	0. 38292	2	0. 19146	0. 61	0. 5443
	BPG	1. 96169	6	0. 32695	1. 04	0. 3986
3	ERROR	108. 70826	346	0. 31419		
	DB	3. 54673	2	1. 77337	6. 97	0. 0011
	DBP	1. 02479	6	0. 17080	0. 67	0. 6726
	DBG	0. 15341	2	0. 07671	0. 30	0. 7398
	DBPG	1. 32138	6	0. 22023	0. 87	0. 5199
4	ERROR	87. 97318	346	0. 25426		

APPENDIX F

Development of Factor Groups

APPENDIX F

The cut-off factor scores for each of the four factors groups were as follows: Negative Symptom Factor groups: $\leq$ -1.40 (low), $\geq$ .96 (high); Positive Symptom Factor froups: $\leq$ -1.39 (low), $\geq$ .98 (high). The mean scores of the low Negative Symptom Factor group was significantly lower (M=-2.62, SD=.86) than the mean of the high Negative Symptom Factor group (M=2.95, SD=1.9) ($t(118)=20.21$, $p < .001$). Similarly, mean scores were significantly lower in the low Positive Symptom Factor group (M=-2.68, SD=.75) than the high Positive Symptom Factor group (M=2.86, SD=1.6) ($t(116)=23.46$, $p < .001$).

A chi-square comparing the four extreme groups was significant ($X^2(1)=5.86$, $p \leq .02$) indicating that the two factors were not independent. Approximately 64% (28) of subjects who scored high on the Positive Symptom factor also scored high on the Negative Symptom factor. Approximately 60% (24) of subjects who scored low on the Positive Symptom factor also scored low on the Negative Symptom factor.

The correlations coefficient for the relationship between the Positive and Negative Symptom factor scores in the entire sample was .30. This finding is consistent with previous studies which have shown that positive and negative symptoms are not mutually exclusive and may co-occur in the same patient (Pogue-Geile & Harrow, 1984; 1985).

APPENDIX G

ANOVA and ANCOVA summary tables

pertaining to Factor Groups

Appendix G.1

Negative Symptom Factor group: Subtests 1, 2, 3, 4. ANCOVA Summary Table.

	SOURCE	SUM OF SQUARES	D. F.	MEAN SQUARE	F	TAIL PROB.
	NEG	0. 55276	1	0. 55276	0. 26	0. 6094
	GENDER	0. 08260	1	0. 08260	0. 04	0. 8434
	NG	0. 55608	1	0. 55608	0. 26	0. 6083
1	1-ST COVAR	57. 67446	1	57. 67446	27. 39	0. 0000
1	ERROR	237. 95077	113	2. 10576		
	SPEED	34. 57829	1	34. 57829	88. 89	0. 0000
	SN	1. 29639	1	1. 29639	3. 33	0. 0705
	SG	0. 00054	1	0. 00054	0. 00	0. 9703
	SNG	0. 96140	1	0. 96140	2 47	0. 1187
2	ERROR	44. 34660	114	0. 38901		
	TYPE	0. 22572	1	0. 22572	0. 19	0. 6639
	TN	0. 29391	1	0. 29391	0 25	0. 6200
	TG	0. 48041	1	0. 48041	0 40	0. 5263
	TNG	0. 24236	1	0. 24236	0. 20	0. 6525
3	ERROR	135. 56783	114	1. 18919		
	ST	1 55084	1	1. 55084	5 01	0 0272
	STN	0. 37855	1	0. 37855	1 22	0 2712
	STG	0. 53210	1	0. 53210	1. 72	0 1925
	STNG	1. 67090	1	1. 67090	5 40	0. 0220
4	ERROR	35. 29802	114	0. 30963		
	BLOCK	2. 59006	2	1. 29503	3 36	0. 0364
	BN	0. 50803	2	0. 25401	0 66	0. 5180
	BG	0. 56842	2	0. 28421	0 74	0 4792
	BNG	0. 55262	2	0 27631	0 72	0 4890
5	ERROR	87. 79734	228	0. 38508		
	SB	0. 16891	2	0. 08445	0. 27	0 7617
	SBN	1. 21884	2	0 60942	1 97	0. 1423
	SBG	0. 11256	2	0 05628	0. 18	0. 8340
	SBNG	1. 12025	2	0. 56013	1 81	0 1664
6	ERROR	70 64858	228	0. 30986		
	TB	24 14467	2	12 07234	32 35	0 0000
	TBN	2 04306	2	1 02153	2 74	0 0669
	TBG	0 32485	2	0. 16243	0 44	0 6476
	TBNG	0 20634	2	0 10317	0 28	0 7587
7	ERROR	85. 08419	228	0. 37318		
	STB	2 05410	2	1 02705	3 63	0 0280
	STBN	0 06994	2	0 03497	0 12	0 8837
	STBG	1 50277	2	0 75139	2 66	0 0722
	STBNG	0 78990	2	0 39495	1 40	0 2494
8	ERROR	64 44153	228	0 28264		

Appendix G.2

Positive Symptom Factor group: Subtests 1 and 5. ANOVA Summary Table.

	SOURCE	SUM OF SQUARES	D. F.	MEAN SQUARE	F	TAIL PROB.
	MEAN	2005. 23125	1	2005. 23125	862. 53	0. 0000
	POS	1. 60460	1	1. 60460	0. 69	0. 4079
	GENDER	0. 09565	1	0. 09565	0. 04	0. 8396
	PG	1. 64541	1	1. 64541	0. 71	0. 4020
1	ERROR	260. 37961	112	2. 32482		
	DISTRACT	0. 00906	1	0. 00906	0. 02	0. 8815
	DP	0. 20262	1	0. 20262	0. 50	0. 4814
	DG	0. 32571	1	0. 32571	0. 80	0. 3724
	DPG	0. 28420	1	0. 28420	0. 70	0. 4046
2	ERROR	45. 47432	112	0. 40602		
	BLOCK	0. 12742	2	0. 06371	0. 17	0. 8413
	BP	0. 71358	2	0. 35679	0. 97	0. 3811
	BG	0. 79607	2	0. 39804	1. 08	0. 3411
	BPG	0. 69423	2	0. 34712	0. 94	0. 3912
3	ERROR	82. 49248	224	0. 36827		
	DB	9. 88771	2	4. 94386	14. 73	0. 0000
	DBP	0. 08852	2	0. 04426	0. 13	0. 8765
	DBG	0. 09191	2	0. 04595	0. 14	0. 8721
	DBPG	0. 79698	2	0. 39849	1. 19	0. 3070
4	ERROR	75. 18252	224	0. 33564		

Appendix G.3

Positive Symptom Factor group: Subtests 2 and 6. ANOVA Summary Table.

	SOURCE	SUM OF SQUARES	D. F.	MEAN SQUARE	F	TAIL PROB.
	MEAN	2236. 73568	1	2236. 73568	1436. 03	0. 0000
	POS	0. 00290	1	0. 00290	0. 00	0. 9657
	GENDER	1. 91103	1	1. 91103	1. 23	0. 2703
	PG	5. 09129	1	5. 09129	3. 27	0. 0732
1	ERROR	177. 56420	114	1. 55758		
	DISTRACT	14. 06257	1	14. 06257	36. 00	0. 0000
	DP	1. 55128	1	1. 55128	3. 97	0. 0487
	DG	0. 03898	1	0. 03898	0. 10	0. 7527
	DPG	0. 10613	1	0. 10613	0. 27	0. 6032
2	ERROR	44. 53369	114	0 39065		
	BLOCK	6. 20011	2	3. 10005	9. 28	0. 0001
	BP	0. 76067	2	0 38033	1. 14	0. 3223
	BG	1. 15648	2	0. 57824	1. 73	0. 1796
	BPG	0. 41940	2	0. 20970	0. 63	0. 5349
3	ERROR	76. 20160	228	0. 33422		
	DB	1. 79551	2	0. 89776	3. 69	0. 0264
	DBP	0. 48247	2	0 24123	0 99	0. 3724
	DBG	0. 33827	2	0. 16914	0 70	0. 4998
	DBPG	0. 03787	2	0. 01894	0. 08	0. 9251
4	ERROR	55 43680	228	0. 24314		