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A Neuropsychological Perspective on the Efficacy of Typical and Atypical Medication Treatment for Chronic Schizophrenia Regarding Executive Functioning

Eric Hart
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A Neuropsychological Perspective on the Efficacy of Typical And Atypical Medication Treatment for Chronic Schizophrenia Regarding Executive Functioning

BY

Eric Hart

THESIS

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2001
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I HEREBY RECOMMEND THIS THESIS BE ACCEPTED AS FULFILLING THIS PART OF THE GRADUATE DEGREE CITED ABOVE

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Date 7/12/01
A NEUROPSYCHOLOGICAL PERSPECTIVE ON THE EFFICACY OF TYPICAL AND ATYPICAL MEDICATION TREATMENT FOR CHRONIC SCHIZOPHRENIA REGARDING EXECUTIVE FUNCTIONING

Eric Hart
Eastern Illinois University
Abstract

This study investigated the efficacy of current medication treatment procedures for chronic schizophrenics on neuropsychological measures. A total of twenty participants from the Coles County Mental Health Center, who met DSM-IV criteria for chronic schizophrenia, volunteered to be administered the Wisconsin Card Sorting Test (WCST)-64 card version as a means of assessing neuropsychological executive functioning. A total of twenty participants free of any diagnosable psychological disorder also volunteered to be administered the WSCT-64, which served as a control group. The staff psychiatrist at the Coles County Mental Health Center completed the Positive and Negative Syndrome Scale (PANSS) in order to determine the predominant symptom presentation of each participant who had been diagnosed with schizophrenia. Participant's current dosage levels of typical and atypical medication were recorded and analyzed following the completion of testing. Results indicated that only one index of the WCST-64 could be predicted by medication type and the combined relationship of symptom presentation and medication on the WCST-64 could not be computed due to small sample size.
Chapter I

Introduction

Our modern day conceptualization of the psychological construct known as schizophrenia has experienced an algorithmic expansion since the coinage of the term in 1911. Eugen Bleuler, a Swiss psychiatrist, first proposed that schizophrenics possess a dysfunctional dichotomy between thought and emotion that is seen exclusively among its sufferers. A current taxonomy is offered in the Diagnostic and Statistical Manual of Mental Disorders: Fourth Addition, and states that symptoms must be present significantly over the course of one month, some of which must be present for at least a six month period.

Characteristics of schizophrenia are manifested typically as a mixture of positive (excess or distortion of functioning) and or negative (diminished or loss of functioning) symptomatology which may significantly impair social, interpersonal, domestic, and occupational pursuits. Crow (1980) and Kibel, Laffont, & Liddle (1993) state that negative symptoms include poverty of thought and speech, blunted affect, decreased motor activity, avolition, as well as diminished interpersonal interaction (as cited in Berk, Lucas, & Mattson 1997). Kay & Opler (1987) state that positive symptoms include delusions, hallucinations,
and conceptual disorganization (as cited in Berk et. al 1997). Diagnoses of subtype (i.e. paranoid, catatonic, and disorganized) are specified contingent upon the predominant symptom manifestation of the sufferer.

Although, as of now, there appears to be no known cure for schizophrenia the advent of modern medicine has provided sufferers with new hope for improved daily functioning. It has been suggested that newer medication, which have an affinity for dopamine-2 (D2) receptor blockage and act as serotonin antagonists, are the most the efficacious method of symptom management and treatment (Alexander (1996) and Stahl (1999)). Traditionally, self-report and observation have been utilized to ascertain the utility and efficacy of psychotropic medication. This study attempted to provide insight into the effects of medication treatment while employing a commonly used neuropsychological measure of executive functioning. Neuropsychological paradigms and testing materials have been found to differentiate the strengths and weakness of suffers of neurological deficits and provide a profile of cortical functions (Golden, Goldstein, & Incagnoli 1986). Although neuropsychological procedures are commonly used within the field today, they are often overlooked as tools for testing medication efficacy.
CHAPTER II

Review of Literature

Researchers over the past several decades have worked diligently to uncover conclusive empirical evidence regarding biological or environmental substrates contributing to the etiology and progression of this crippling disorder. The research in the area of schizophrenia and information processing has been focused on identifying cognitive deficits which may provide us with deeper insight into this psychological construct (Green 1996). Cognitive deficits found among schizophrenics appear to be varied due to the heterogeneity between, as well as within, each subgroup. However, schizophrenics collectively perform poorly on virtually all measures of cognitive ability (Green 1996). There appear to be two distinct types of cognitive deficits underlying this disorder: those that are central to the disorder and those that emerge as a result of psychotic episodes or the effects of psychotropic medications (Green 1996). Differentiation of these two forms of deficits in cognitive functioning may be best understood when longitudinal studies are employed that delineate deficits present exclusively during psychotic episodes from those that are stable throughout the course of the illness. The latter
may serve as "cognitive markers" for subsequent psychotic episodes (Van Der Does et. al 1993). A wide range of information processing deficits may be found during prodromal and residual stages.

Van Der Does et. al (1993) looked at groups of chronic schizophrenics and compared measures of information processing to groups of depressed participants without schizophrenia and control participants (those free of clinical diagnosis). They found that differences occurred between groups with regards to the type of information processing skills which contributed to problem-solving ability. Specifically, it was found that the schizophrenic group showed significant impairment in molecular information processing (i.e. reaction time, reaction time release, backward masking, and vigilance). It was concluded from this study that, "social cognitive problem solving is associated with sustained attention among individuals with a mood disorder and with a liberal response style among individuals with schizophrenia" (p. 19).

In general, findings in the area of clinical neuropsychology have lead to the proposition that schizophrenia is associated with subcortical dysfunction, lateralized dysfunction, left hemisphere deficit and
overactivation, impaired internhemispheric integration, and frontal dysfunction (Craft, Levin, & Yurgelun 1989). The use of neuropsychological testing paradigms have been instrumental for researchers examining these areas of deficit among schizophrenics.

Neuropsychological deficits are impairments in brain functioning that may inhibit behavior and various degrees of psychological functioning. Measures designed to assess these impairments attempt to address behavior deficits and allow administrators to make inferences regarding dysfunction in corresponding cortical and subcortical regions of the brain. Psychological impairments related to brain dysfunction are typically measured by using standardized testing procedures. Neuropsychological assessment procedures are an extension and quantification of part of the neurologic examination concerned with higher cortical functioning (Golden, Goldstein, & Incagnoli 1986). The benefit of neuropsychological assessment over some classical medical neurological procedures is that they appear to be more sensitive to cognitive and personality changes. These forms of testing batteries differentiate the strengths and weaknesses of sufferers of neuropsychological deficits and provide a profile of higher cortical functions (Golden et. al 1986).
It has been suggested that chronic schizophrenics show significant cognitive deficits, which are evident in performance on cognitive-based tests. A study conducted by Boronow, Dickerson, & Ringel (1991) investigated the relationship between neuropsychological deficits among chronic schizophrenics regarding symptom manifestation and found that the deficits that were found to be correlated with predominant symptom manifestation were memory and intellectual processes.

Impairment in voluntary and involuntary motor control are often observed in chronic schizophrenic patients (Craft et. al 1989). Neuropsychological measures that assess motor ability in schizophrenics routinely find a range of impairments from motor deficits of simple tasks, such as finger tapping and manual dexterity, to complex perceptuo-motor tasks, such as reaction time (Craft et. al 1989).

Greater visuomotor deficits have been found in schizophrenics with primarily negative symptoms than in schizophrenics with primarily positive symptoms (Craft et. al 1989). Interpretation of these findings suggests that frontal lobe impairment found in schizophrenics with predominant negative symptoms may disrupt their ability to organize visuoconstructional tasks (Craft et. al 1989).
Fraustman et al. (1988) and Lawson et al. (1988) found no significant relationship between predominant symptoms manifestation and neuropsychological deficits in chronic schizophrenics, however these findings may be difficult to interpret because the participants were unmedicated at the time of testing (as cited in Boronow et al. 1991). Both studies found that memory and intellectual processes were impaired among chronic schizophrenics regardless of predominant symptom manifestation.

Several neuropsychologically based studies with chronic schizophrenics have focused on observations of abnormal speech processes. Abnormal speech patterns of schizophrenics strongly resembles Wernicke’s aphasia, which may suggest brain dysfunction of the left temporal lobe (Craft et al. 1989). However, no significant impairment of elementary language functions, i.e. naming and repetition has been found.

Memory dysfunction found in schizophrenics suggests neuropathological changes in medial limbic structures of the temporal lobe including the hippocampus (Craft et al. 1989). It has been suggested by Luria (1966), that loss of higher cortical functions in patients with a localized brain injury leads to significant changes in the process of learning, affecting the quality and character of the
results obtained in relation to memory processes (as cited in Berg et al. 1982). The study of memory processes with schizophrenics has largely focused on ascertaining whether or not distinctions exist between encoding and retrieval processes, verbal and visual memory, and free recall and recognition memory. The functional consequences of memory impairment may foster a diminished capacity for appropriate social skill acquisition, problem solving, and overall information processing.

Attention deficits in schizophrenia are thought to be both a clinical symptom and underlying mechanism of other cognitive dysfunctions (Craft et al. 1989). One theory of attention deficit in schizophrenia is that sufferers are incapable of selectively attending to certain stimuli. Another theory states that the slowing of neurocognitive functioning in schizophrenia correlates with attentional deficits (Craft et al. 1989). It is imperative that, due to the complex nature of the various aspects of attention, researchers operationally define this construct in their studies.

Prefrontal lobe dysfunction in schizophrenia has long been recognized. However, variability exists among sufferers in that not all exhibit dysfunction to the same degree. Walsh (1985) states that cognitive deficits
mediated by prefrontal lobe functioning are those that allow an individual, “to respond and adapt appropriately to his or her environment” (as cited in Craft et al, 1989, p. 345). These cognitive processes collectively designate what are commonly referred to as executive functioning and are often found to be impoverished among schizophrenics. Although executive functions are widely believed to be mediated by the prefrontal lobes, it is possible that other cortical and subcortical brain structures contribute to these processes. For this reason, the use of the term executive appears to be more accurate than what was commonly referred to as prefrontal functioning.

Several studies that have implemented neuropsychological testing procedures with schizophrenics have found impairment in frontal lobe functioning. Kolb and Whishaw (1983) found that measures of right- and left frontal and temporal functions suggested significantly more impairment in schizophrenics than controls (as cited in Craft et al. 1989).

It is suggested in general, regardless of intelligence level, that schizophrenics perform poorly on the Wisconsin Cart Sorting Test (WCST). The WCST has been suggested to place high demands on functions of the prefrontal cortex, as well as its coordination with the limbic system mostly
regarding the amygdala and the hippocampus (Harvard Mental Health Letter, 1999). Most notably found in performances among schizophrenics are signs of perseveration, which is believed to be an, "inability to change expectations and adopt to new information" (Harvard Mental Health Letter, 1999). Certain negative symptomatic behavior of schizophrenia manifested as blunted affect, emotional withdrawal, lack of spontaneity, and loss of drive parallel the apathetic syndrome of the prefrontal lobe (Berk et al. 1997). Prefrontal dysfunction has been found to be more strongly correlated with negative symptom manifestation than with positive symptom manifestation. Specifically, schizophrenics with predominantly negative symptom manifestations presented deficiencies in the initiation, planning, and organization of material, difficulties in shifting cognitive set, recent memory impairment, and slowed rate of learning and on slowing of thought (Berk et al 1997). They suggest that, in regards to anatomical structures, such difficulties correlate with deficits of the dorso-lateral and medial prefrontal areas.

Results from studies using magnetic resonance imaging (MRI) indicate structural anomalies of the prefrontal cortex in schizophrenics (Berk et al. 1997). Brain scans taken while testing schizophrenics on behaviors mediated by
the prefrontal cortex, indicate that corresponding structures are unable to meet requirements of the task and that blood flow appears to be lower than normal in this region (Harvard Mental Health Letter, 1999).

Although at the current time there appears to be no known cure for the pervasive cognitively-degenerative disorder referred to as schizophrenia, new methods of symptom management and relapse prevention have caught the attention of many researchers and health care professionals during the end of the twentieth century. It is imperative that treatment surrounding the schizophrenic population must consider the heterogeneity among its suffers. Kane and McGlashan (1995) state that the most pragmatic therapeutic approach in effectively treating chronically disabled persons is by, “integrating drug and psychosocial treatments” (p. 820).

Deficits in social functioning are commonly exhibited in schizophrenics and appear to be pervasive throughout the various stages of illness. Methods of remediation are frequently employed to improve the impoverished levels of psychosocial functioning of the schizophrenic sufferer. Specialized programs have been designed to train schizophrenics on a range of specific skills, “including basic conversation, interpersonal problem solving, and
medication management” (Corrigan, Green, Schade, & Wallace 1994). Psychosocial treatment programs are typically designed so that skilled professionals develop an environment that is conducive to social skill enhancement by facilitating role plays regarding target behaviors, offering constructive feedback for client participation, and by offering reinforcement for successive approximations of a target behavior (Corrigan et. al 1994). Corrigan et. al (1994) state that research in the area of treatment for psychosocial deficits in schizophrenics have found that many participants, “improve their repertoire of interpersonal and coping behaviors” (p. 6).

The majority of outpatient psychosocial rehabilitation services available for sufferers of schizophrenia address improving interpersonal skills, community integration and provide vocational training opportunities. Often times structured and monitored housing is integrated into a patient’s comprehensive treatment plan. One major advantage of the use of specialized psychosocial rehabilitation programs is, “avoiding institutionalization with its learned dependence and truncating the loss of healthy mental capacity and coping skills (Kane & McGlashan 1995).”
The advancement of modern psychotropic medication has provided researchers with a richer conceptualization of this mind crippling psychiatric disorder as well as offering promise for the prognosis of its sufferers. The advent of antipsychotic medication has contributed to a greater understanding of the aetiology, as well as the pathophysiology of schizophrenia (Kane & McGlashan 1995). The spotlight on pharmaceutical agents for the treatment of major psychoses has shifted from traditional or “typical” medications such as haloperidol and chlorpromazine to the progressive “atypical” agents such as clozapine and risperidone. It is suggested that the new atypical pharmaceuticals, offer efficacy in positive symptoms (hallucinations, delusions, suspiciousness and persecution, agitation, and conceptual disorganization) and in negative symptoms (flat affect, emotional withdrawal, apathy, anhedonia, and alogia) (Alexander 1996). Of most importance is that the newly discovered atypicals provide efficacy for negative symptom manifestation, which is not found in older typical agents.

Typical medications, otherwise known as “conventional”, vary in potency and degree of side-effect inducement; however, it is believed that all are effective in reducing psychotic symptoms, specifically positive
symptoms due to their affinity for dopamine-2 (D2) receptors (Stahl 1999). It appears that typical medication provides efficacy in controlling positive symptoms of schizophrenia by acting as an antagonist in synaptic sites of the mesolimbic dopamine pathway, which projects from the ventral tegmental area through the medial forebrain bundle to the amygdala, the lateral septum, the bed nucleus of the stria terminalis, the hippocampus, and the nucleus accumbens (Carlson 1995). Stahl (1999) stated that, “blockage of postsynaptic dopamine receptors in the mesolimbic pathway is thought to mediate the antipsychotic efficacy of the antipsychotic drugs, and their ability to diminish or block positive psychotic symptoms” (p. 38).

Unfortunately, typical or conventional medication may also produce undesirable side-effects such as extrapyramidal symptoms (EPS) and tardive dyskinesia, which are a product of the D2 blocking properties of these medications.

Extrapyramidal symptoms are produced by blockage of receptors in the nigrostriatal dopamine pathway (which project from the substantia nigra and terminate in the basal ganglia). The nigrostriatal dopamine pathway is part of the extrapyramidal neuronal system of the central nervous system, and blockage of associated dopamine receptors produces disorder of movement referred to as
extrapyramidal symptoms (Stahl 1999). When dopamine receptors in the nigrostriatal pathway are blocked for a significant length of time, the irreversible hyperkinetic disorder known as tardive dyskinesia may be a result.

Interestingly, typical medication may also produce side-effects that resemble the negative symptoms of schizophrenia. Such side-effects occur when typical medication blocks dopamine receptors in the mesocortical pathway (which begins in the ventral tegmental area and terminates in areas of the frontal and prefrontal lobes, as well as in the limbic cortex, and hippocampus (Carlson 1995).

It is believed that the more recently developed atypical medications differ from that of traditional typical medication on three levels of efficacy. Stahl (1999) states that atypical medication differs from typical medication producing little or no extrapyramidal symptoms or tardive dyskinesia, by not raising prolactin levels like traditional typical medications, and by having greater efficacy for controlling negative symptoms over typical medication.

Of most relevance to the current study is the efficacy of the progressive atypical medication on controlling the deficiency of receptors in the mesocortical dopamine
pathway, which mediates negative symptom manifestation. It is believed that the efficacy of atypical medication in controlling negative symptom manifestation is due to their properties of being both a serotonin and dopamine antagonist. Stahl (1999) states that another hypothetical cause of the negative symptoms of schizophrenia, other than primary deficiency of dopamine in the mesocortical pathway, is that of secondary deficiency of “dopamine in the mesocortical pathway as a result of serotonin excess” (p. 57). It is believed that serotonin opposes or inhibits the release of dopamine and that agents with antagonistic serotonin propensity will consequently produce an increase of dopamine by disinhibition. The efficacy of atypical over typical medication in treating the negative symptoms of schizophrenia is the result of the serotonin-dopamine antagonistic properties which have the capacity to increase dopamine release selectivity in the mesocortical pathway (Stahl 1999).

The current study attempted to provide further insight into the efficacy of medication treatment for chronic schizophrenia. Of particular interest, was the influence of the newly discovered atypical medications over the traditional typical medication on executive functioning for schizophrenics that express predominantly more negative
symptom manifestations. It is hypothesized in general, based on previous empirical support (Berk Lucas, & Mattson 1997), that those who possess predominantly more negative symptom manifestations will perform significantly worse on measures of executive functioning than those that possess predominantly positive symptom manifestations regardless of medication type. Specifically, it is hypothesized that those participants who possess predominantly more negative symptom manifestations, and whose treatment involves higher levels of typical medication, will perform significantly worse on measures of executive functioning when compared to participants with similar predominant negative symptom manifestations whose treatment involves higher levels of atypical medications. The latter hypothesis is based on empirical support (Stahl 1999) suggesting the efficacy of atypical medication on negative symptom manifestation. It has been suggested that atypical medication shows greater efficacy for negative symptom manifestations partly by addressing deficiencies in the meso-cortical dopamine pathways which have termination sites in the frontal and prefrontal cortex. Also suggested is that such deficiencies may result in impoverished executive functioning, thus it may be hypothesized that increased levels of dopamine in the prefrontal cortex (resulting from
atypical medication use) could influence measures of executive functioning. The current study differs from previous studies by employing a neuropsychological measure of executive functioning in attempts to delineate predominant symptom manifestation and medication treatment. It is hoped that the contribution of this study may lead to subsequent research on medication efficacy regarding the use of neuropsychological testing paradigms and to add empirical support to the ever-developing conceptualization of this psychological construct.
Participants

Participants were drawn from the Coles County Mental Health Center and were members of a specialized community mental health rehabilitation program. All participants used in the sample met DSM-IV criteria for schizophrenia, regardless of subtype (Undifferentiated N= 7, Paranoid N= 7, Schizoaffective N= 5, Residual N= 0, and 1 undetermined). A total of 20 participants diagnosed with schizophrenia who ranged in age from 30-66 years old (M = 48.55, SD = 9.24) and with 8 to 13 years of education volunteered for this study.

A control group of participants from the community free of any diagnosable psychological disorder volunteered for this study in order to strengthen the validity of the testing procedures. A total of 20 control participants were selected whose ages ranged from 18-57 years old (M = 27.60, SD = 10.09) with 11 to 17 years of education.

Materials

The current study used the Wisconsin Card Sorting Test- 64 Card Version (WCST-64) to measure executive functioning. Currently there are no studies that determine the validity of the WCST-64. However Heaton, Iverson,
Kongs, and Thompson (2000) state that since this version and previous versions have the same task requirements and is derived from the same sample population, much of what has been found from the earlier versions will generalize to the current version. The new WCST (64 card version) was chosen over older versions due to its shorter administration time, which was considered to be beneficial due to deficits of attention span often found among schizophrenics (Craft et. al 1989, and Carpenter, Gold, Goldberg, Randolph, & Weinberger 1992).

The WCST-64 is a widely used test of executive functioning in which participants are given a pack of 64 cards which contain as few as one and as many as four different symbols: triangle, star, cross, or circle in either red, green, yellow, or blue. There are no cards that are identical regarding shape or color. Lezak (1983) states that this task requires the participant to, "place [cards] one by one under four stimulus cards -- one red triangle, two green stars, three yellow crosses, and four blue circles--according to a principle that the patient must deduce from the pattern if the examiner's response to the patient's placement of the cards" (p. 488). The initial basis for sorting is in regards to color, then form, number, back to color, and so on. Participants are given
feedback after each trial informing them whether or not their response was correct and principles for matching are changed after 10 correct responses. The test is terminated when the participant attempts 64 trials or achieves six correct categories. Scores generated by the WCST-64 for clinical purposes include: perseverative errors (PE), which represent the number of errors in which a participant responds incorrectly while using the same response pattern; nonperseverative errors (NE), which represent the number of responses that are incorrect which do not met criteria as perseverative errors; total number of errors (TE), which represents the sum of perseverative and nonperseverative errors; categories completed (CC), in which is scored by the number of times a participant scores 10 consecutive items; failure to maintain set (FM), which represents a participants inability to complete a category after successfully completing at least 5 trials within the same sorting principle; and conceptual level (CL), which represents consecutive responses that are “correct in groups of three or more divided by the total number of responses” (Bell et. al 1995). It is suggested that a poor performance on the WCST indicates difficulty in sorting regarding categorical instructions, which may be indicative of an impaired ability to form concepts. Participants with
particularly left frontal lobe damage involving the medial area often exhibit such diminished capacity (Lezak 1983). In general, the WCST-64 assesses the executive or "frontal" functioning of planning, organization, cognitive flexibility in shifting set, working memory, and inhibition of impulsive responding (Heaton et al. 2000). It has been found that the perseverative response score has achieved, "the best diagnostic accuracy, correctly classifying 74% of the total impaired group and 72% of the normals" in the initial normative sample (Mitchell, 1985, p. 1746). In general, it is believed that the WCST-64 is most accurate in differentiating between patients with focal frontal lesions and has long been found to be beneficial in diagnosing neurological problems (Mitchell 1985).

The Positive and Negative Syndrome Scale (PANSS) was used as an indicator of predominant symptom manifestation among participants. The PANSS consists of 29 items which determines the presence of positive (items 1, 4, 5, 6, 17, 22, and 23), negative (items 7, 8, 9, 10, 11, 15, and 16) and general symptoms (items 2, 3, 12, 13, 14, 18, 19, 20, 21, 24, 25, 26, 27, 28, and 29) of the participant’s disorder. Scores are obtained by, "summing the scores of individual items composing each component [positive, negative, cognitive, hostility, and emotional discomfort] (Bell et.
Examples of positive symptoms reported on the PANSS include "delusions" and "hallucinations". Negative symptom examples include the presence of "passive withdraw" and "blunted affect", and general symptom examples include "preoccupation" and "motor retardation". Predominant symptom manifestation will thus be evident by considering the number of corresponding symptoms in each component.

Procedure

All participants were administered the Wisconsin Card Sorting Task (WCST-64) when they were clinically stable on neuroleptic medication and cooperative and compliant to testing instructions to assess levels of executive functioning. The testing environment consisted of a private room within the psychosocial rehabilitation facilities. Each participant received a two dollar monetary incentive(non-contingent upon their completion of the WCST-64) for their volunteering to participate in this study. Personal demographic information regarding medication, current age, education and diagnosis was obtained upon permission granted from each participant. The Positive and Negative Syndrome Scale (PANSS) was completed by the staff psychiatrist and was returned to this study's primary investigator following testing in
order to reduce the confounding effect of researcher confirmation biases.
Chapter III

Results

Results of the PANSS indicated that the range of positive and negative symptom presentation varied from 0 to 6 items reported and 1 to 6 items reported under the general symptom index. All participants were identified as having some symptom presentation related to their disorder within the last 6 months. Information regarding medication treatment indicated that the range of typical dosage varied from 0 mg to 150 mg ($M = 25.97$, $SD = 48.81$), and atypical medication dosage varied from 0 mg to 160 mg ($M = 17.56$, $SD = 34.38$).

All participants in the experimental group revealed some level of impairment in executive functioning as evidenced by results obtained by the WCST-64. Only 3 participants successfully completed 3 categories. Of these scores, all 3 participant's scored a percentile rank of $>16$. Table 1 shows the scores of the participants in the experimental group on each index of the WCST-64 as divided into qualifiers ranging from severe impairment to average (no impairment).
Table 1

Number of participants in the experimental group who scored in each qualifier of the WCST-64.

<table>
<thead>
<tr>
<th>Qualifiers</th>
<th>Index</th>
<th>severe</th>
<th>moderate</th>
<th>mild/moderate</th>
<th>mild *below average</th>
<th>*average</th>
</tr>
</thead>
<tbody>
<tr>
<td>TE</td>
<td>(N=1)</td>
<td>(N=5)</td>
<td>(N=7)</td>
<td>(N=0)</td>
<td>(N=3)</td>
<td>(N=4)</td>
</tr>
<tr>
<td>PR</td>
<td>(N=1)</td>
<td>(N=0)</td>
<td>(N=4)</td>
<td>(N=4)</td>
<td>(N=5)</td>
<td>(N=6)</td>
</tr>
<tr>
<td>PE</td>
<td>(N=2)</td>
<td>(N=1)</td>
<td>(N=7)</td>
<td>(N=2)</td>
<td>(N=5)</td>
<td>(N=3)</td>
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<tr>
<td>NE</td>
<td>(N=1)</td>
<td>(N=0)</td>
<td>(N=9)</td>
<td>(N=6)</td>
<td>(N=2)</td>
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<tr>
<td>CL</td>
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<td>(N=3)</td>
<td>(N=6)</td>
<td>(N=5)</td>
<td>(N=2)</td>
<td>(N=1)</td>
</tr>
</tbody>
</table>

Note. TE = Total Errors, PR = Perseverative Response, PE = Perseverative Errors, NE= Nonperseverative Errors, and CL = Conceptual Level. *below average and average index represents no impairment.

Only one member of the control group exhibited any level of impairment with executive functioning as evidenced on the WCST-64. All but one participant completed 3 or more categories and scored a learning to learn percentile score >16. Table 2 shows the scores of the control group on each index of the WCST-64 as divided into the same qualifiers as the experimental group.
Table 2

Number of participants in the control group who scored in each qualifier of the WCST-64.

<table>
<thead>
<tr>
<th>Qualifiers</th>
<th>Index</th>
<th>Severe</th>
<th>Mild/Moderate</th>
<th>Mild</th>
<th>Below Average</th>
<th>Average</th>
<th>Above Average</th>
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</tr>
<tr>
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<td>(N=0)</td>
<td>(N=0)</td>
<td>(N=1)</td>
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<tr>
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<td>(N=0)</td>
<td>(N=1)</td>
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</table>

Note. TE = Total Errors, PR = Perseverative Response, PE = Perseverative Errors, NE = Nonperseverative Errors, and CL = Conceptual Level. *below average, average, & above average index represents no impairment.

Results of a Pearson Correlation revealed that there was a significant relationship between medication type and performance on the Failure to Maintain Set index of the WCST-64. Those participants with lower levels of atypical medication were less able to maintain set than those with higher levels of atypical medication. Results are represented in Table 3.
Table 3.

Results of a Pearson Correlation for medication type and performance on the WSCT-64.

<table>
<thead>
<tr>
<th>Index</th>
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<th>Atypical</th>
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<td>CC</td>
<td>-.111</td>
<td>-.193</td>
</tr>
<tr>
<td>FM</td>
<td>-.265</td>
<td>.493*</td>
</tr>
<tr>
<td>TE</td>
<td>-.180</td>
<td>-.117</td>
</tr>
<tr>
<td>PE</td>
<td>-.022</td>
<td>-.266</td>
</tr>
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<td>PR</td>
<td>-.166</td>
<td>.257</td>
</tr>
<tr>
<td>NE</td>
<td>.225</td>
<td>.329</td>
</tr>
<tr>
<td>CL</td>
<td>-.222</td>
<td>-.052</td>
</tr>
<tr>
<td>TC</td>
<td>-.095</td>
<td>-.208</td>
</tr>
<tr>
<td>TF</td>
<td>-.227</td>
<td>.143</td>
</tr>
</tbody>
</table>

Note. TE = Total Errors, PR = Perseverative Response, PE = Perseverative Errors, NE = Nonperseverative Errors, and CL = Conceptual Level, CC = Categories Completed, FM = Failure to Maintain Set, TC = Total Number Correct, and TF = Trials to Complete First Trial.

*Significant at p < .05.

Results of a Pearson Correlation revealed that there were no significant relationships between predominant symptom presentation and performance on the WCST-64. Results are represented in table 4.
Table 4

Results of a Pearson Correlation for symptom presentation and performance on the WCST-64.

<table>
<thead>
<tr>
<th>Symptom Presentation</th>
<th>Positive</th>
<th>Negative</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC</td>
<td>-.176</td>
<td>-.316</td>
<td>-.375</td>
</tr>
<tr>
<td>FM</td>
<td>.101</td>
<td>-.273</td>
<td>.238</td>
</tr>
<tr>
<td>TE</td>
<td>-.118</td>
<td>.002</td>
<td>.017</td>
</tr>
<tr>
<td>PR</td>
<td>-.137</td>
<td>-.265</td>
<td>-.221</td>
</tr>
<tr>
<td>PE</td>
<td>-.145</td>
<td>-.248</td>
<td>-.158</td>
</tr>
<tr>
<td>NE</td>
<td>.069</td>
<td>-.176</td>
<td>-.047</td>
</tr>
<tr>
<td>CL</td>
<td>-.134</td>
<td>-.365</td>
<td>-.266</td>
</tr>
<tr>
<td>TC</td>
<td>.073</td>
<td>-.404</td>
<td>-.065</td>
</tr>
<tr>
<td>TF</td>
<td>-.216</td>
<td>-.196</td>
<td>.076</td>
</tr>
</tbody>
</table>

Note. TE = Total Errors, PR = Perseverative Response, PE = Perseverative Errors, NE = Nonperseverative Errors, and CL = Conceptual Level, CC = Categories Completed, FM = Failure to Maintain Set, TC = Total Number Correct, and TF = Trials to Complete First Trial.

Significant differences were found on all WCST-64 between the control group and the experimental group.

Results of a t-test for independent means are represented in table 5.
Table 5

Descriptive statistics for the experimental and control group’s performance on each index of the WCST-64.

<table>
<thead>
<tr>
<th>Index</th>
<th>Experimental Group</th>
<th>Control Group</th>
<th>T Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SD M</td>
<td>SD M</td>
<td></td>
</tr>
<tr>
<td>TE</td>
<td>13.09 10.45</td>
<td>23.75 67.40</td>
<td>-9.38*</td>
</tr>
<tr>
<td>PR</td>
<td>16.69 19.30</td>
<td>24.83 58.20</td>
<td>-5.91*</td>
</tr>
<tr>
<td>PE</td>
<td>17.55 18.15</td>
<td>24.83 67.50</td>
<td>-7.25*</td>
</tr>
<tr>
<td>NE</td>
<td>23.22 16.45</td>
<td>25.08 51.20</td>
<td>-4.54*</td>
</tr>
<tr>
<td>CL</td>
<td>9.61 7.15</td>
<td>22.54 49.95</td>
<td>-7.80*</td>
</tr>
<tr>
<td>CC</td>
<td>5.67 7.30</td>
<td>1.78 15.60</td>
<td>-6.23*</td>
</tr>
<tr>
<td>FM</td>
<td>.76 .80</td>
<td>.41 .20</td>
<td>3.08**</td>
</tr>
<tr>
<td>TC</td>
<td>11.35 31.20</td>
<td>7.28 52.40</td>
<td>-7.02*</td>
</tr>
<tr>
<td>TF</td>
<td>6.62 9.75</td>
<td>.97 15.30</td>
<td>-3.70*</td>
</tr>
</tbody>
</table>

Note. TE = Total Errors, PR = Perseverative Response, PE = Perseverative Errors, NE = Nonperseverative Errors, and CL = Conceptual Level, CC = Categories Completed, FM = Failure to Maintain Set, TC = Total Number Correct, and TF = Trials to Complete First Trial.

*Significant at p < .001, **Significant at p < .005.

A Partial Correlation could not be conducted to determine the combined relationship of symptom presentation and performance on the WCST-64 due to the insignificant results found with the Pearson Correlation between symptom presentation and performance on the WCST-64.
A Linear Regression to determine possible main effects and interactions of medication type could not be conducted due to the small sample size of this study.
Chapter IV
Discussion

Results from this study indicated that the WCST-64 successfully delineated between the experimental and the control group, however the efficacy of medication treatment for chronic schizophrenia could not be ascertained. A significant correlation between medication treatment and performance on the WCST-64 was found only between the Failure to Maintain Set index and atypical medication. This index measures participants' inability to complete a category after completing 5 successful trials. One's failure to maintain set represents an inability to sort cards successfully through changing stimuli after establishing the correct matching principle (Heaton et. al 2000). Skills required in successfully maintaining set may encompass many of the defining features of executive functioning. Most pertinent is a definition by Craft et. al (1989, p.345), which describes executive functioning as the "ability to get into the appropriate response set for a given task, maintain that set, and to shift as needed." The results of this study suggest that atypical medication may be efficacious
on improving this ability among schizophrenics and supports initial hypotheses of this study.

Overall, limited findings of this study may be explained by first, the levels of cognitive impairment among the experimental group may have been too severe to delineate any within group variability. Second, in order to thoroughly address executive functioning, a more comprehensive neuropsychological battery should be considered. Finally, the small sample size of this study may have masked some potentially significant results. The relationship of symptom presentation and medication treatment on performance on the WCST-64 could not be computed, along with possible main effects and interactions of medication type, as a result this limited sample size and insignificant findings of a Pearson Correlation.

As was expected, the WCST-64 effectively delineated cognitive impairment between the experimental and control group. This finding strengthens previous assumptions regarding its efficacy of distinguishing between cognitively impaired participants. Performance on almost all of the items on the WSCT-64 were found to be significantly worse for the experimental group than with the control group.
Future studies of this nature may show more valid and generalizable results by an increased sample size. Increasing the number of neuropsychological tests used may also provide a richer profile of executive functioning and potentially present a greater variation of cognitive impairment among schizophrenic participants. Since a baseline of cognitive functioning prior to the introduction of medication treatment for each participant in the experimental group was not established, assumptions which minimizes the benefits of atypical medication over typical medication may be erroneous. Future researchers may consider establishing baselines of cognitive functioning and designing longitudinal studies which may lead to more conclusive findings.
References


Browne, S. (1999). Rehabilitation programmes and quality of life in severe mental illness. The


