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A

THE IMPACT OF NEUROMOTOR SIGNS AND NEUROPSYCHOLOGICAL PERFORMANCE ON SOCIAL FUNCTIONING IN SCHIZOPHRENIA

by

Rosemarie Ann Basile-Szulc

A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

1999

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This manuscript has been read and accepted for the Graduate Faculty in Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy

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ABSTRACT

THE IMPACT OF NEUROMOTOR SIGNS AND NEUROPSYCHOLOGICAL PERFORMANCE ON SOCIAL FUNCTIONING IN SCHIZOPHRENIA

by

ROSEMARIE ANN BASILE-SZULC

Advisor: Judith Jaeger, Ph.D.

This study examined the relationship between neuromotor abnormalities, neuropsychological performance and social functioning among schizophrenic and schizoaffective patients following an acute exacerbation of their illness. One hundred twenty-seven patients, aged 18-54, were recruited after discharge from an inpatient or partial hospitalization at Hillside Hospital or an affiliated hospital. Up to six months after discharge, patients were assessed on neuropsychological, neuromotor, social functioning, social likability, and psychopathological measures. Social likability was rated on on the basis of a three minute videotaped role-play and on a videostill. Nineteen groups of raters, composed of approximately ten raters per group, made social likability ratings while uninformed about the disability status of the patients. The following hypotheses were tested: (1) Neuromotor abnormalities will be associated with lower social and occupational functioning (SOF) and lower social likability, (2) Subjects with orofacial tardive dyskinesia (TD) will demonstrate greater impairment in SOF and have lower ratings of social likability than subjects with limbotruncal TD, (3) Subjects with movement disorders will show greater impairment on measures of memory and attention

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than patients without movement disorders. (4) Subjects with limbotruncal TD will have greater neuropsychological (NP) impairment than subjects with orofacial TD.

Exploratory analyses according to diagnostic subgroup and neuroleptic (NL) type were conducted on the relationship between neuromotor abnormalities and SOF, with psychopathology and attention and memory as covariates. A significant relationship was obtained only for the subgroup of subjects on atypical neuroleptic medication. Likability ratings indicated that increased severity of gestural and expressive stigmata severity (GESS) and parkinsonism were associated with lower ratings of social likability during the dynamic, but not the static presentations.

The relationship between neuromotor and neuropsychological measures demonstrated that parkinsonism and GESS were associated with poor performance on verbal learning and visuomotor attention, with patients' age, duration of illness and psychopathology as covariates. Exploratory analyses of the influence of diagnostic group was not significant. Exploratory analyses on influence of NL medication, was significant only among subjects on atypical NL's and indicated that limbotruncal TD was associated with impairment on measures of verbal memory and visual attention.

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I would also like thank my father for his support and sacrifice and my husband for humor along the way.

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THE IMPACT OF NEUROMOTOR SIGNS AND NEUROPSYCHOLOGICAL PERFORMANCE ON SOCIAL FUNCTIONING IN SCHIZOPHRENIA

Movement disorders among persistently ill psychiatric patients have been widely researched with respect to etiology and pathophysiology. An area that has received little attention, however, is the stigmatizing effect of these impairments on social functioning. Phenomena purely motor in origin can profoundly disrupt social and interpersonal interactions, contributing to disability in educational, vocational and living environments, even among patients whose manifest psychopathology is well controlled. Patients with persistent neuropsychiatric illnesses seeking to assimilate into the mainstream experience often stand out on the basis of how they 'look'. Neuromotor impairments such as orofacial movements, extremity tremors or choreathetoid movements due to tardive dyskinesia (TD), dystonia, pseudo-parkinsonism rigidity, shuffling gait, akinetic or bizarre facial expressions, and akathisia can negatively impact a person in social settings. The stigmatizing impact may even be felt in the absence of the severe types of movement disorders which are measured by standard neurological rating scales for TD and extrapyramidal symptoms (EPS), such as the Abnormal Involuntary Movement Scale (AIMS, 1976), and the Modified Simpson/Angus Scale (1970). The primary purpose of the present project was to assess the impact of even relatively subtle movement disorders (whether idiopathic or iatrogenic) on social role functioning in clinically stable outpatients with schizophrenia or schizoaffective disorder, independent of the influences of psychopathology and neuropsychological deficits.

This issue is of interest for several reasons. First, medication noncompliance due

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to socially embarrassing side effects poses a barrier to effective treatment in psychiatric patients. Weiden and Olfson (1991) have demonstrated at least a 50% noncompliance rate for discharged patients with schizophrenia after one year and 75% after two years. Motor side effects are one of the chief reasons for medication noncompliance and relapse of psychiatric symptoms (Lindstrom, 1994; Weiden & Olfson, 1995). In a survey of 85 chronic schizophrenics prescribed phenothiazines over a two year period, 46% took less than their prescribed amount of medication, citing extrapyramidal symptoms (EPS), most notably akathisia, as the chief reason for medication noncompliance (Van Putten, 1974). Thus, patients and physicians face a difficult choice. Neuroleptic medication is necessary to prevent or reduce psychotic symptoms, relapse and rehospitalization; yet, in many instances, the patient experiences distressing or embarrassing involuntary movements. Second, studies have shown that a patient's likelihood of being hired into a job is greatly affected by verbal/nonverbal behaviors (Charisiou et al., 1989). Residual social and occupational disability in psychiatric populations constitutes the majority of their economic costs to society, and represents an enormous family and societal burden. Since schizophrenia most often has an early onset and a chronic and disabling course, the indirect costs stemming from lost productivity have been reported at three to four times the cost of direct patient care (Andrews et al., 1985; Fein, 1958; Gunderson& Mosher, 1975; Hall et al., 1985). While schizophrenia affects only 1% of the population, it accounts for 2.5% of the total health care expenditures in the US (Rupp& Keith, 1993). In 1991 the annual cost of schizophrenia in the United States was estimated at 65 billion dollars with direct costs totaling $19 billion and indirect costs totaling $46 billion (Wyatt et al., 1995). Thus, gestural and expressive stigmata may represent an important element in

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understanding the various contributions to social and occupational disability in these individuals. This knowledge may lead to more effective rehabilitation strategies and support services.

AN OVERVIEW OF MOTOR ABNORMALITIES ASSOCIATED WITH SCHIZOPHRENIA

Motor abnormalities have been included in the earliest descriptions of schizophrenia. Kraepelin (1919) described motor abnormalities among patients he diagnosed with dementia praecox. Abnormal involuntary movements have been well documented among chronic schizophrenic patients who have never received NL medication or who have been medication free for many years (Crow et al., 1982; Owens, Johnstone, & Frith, 1982; Rogers, 1985; Fenton, 1994). Studies of medication free patients suggest a 20 to 50% prevalence rate of motor abnormalities and that motor abnormalities increase with age (Owens, Johnstone, & Frith, 1982).

Neuromotor Precursors of Schizophrenia

Early investigation into the neurodevelopmental antecedents of schizophrenia by Fish (1957,1977) and Sobel (1961) have suggested that abnormal motor functioning precedes the onset of manifest symptoms by many years and may serve as a trait marker for schizophrenia. Several pioneering studies, in which children with at least one parent (usually the mother) carrying a diagnosis of schizophrenia are followed from infancy into adulthood, have documented neurodevelopmental precursors to schizophrenia as early as the first two years of life (Mednick, 1978; Fish et al., 1992; Walker, Savole, & Davis,

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1994). Fish (1977) has referred to the cluster of early motor abnormalities that include delays in motor development and irregularities in motor capacity observed among chronic schizophrenics in childhood as “pandevelopmental retardation”. These motor abnormalities may provide an early trait marker reflective of an inherited neurointegrative defect.

Retrospective studies of the early motor development of adult with schizophrenia report early abnormalities in both gross and fine-motor ability. Walker et al. (1994) examined the home movies of pre-schizophrenic children, their healthy siblings, pre-affective disorder patients and their healthy siblings. Pre-schizophrenic children are individuals who subsequently, in adolescence or adulthood, received a diagnosis of schizophrenia. Group comparisons between patient groups and their healthy siblings revealed that the greatest frequency of postural and movement abnormalities was among pre-schizophrenic children. These abnormalities included splaying of the fingers, prolonged fisting, hyperextension, wrist hyperflexion, choreoathetoid movements when motor abilities are challenged, and an increased rate of associated reactions (i.e. extraneous movements in one body part during effortful activity in another body part, especially the contralateral arm). These motoric observations were most noticeable on the left side from birth to age two years (Walker et al., 1994). It should be noted that many of the motoric abnormalities observed in the pre-schizophrenic children routinely occur in normal children and are not pathognomonic of schizophrenia. However, their magnitude and frequency, as well as their failure to diminish at the appropriate ages, indicate abnormality. For example, Walker et al. (1994) reported abnormal hand posturing among 19 of 30 pre-schizophrenic children, but in only five out of 28 healthy

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siblings, and choreoathetoid movements were seen in seven of 30 pre-schizophrenic children but in only one of their healthy siblings. In an earlier study by Walker, also a retrospective study of home-movies, individuals who were later diagnosed with schizophrenia were distinguishable from their healthy siblings before eight years of age (Walker & Lewine, 1990). These children were noted to be less responsive, have poorer eye contact, suffer from deficits in fine and gross motor coordination, and present with less positive affect compared with their unaffected siblings.

High-risk studies have also reported a greater frequency of neurological soft signs in index children compared with controls (Marcus, Hans, Lewow, Wilkinson, & Burack, 1985; Silberman & Tassone, 1985). Marcus et al. (1985) conducted a five-year study of high-risk children, finding that over the course of the study 22 of 50 index cases demonstrated neurological dysfunction compared with three of 50 controls. Abnormalities included impairments in motor coordination, right-left orientation, balance, perceptual-sensory integration, and excess motor overflow. Abnormal fetal brain development, resulting either from a genetic predisposition, pathogenic environmental factors during a critical period of development, or an interaction of these two factors has been proposed as having possible etiologic roles in this neurological dysfunction. Mednick and colleagues, in decades of research with high-risk children, have advanced the hypothesis that events during the second trimester of development and obstetrical complications produce the multiple neurological soft signs evident in schizophrenic individuals in early childhood. Second trimester complications, perinatal complications, and motor development difficulties have all correlated positively with the incidence of adult schizophrenia (Lyon, Barr, Cannon, Mednick, & Shore, 1989).

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It has been hypothesized, although more research is needed, that a connection exists between early neurological abnormalities, minor physical anomalies (MPA) (Green Bracha, Satz, & Christenson, 1994) and gross anatomical brain abnormalities observed in adulthood, including ventricular enlargement of the lateral and third ventricles, a widening of cortical sulci (Cannon, Mednick, & Parnas, 1989), and cerebral asymmetry (Crow et al., 1989). Minor physical abnormalities may represent one observable anomaly in fetal neurodevelopment. Schizophrenics show increased rates of minor physical abnormalities compared to their healthy siblings, bipolar patients (Green et al., 1994) and their discordant monozygotic twin (Torrey et al., 1994), while rates of MPA in bipolar individuals and normal controls do not differ significantly from each other. These minor physical anomalies include malformed and/or asymmetrical ears, completely attached ear lobes, a furrowed tongue, and/ or a moderately high palate. Thus, some early compromise to central nervous system development may be a predisposing factor to schizophrenia with minor physical anomalies and delayed and/or aberrant motor functioning representing some of the earliest observable manifestations.

Neurodevelopmental Theories of Motor Abnormalities

Neurodevelopmental models of schizophrenia face the challenge of accounting for the apparent age related changes in the expression of motoric and psychological dysfunction. It is puzzling that motor abnormalities often recede during adolescence and then reemerge later in life - often at symptom onset. Weinberger (1987) suggests that normal maturational events in the CNS moderate the behavioral expression of a congenital neuropathology that affects certain subcortical regions of the brain which are

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parts of multiple neural circuits. Further, the diathesis for schizophrenia involves an excess of dopamine (DA) activity in the basal ganglia disrupting these circuits. The feedback circuits linking the motor cortex with subcortical structures are maximally activated early and late in life when dopamine excess may be expressed in neuromotor dysfunction, while late adolescence and early adulthood are marked by activation of limbic and frontal regions with maximal dopamine activation causing psychotic symptoms. Alternatively, Alexander, DeLong, & Strick (1986) and Alexander, Crutcher, and Malloy (1990) suggested functionally segregated circuits that connect feedback loops from various regions of the cortex and basal ganglia. These circuits are differentially activated at various points in the life course with the motor circuit being activated early and the frontal and anterior cingulate circuits attaining maximal structural maturity and metabolic dominance in early adulthood. Penny and Young (1983) argue that dyskinesia is due to dysregulation of a complex circuit that involves excess activation of inhibitory DA pathways from the substantia nigra to the striatum, underactivation of inhibitory GABA projections from the striatum to the globus pallidus, and overactivation of inhibitory GABA projections from the globus pallidus to the thalamus to the motor cortex feedback loop. Csernansky et al. (1991) theorize a congenital abnormality in limbic cortex cytoarchitecture that leads to a chronic increase in excitatory glutamatergic neurons from limbic cortex to the nucleus accumbens, reduction in mesolimbic DA transmission, and increased activation of inhibitory GABA projections to the frontal cortex. Prolonged reduction of DA leads to an increase in the number of dopamine D2 receptors. During times of stress, DA levels in the brain increases and this overabundance results in psychosis. Since the primary imbalance lies

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within limbic circuitry, schizophrenia is predominantly a behavioral, affective, and cognitive disorder rather than a primary movement disorder.

Movement Abnormalities in Unmedicated Schizophrenic Patients

Dyskinetic movements and extrapyramidal symptoms in schizophrenia are usually regarded as iatrogenic in origin. However, the pre-neuroleptic era literature contains several well documented descriptions of movement disorders resembling tardive dyskinesia (Kraepelin, 1919; Reiter, 1926) and support the notion of a motor component to schizophrenia. Kraepelin (1919) observed:

> "The spasmotic phenomena in the musculature of the face and speech, which often appear, are extremely peculiar disorders.... Some of them resemble movement of expression, wrinkling of the forehead, distortion of the corners of the mouth, irregular movements of the tongue and lips, twisting of the eyes, opening them wide and shutting them tight, in short those movements which we bring together under the name of making faces or grimacing, they remind one of the corresponding disorder of choreic patients...Connected with these are further, smacking and clicking of the tongue...But besides we observe specially in the lip muscles, fine lightening-lie or rhythmical twichings, which in no way bear the stamp of voluntary movement. Several patients continually carried out peculiar sprawling irregular choreiform, outspreading movements which I think I can best characterise by the expression 'athetoid ataxia'."

Two large studies surveying the incidence of spontaneous dyskinesia among mental hospital patients showed no significant difference in the prevalence rate of dyskinesia in neuroleptic treated patients compared with non-neuroleptic treated patients (Brandon, McClelland, & Protheroe, 1971; Owens, Johnstone, & Frith, 1982). Orofacial dyskinesia was the most common movement abnormality reported in neuroleptic naive

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patients and was indistinguishable from TD. Owens, Johnstone & Frith (1981) examined 411 hospitalized chronic schizophrenic patients and found abnormal movements in 50.4% of NL naïve patients. This figure is higher than in other reports because the sample was comprised of elderly, long term institutionalized patients. While institutionalization does not significantly influence the rate of dyskinesia (Johnstone, Owens, Gold, Crow & Macmillan, 1981), age does have an effect and the normal elderly population has approximately a 4% rate of spontaneous abnormal involuntary movements. In another large scale investigation of 910 inpatients with schizophrenia, Brandon et al. (1971) reported spontaneous orofacial dyskinesia among 12% of males and 29% of females. Fenton, Wyatt, & McGlashan (1994) retrospectively diagnosed spontaneous dyskinesia in a young sample of schizophrenics (mean age = 28 years) and reported that 23% of patient records documented some form of movement disorder and 15% of these were orofacial dyskinesia. Clinical correlates associated with spontaneous dyskinesia, specifically orofacial dyskinesia, include: increased age, female gender, negative symptoms, lower IQ at index and on long-term follow-up, and poorer long-term outcome. (Johnstone, MacMillan, Frith, Benn, & Crow, 1971; Yarden & Discipio, 1971; Fenton, Wyatt, & McGlashan, 1994).

Three studies have examined the rates of extrapyramidal signs in neuroleptic naive first-episode patients. Chatterjee et al. (1995) reported extrapyramidal signs in 16.9% of a NL naive sample, which prospectively correlated with more negative symptoms, a longer time to achieve remission and a lower level of remission. Caligiuri, Lohr, & Jeste (1993) compared neuroleptic naive patients with age matched controls, finding tremors in 37%, rigidity in 24% and bradykinesia in 12% of the patients, whereas

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neither rigidity nor bradykinesia were present in the age-matched controls and tremors were seen in only 4% of controls. The third study, by Gupta et al. (1995), reported motor abnormalities including EPS and neurological soft signs in 23% of their NL naive patients.

A REVIEW OF CONVENTIONAL AND ATYPICAL NEUROLEPTIC MEDICATION

A Brief History of Neuroleptic Medication

Although neuromotor abnormalities are often part of the clinical presentation in schizophrenia, they have become increasingly ubiquitous since the early 1950's when a series of studies by the French surgeon Henri Laborit led to the discovery of phenothiazine, a powerful tranquilizer that calmed patients preoperatively. It was not long until the benefits of this medication were realized for schizophrenic patients. The introduction of NL medication as the primary mode of treating schizophrenic patients was revolutionary. For the first time, the florid symptoms of hallucinations and delusions could be dramatically reduced or even eliminated and fewer patients required long term hospitalization. The deinstitutionalization movement began and greater numbers of patients were able to remain symptom free for longer periods of time with little or no residual symptomatology, and were able to integrate into the community.

Optimism about the use of NL's, namely the phenothiazines and the butyrophenones, was soon tempered with caution as reports emerged linking these medications with TD as well as a variety of other motor symptoms involving the extrapyramidal system (Jacobson, Baldessarini, & Manschreck, 1974). In fact, it was

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once standard practice that the antipsychotic level was measured at the point at which motor side effects emerged (Delay & Deniker, 1952). However, these motor side effects did not always remain short lived and could be serious and irreversible.

Atypical Neuroleptic Medications

The efficacy of antipsychotic medication in treating schizophrenia correlates most closely with the drug's potency as a dopamine D2 receptor antagonist. There are three dopamine tracts where standard NL medications exerts their effects as a dopamine antagonist. These tracts include the nigrostrial (substantia nigra to the striatum-caudate and putamen), mesolimbic (ventral tegmental area to the nucleus accumbens), and mesocortical (ventral tegemental to cortex). The newer atypical antipsychotic medications are more selective than conventional NL's and act on the mesocortical and mesolimbic systems rather than the nigrostriatal system. Thus, the newer antipsychotic agents have a more favorable motor side-effect profile. This is one of defining features of an "atypical" antipsychotic medication, a low liability to induce EPS (Waddington, Scully & O'Callaghan, 1997). Newer agents, such as clozapine, risperidone, olanzapine, seroquel, and sertindole, as opposed to most conventional NL's, are also broader in spectrum, blocking several neurotransmitter systems. Extracellular single unit recordings indicate seroquel is selective for the A10 (ventral tegmental) cell group and exhibits a high affinity for serotonin 5-HT2 receptors and dopamine D2 receptors (Goldstein, Litwin, Sutton, & Malick 1993). Clozapine and risperidone both have a greater affinity for 5-HT2a than for D2 receptors. Meltzer (1989) has suggested that a high ratio of 5-HT2a / D2 antagonism may contribute to a lower EPS risk and data from both non-

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human primates (Casey, 1991) and rodents (Meltzer, 1989) have been supportive.

CLOZAPINE

Clozapine, in comparison to standard neuroleptic medication, is associated with a lower incidence and severity of EPS (Claghorn, Honigfeld, & Abuzzahab, 1987; Kane, Honigfeld, & Singer, 1988; Casey, 1989; Cohen, Keck, Satlin, & Cole, 1991). It induces less akathisia and tremor and is only rarely associated with dystonia or rigidity (Gerlach, Lublin , & Peacock, 1996). A low EPS liability has been attributed to the low level of D2 receptor blockade which is at 40% to 50% occupancy by PET (Gerlach et al., 1996). The incidence of TD is also significantly lower than with the standard NL medication (Claghorn, 1987; Kane, 1988; Casey, 1989). NL induced dyskinesia may even be reduced or removed by treatment with clozapine (Casey, 1989; Lieberman, Saltz, Johns, Pollack, Borenstein, & Kane, 1991). Additionally, clozapine has proved to be an effective medication for a subgroup of patients who fail to respond to the typical neuroleptics or who have experienced intolerable side-effects. Unlike conventional NL's, it also has therapeutic effects on negative symptoms (Lieberman et al., 1991; Peacock Solgaard, Lublin, & Gerlach, 1996). However, not all patients are good candidates for clozapine due to its side-effect profile. Clozapine treated patients must have their white blood cell count monitored regularly as a small portion of patients (1 to 2%) are at risk for agranulocytosis. Clozapine is also associated with an increased risk for seizures, which is not common with traditional neuroleptics such as haloperidol or other newer medications such as olanzapine and sertindole (Casey, 1996).

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RISPERIDONE

Risperidone, another atypical antipsychotic, is also associated with a lowered risk of EPS than traditional neuroleptics. However, risperidone's potential to produce EPS seems to be dose related. Simpson & Lindenmayer (1997), reporting on a multicenter study of 523 chronic schizophrenics, found that EPS levels were comparable to placebo when doses of risperidone were 2mg and 6mg/day. At 16mg/day a significant linear relationship was noted between increased risperidone dosage and extrapyramidal symptoms. Miller, Mohr, Umbricht, Woerner, Fleischhacker, & Lieberman (1998) reported EPS levels among patients treated with mean daily doses of 4.7mg of risperidone were intermediate between that of clozapine and the traditional neuroleptics such as fluphenazine or haloperidol. A comparison between risperidone and conventional antipsychotic medication yielded no significant difference on any item of the Simpson-Angus Neurological Rating Scale- a widely used rating scale for evaluating the presence and severity of EPS.

OLANZAPINE

Olanzapine is a potent 5HT-2 receptor antagonist with weaker D2 and D4 binding. In a double-blind international study, olanzapine was found superior to haloperidol in the treatment of negative symptoms, demonstrated a low risk for EPS compared to patients treated with haloperidol (Tollefson, Beasley, & Tran, 1997; Allan, Sison, Alpert, Connolly, & Crichton , 1998) and was also superior to risperidone on both factors. Clinical trials of olanzapine treated patients showed minimal risks for parkinsonism, akathisia, and dystonia at dosages of 5-20 mg/day (Beasley, Tollefson,

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Tran, Satterlee, Sanger, & Hamilton, 1996). Higher dosages of 20-25mg/day can produce severe akathisia; however, dosages this high are not usually required for a therapeutic response (Jauss, Schroder, Pantel, Bachmann, Gerdsen , & Mundt, 1998).

A REVIEW OF NEUROLEPTIC-INDUCED MOVEMENT DISORDERS

There are four main syndromes consequent to NL medication, particularly the butyrophenones and the phenothiazines, parkinsonism, akathisia, dystonia, and tardive dyskinesia.

Parkinsonism

The symptoms of NL-induced parkinsonism or "pseudoparkinsonism" are similar to those observed in idiopathic Parkinson's Disease. Movements are difficult to initiate and slower and smaller than normal (bradykinesia). Since movements are difficult to initiate, there is a conspicuous paucity of movements (hypokinesia) or a lack of movement (akinesia). This lack of movement may be noted in the face, causing it to appear mask-like and with a low frequency of blinking. The gait is slow and shuffling, referred to as festinating gait, arm swing is diminished or absent and balance is impaired. Difficulty in gait and balance may result from postural changes that can cause a characteristic flexion of the trunk and neck. This brings the chin to the chest, with the arms adducted at the shoulders and flexed at the elbows, wrists and knuckles. Increased muscle tone is evidenced by rigidity and stiffness on passive movements and present in both large and small muscles of the trunk, limbs, and neck. If tremor is also present, this rigidity will be a "cogwheel rigidity." A resting tremor is present in the extremities and disappears, or is less marked, when initiating voluntary movement and is completely

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absent during sleep. Tremor is also common in the jaw and tongue and may affect the head and lower limbs. Other physical features include excessive salivation, or seborrhea. Decreased gestures and spontaneous speech are characteristic. Onset of these symptoms often occurs within a few weeks of NL treatment or a reduction in side effect (anti-cholinergic) medication. About 50% of outpatients on NL treatment will, at some point, develop parkinsonian symptoms. Patients with clinically significant psuedoparkinsonism have at least a two-fold greater risk of developing TD than patients without such a history (Kane, Woerner, & Lieberman, 1988; Chouinard, Annable, Chouinard, & Mercier, 1988).

Akathisia

Akathisia ranges from vague reports of feeling squirmy inside, uptight and tense, to more a definite feeling of motor restlessness and a drive to move. Fidgety movements such as trouble remaining seated, caressing, rocking, or pacing, are often noted. In severe cases, the patient is restless to the point of agitation, unable to sit still for more than seconds or minutes and will report the feeling of going to " jump out of [his] skin.". Onset of akathisia can occur within hours or weeks of NL medication onset, an increase in dosage, a change in the type of drug or a reduction anticholinergic medication. Usually, onset is within the first 6 weeks of medication initiation. However, onset may occur after many months of exposure. Incidence rates with conventional NL's are approximately 20 to 30% (Sachev, 1995) and reportedly lower with the newer atypical antipsychotic medications.

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Dystonia

Dystonia involves sustained or intermittent muscle contractions. Signs and symptoms may include torticollis or retrocollis, which are abnormal positioning of the head and neck in relation to the trunk. Spasms of the jaw muscles, such as trismus or grimacing, tongue protrusions, dysphagia, or dysarthria due to a hypertonic tongue may be present. Breathing problems because of laryngeal-pharyngeal spasms may occur, as well as oculogyric crises. Onset may be within a week of NL administration, an increase in dosage, a change in the type of drug or a reduction in anticholinergic medication.

Tardive Dyskinesia

The term tardive dyskinesia was introduced in 1964 to refer to an iatrogenic disease associated with antipsychotic drug use. (American College of Neuropsychopharmacology FDA Task Force 1973, Fann & Lake, 1976). Characteristic signs of TD involve abnormal movements of the mouth and tongue -including writhing or protruding tongue movements, lip pressing, smacking or puckering. Sucking or chewing movements are also frequently seen. Choreiform and athetotic movements in the distal extremities are common. About three-fourths of the people with TD have abnormal movements in the orofacial region, 50% have involuntary limb movements, and 25% have axial dyskinesia of the trunk. Limbotruncal TD is most common among younger patients; and orofacial TD is more common among older patients.

Prevalence rates among patients receiving long-term treatment with NL's range from 20-25% (Kane & Smith, 1982; Yassa & Jeste, 1992). Among adults under age 45, rates range from 4.6% to 13.3% (Kane, Wegner, Stenzler, & Ramsey, 1980; Woerner et

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al.,1991), while among the elderly rates range from 35% to 50% (Yassa, Nastase, Dupont & Thibeau, 1992; Woerner et al.,1991). Differences in sample age, length of NL exposure, chronicity, and the type of institutional setting from which the sample was drawn (i.e. state hospital, private hospital, outpatient clinic etc.) all affect prevalence rates. Many of these factors, however, are not mutually exclusive and frequently co-occur. For example, chronic patients tend to be older, have a longer duration of cumulative NL exposure, and often reside in state hospitals (Woerner et al., 1991).

A number of risk factors and clinical correlates of TD have been identified in the hope of better understanding its etiology. Advanced age and female sex are the two variables most consistently associated with an increased risk for TD (Kane & Smith, 1982; Yassa et al., 1990; Kane, Woerner, & Lieberman, 1988). Each contributes independently to an increased risk for TD. Patients over 40 years of age are three times more likely to develop TD than younger patients (Jeste, Wyatt, & Matthysse, 1982) and elderly NL treated patients are especially vulnerable to developing TD (Yassa et al., 1992). While increased age and female gender represent independent risk factors for TD, there is often an interaction among several risk factors, which may naturally co-occur and increase vulnerability to TD. For example, Yassa & Jeste (1992) conducted a meta-analysis of 76 studies between 1964 and 1989 and found an age by gender interaction such that TD peaked between 50 and 70 years of age in men, was more severe among women, and continued to rise in women after age 70 years.

Patients with acute or subacute EPS have also been found to present with a greater risk for TD with continued treatment (Kane et al., 1992). Length of NL treatment and cumulative lifetime NL dosage are both positively correlated with TD (Kane, Woerner,

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Weinhold, Wegner, Kinon, & Borenstein, 1984 ; Kane, Woerner, & Lieberman, 1988; Chouinard, 1988). Kane et al. (1984, 1988) in a long-term study of 850 patients, found that the incidence of TD increases in a linear progression for the first several years of continuous antipsychotic treatment. Jeste et al. (1995), prospectively studied the risk of developing TD in a sample of middle aged and elderly outpatients and finds that the cumulative incidence of TD was 26%, 52%, and 60% after one, two, and three years respectively. Chouinard (1988) suggests that more than five years of NL exposure predict subsequent TD development. It has also been found that neuroleptic treated smokers have an increased risk of TD, which may result from the excitatory influence of nicotine on dopamine containing nigrostriatal neurons (Yassa, Lal, Korpassy, & Ally, 1987). Asians have a lower prevalence of TD than North American, European or African patients (Yassa & Jeste, 1992). This may be due to differences in patient management rather than any intrinsic differences between these groups.

Factors related to the persistence of TD are frequently the same factors predicting its occurrence. Remission is less likely in individuals over age 56, when the duration of the illness exceeds 30 years, and cumulative NL exposure >3550g chlorpromazine equivalent (Cavallaro et al., 1993). In a 10 year follow-up of an elderly sample with TD, 50% had no change in TD severity, 20% had some improvement, and 13% had a worsening. Patients with improved TD had a lower present dosage of NL's than patients whose TD worsened. Clozapine and the other new atypical medications show promise in being superior to traditional NL medication in preventing or reducing the likelihood of TD or other movement side effects. The bulk of the evidence suggests a low TD and EPS liability with the atypical antipsychotic medication compared to the traditional

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medications. Lieberman et al. (1989*b*) reported a nearly complete remission of symptoms in 43% of TD patients treated with clozapine when examined with the AIMS, a standardly used neurological rating scale for the presence, severity, and distribution of tardive dyskinesia (Guy, 1976).

There is no cure for TD and treatment has been confined to preventative measures such as the simultaneous administration of anticholinergics or attempts to minimize TD once present. Medication dosages are reduced or changed, drug holidays are introduced where appropriate, or anticholinergics are prescribed. However, neuroleptics can mask TD and neuroleptic withdrawal can worsen TD (Jeste, Lohr, Clark, & Wyatt, 1988). It has been hypothesized that TD may result, in part, from neurotoxic damage due to the formation of free radicals. Vitamin E, a known antioxidant that can reduce free radicals, has been recently investigated for its efficacy in the treatment of TD. To date results have been mixed; however, no harm has been found to result from the treatment. One factor that may account for the differences in findings across the handful of studies is the length of time the patient has experienced TD. Studies of subjects with a relatively shorter duration of TD and/or later onset of TD have the best response to Vitamin E. Lohr et al. (1988) found mean reductions in AIMS score of 43% with dosages started at 400IU's/day and increasing to 1200 IU's/day over a four week period. Adler et al. (1993) administering 1600IU's for 8-12weeks reported a mean decrease of 32.5% in AIMS scores. The mean improvement after vitamin E treatment was twice as great among patients who had TD for less than five years compared with patients who had TD for five years or more (55.2% compared to 26.7%). However, Egan et al. (1992) found a minor effect in people with TD for less than five years,

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whereas Shriqui, Bradwejn, Annable, & Jones (1992) found no difference in the effects of vitamin E versus placebo in patients with a long duration of TD and exposure to NL's. The difficulty in treating TD has caused some researchers to go to great lengths to reduce its effects. One group applied behavioral principles utilizing overcorrections and negative and positive feedback. Unfortunately, these procedures did not generalize much beyond the treatment phase of the study (Taylor, Zlutnick, & Hoehle, 1979).

THE NEUROPATHOLOGY OF IATROGENIC MOVEMENT ABNORMALITIES

The pathophysiology of TD is unknown. Theories include GABA depletion, neurotoxicity, or striatial dysregulation (Egan, Apud, & Wyatt, 1997). The most popular theory is that of D2 receptor supersensitivity or D2 receptor upregulation following prolonged postsynaptic receptor blockade by NL's in the caudate and putamen, which upsets the dopamine-acetylcholine equilibrium and gives rise to abnormal movements. Supersensitivity of striatal dopamine is the consequence of neuroleptic treatment; it does not explain TD. Several neurotransmitter systems are believed to be involved. It may be that there is increased central dopamine and norepinephrine and decreased GABA and acetylcholine activity. Patients with EPS have an increased risk of developing TD. Andrew (1994) proposed that dopamine hypofunction resulting in EPS may lead to the development of dopamine receptor supersensitivity, thereby increasing the risk of TD, and suggests drugs with lower EPS liability may result in a lowered incidence of TD.

There is some evidence that there may be two subtypes of TD and that involuntary movements of the face constitute a distinct subtype from those of the limb and trunk, and each arise from different precursors and have a different etiologies. The

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finding that dopamine D2 agonists produce repetitive movements of limb and trunk while D1 agonists produce orofacial movements and sedation is support of this line of research. Orofacial dyskinesia is associated with advanced age, a greater presence of negative symptoms, withdrawal of neuroleptic medication and resembles the spontaneous orofacial movements seen among normal elderly individuals. Limbotruncal is more common in younger individuals. It is associated with dystonia and akathisia and unlike orofacial TD is improved by a reduction in NL dose and/or anticholinergic medication (Owens et al., 1982).

There is a strong resemblance between medication induced movement disorders and basal ganglia disorders. Diseases of the basal ganglia lead to characteristic disturbances of movement and muscle tone. There is usually a mixture of symptoms due to a loss of neuronal activity and/or due to abnormally increased neuronal activity. The later increase results from a lack of inhibition or disinhibition resulting from neuronal degeneration. This excess or release phenomena or positive disturbance represents the activity of surviving intact structures. It includes tremor, athetosis, chorea and ballism. Disturbances arising from a loss of neuronal activity includes akinesia, bradykinesia, diminished swing during ambulation, and a mask-like appearance.

AN OVERVIEW OF ABNORMAL MOVEMENT RATING SCALES

The measurement of tardive dyskinesia may take one of several forms including self-reports, observer ratings, or objective instrumental procedures (Jeste & Caligiuri, 1993). Each approach has its own relative advantages and disadvantages and the choice of assessment procedure is often determined based on how the information is to be

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utilized. Self-reports, which are an easy, inexpensive way to gather data, tend to have poor reliability as many individuals with tardive dyskinesia lack awareness of their involuntary movement and are not able to accurately report their symptoms (Caracci, Mukherjee, Roth, & Decina, 1990; Macpherson & Collis, 1992). For patients who are aware of their symptoms, self-reports may be useful to track and monitor factors affecting fluctuations in symptom expression and severity, such as environment influences and diurnal variations.

Observer ratings, when completed by well trained administrators, are generally regarded as a reliable measure of TD. The first rating scales for tardive dyskinesia were developed by George Crane (1969, 1971) at the National Institute of Mental Health (NIMH)- Psychopharmacology Research Branch to study to neurological side-effects of neuroleptic medications. This initial rating scale, which varied across several studies, divided the body into eleven general regions and abnormal movements were rated on a five-point severity scale. The Abnormal Involuntary Movement Scale (AIMS) (Guy, 1976), later developed at NIMH, was the first published scale. This scale examines abnormal movements in seven body regions (face, lips and perioral area, jaw, tongue, upper and lower limbs, and neck, shoulders and hips) on a five point scale of severity that ranges from 0 (absent) to 4 (severe). Additionally, there is a global rating of overall severity. Following the AIMS, several detailed multi-item rating scales were developed. The first multi-item scale, developed by George Simpson at Rockland State Hospital, was the Simpson Dyskinesia Rating Scale also known Rockland Dyskinesia Rating Scale (Simpson, Lee, Zoubok, B., & Gardos, 1979). Based on Crane's original scales, Smith, Allen, Gordan, & Wolff (1983) constructed the Smith-Texas Research Institute of Mental

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Sciences (TRIMS) Tardive Dyskinesia Scale, another multi-item scale which assesses both tardive dyskinesia and parkinsonian symptoms. Additionally, Sprague et al. (1984a) constructed the Dyskinesia Identification System which contains 34 items assessing discrete body movements common in tardive dyskinesia.

The Abnormal Involuntary Movement Scale (AIMS) (Guy, 1976) and the Simpson Dyskinesia Ratings Scale are two of the commonest observer rating scales for assessing TD. One reason is that the research and diagnostic criteria for tardive dyskinesia (RDC-TD) (Schooler & Kane, 1982) were developed for use with the AIMS or Simpson Dyskineisa Scale. To receive a designation of TD a patient must receive at least two scores of mild for a global body region or at least one score of moderate for a body region. There must be at least three months of cumulative NL exposure and the abnormal movements can not be better explained by any other medical condition.

The AIMS, because it is easy to complete in a short period of time, has been incorporated as a standard screening tool in many psychiatric inpatient and outpatients facilities throughout the country. This scale, while traditionally used for the assessment of TD, does not distinguish between TD and other types of movement disorders. One limitation of this scale is that the scale contains so few items. A rating on the tongue fails to identify the actual abnormal movement, for example Bon Bon sign, choreatheoid tongue, tongue protrusion, or tongue dystonia. The Simpson Dyskinesia Scale (SDS) is a 34 item scale where abnormal movements are recorded on a severity continuum from 0 (absent) to 5 (severe). As with the AIMS, items include ratings of face, lips, jaw, tongue, neck, trunk, upper and lower extremities, and entire body. However, with the SDS each body region is considered in greater detail making ratings more precise and improving

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the ability to track changes in TD over time. The SDS like, the AIMS, is considered reliable for measuring TD when completed by a trained rater. Some items included, such as restless legs, are not specific to TD.

A number of instruments have been employed to quantitatively measure TD included among these are ultrasound, accelerometers, electromyography, and forced pressure procedures (Lohr & Caligiuri, 1992). Accelerometers utilize a miniature strain-gauge that is responsive to acceleration in a single plane. The devise is small and weighs only a few grams so not to impede movement. Several are used to look at movements on more than one plane. Electromyography measures electrical signals emitted during muscle contraction. Force procedures utilize force gauges where the patient must engage in some voluntary activity. The subject is asked to maintain a constant force under isometric conditions for a set time period and the degree of force instability is calculated. Ultrasound involving the Doppler or pulse echo technique transduces movement which causes a shift in the frequency of the transmitted wave. Instrumental procedures are less frequently used than observer ratings because they are costly, and can be invasive and intimidating to psychiatric patients (Gardos, Cole, & LaBrie, 1977).

Factors Influencing the Assessment of Abnormal Involuntary Movements

There are many factors that can affect the chance for misdiagnosis or false positives. Subjects who are aware of their involuntary movements may intentionally try to suppress their movements during the examination. Stress may affect the appearance of dyskinetic movements in TD. High levels of stress or anxiety tend to increase abnormal movements while sedation may artificially mask TD. High levels of NL medication may also mask TD while withdrawal can result in increasing dyskinesia.

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Patients who wear dentures but do not wear them during the exam are more likely to be considered having TD than those who do not have dentures (Woerner et al., 1991). Primary neurological problems can also lead to large number of false positives among elderly samples. Finally, TD has a fluctuating course and this natural variability over time can make reliable assessments difficult.

Neuropsychological Effects

Schizophrenic patients show a variety of deficits on measures of neuropsychological functioning. The prevalence of cognitive disturbances is higher among schizophrenics with TD. Paulsen, Heaton & Jeste (1994) reviewed 31 studies and reported that 77% found that schizophrenic patients with TD have greater NP deficits than schizophrenic patients without TD. Topography has been a source of debate, whether patients with a predominantly orofacial presentation demonstrate greater neuropsychological impairment than patients with limbotruncal dyskinesia. A review by this author of 40 published studies on TD in psychiatric patients and neuropsychological functioning from 1966-1995 indicates greater neuropsychological impairment among schizophrenic patients with TD. Five studies found no difference between TD and non-TD groups (Anis, Leopold, Duvoisin, & Schwartz, 1977; Collerton, Fairbain, & Britton, 1985; Hoffman, Labs, & Casey, 1987) and one found patients with TD to have superior performance on a measure of cued- recall compared to non-TD patients (Collerton et al., 1985). There have been six studies that have directly assessed the issue of topography by comparing an orofacial sample with a limbotruncal group. Half reported greater cognitive impairment in the orofacial group (Gilleard & Vaddadi, 1986; Waddington,

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Youssef, Dolpin, & Kinsella, 1987; Gureje,1988) and the other half reported greater impairment in the limbotruncal group (Brown & White, 1991; Brown, 1992; Paulsen,1994). Many of these studies contained methodological limitations that restrict the conclusions. For example, a number of studies used small samples of elderly, long term institutionalized patients. Several studies included mixed diagnostic groups such as patients with depression and bipolar disorder (Wolf, Ryan & Mosnaim, 1983; Wegner, Kane, Weinhold, Woerner, Kinon, & Lieberman, 1985; Waddington & Youssef, 1986; Wade, 1989) others included cases with CNS syphilis (Itil & Soldatos, 1980), lobotomies (Karson, Bracha, Powell, & Adams, 1990), and dementia (Edwards, 1970; Itil & Soldatos, 1980). Despite these limitations, most findings suggest a tendency toward greater impairment on measures on frontal lobe function though no localized deficit has been found. However, the NP instruments used are often very coarse measures of mental status and basic orientation and younger patient are likely to demonstrate a ceiling effect and elderly, chronically institutionalized patients are likely to show a floor effect. Furthermore, some NP tests have a motor element that might be sensitive to the movement disorder rather than to cognitive dysfunction.

CONSEQUENCES OF MOVEMENT DISORDERS

A broad range of medical and psychological problems have been reported to result from TD, including: impaired gait and posture, speech and eating problems, and psychosocial problems resulting from the reactions of neighbors, family and fellow patients (Yassa, 1989). A disturbed gag reflex, swallowing problems involving the tongue, weight loss because of the excess movement, loosening of natural and artificial

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teeth, disrupted speech (resembling dysarthria) irregular respiration, shortness of breath at rest, audible involuntary grunting and gasping noises have all been reported (Yassa & Jones, 1989). Suicide, increased mortality, occupational impairment and social stigmatization are also common among individuals with TD (Yassa & Jones, 1989).

Social Stigmatization

Even when knowledge about a patient's diagnosis is not public, abnormal movements can suggest mental illness to people in the community and lead to stigmatization. The word *stigma* is derived from the Greek language to refer to a brand or scar on the body meant to set someone apart. The 1978 report of the President's Commission on Mental Health defined stigma as " a series of myths which serves only to quarantine the mentally ill from the rest of society. It brands the person seeking professional services with a mark of shame" (p.345). Several studies have demonstrated the manner in which a person labeled as mentally ill may be quarantined from society. Page (1977) reported that persons identifying themselves as mental patients were refused rooms for rent significantly more often than were persons using no mental illness identification. Preexisting beliefs are important in understanding labeling effects. The label of mentally ill for some evokes beliefs about dangerousness and unpredictability and creates a desire to maintain increased social distance (Link, Cullen, Frank, & Wozniak, 1987). Lack of previous contact with someone with a mental illness is associated with an increased desire to maintain greater social distance from the target individual and a perception of the mentally ill as more dangerous.

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BARRIERS TO SOCIAL INTEGRATION

Dissociation Between Residual Symptoms and Social Functioning

An examination of the factors independently impacting social integration among schizophrenics has failed to demonstrate a strong relationship between residual symptoms and social functioning. Surprisingly, symptoms are only weakly associated with social competence and functional outcome measures in schizophrenia (Bellack et al., 1990a, 1990b, Appelo et al., 1980; Green, 1996). Neuropsychological deficits such as impairments in memory (Mueser, 1991; Bellack, Sayers, Mueser, & Bennet, 1994; Corrigan, Green, & Toomey, 1994), learning (Kern, Green, & Satz, 1992) and vigilance (Penn et al., 1993; Corrigan, et al., 1994; Penn et al., 1995) are better predictors of community functioning. In Green's (1996) review of eight studies on residual symptoms and outcome, psychotic symptoms were not significantly associated with functional outcome. Even positive or florid psychotic symptoms do not necessarily preclude successful social integration (Bellack et al., 1994; Corrigan, Green, & Toomey, 1994; Corrigan & Buican, 1995). These symptoms, which typically are the target of pharmaceutical interventions, often remit with medication, and patients can learn compensatory techniques to adapt to positive symptoms. It is the negative or deficits symptoms that are far more disabling. These symptoms which include, avolition, anhedonia, affective flattening, and alogia represent a functional deterioration, reflected of the frontal lobe dysfunction that has been demonstrated when this type of symptomatology is prominent (Weinberger, Wagner, & Wyatt, 1983; Andreasen, et al., 1992). However, closer investigation of reports demonstrating an apparent relationship between negative symptoms and deficits in community functioning reveal

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methodological flaws in the way these constructs are measured (Bellack, Morrison, Mueser, & Wade, 1989; Bellack, Morrison, Wixed, & Mueser, 1990). Negative symptoms are commonly assessed using the Scale for the Assessment of Negative Symptoms (SANS) (Andreasen,1982). Part of the determination for the "Avolition/Apathy" item on this scale involves making a rating of "Impersistence at work or school" - that is, whether the patient has difficulty seeking or maintaining employment (or schoolwork) as appropriate for his or her age and sex."(page5). "Anhedonia/Asociality" is rated on the basis of recreational involvement, and degree of relationships with friends and a significant other. Ratings on these items are then correlated with scores on an outcome measure such as the Social Adjustment Scale (Schooler, 1979) which examines recreational involvement, work role and relationship with others. An association must be found because there is a duplication of measurement. This overlap between ratings artificially suggests a relationship as the same construct is being measured twice. This is one limitation in an area of the literature that suffers from methodological problems. Social competence is difficult to define, and definitions and methods of measurement vary, as does the external validity of "social competence". Further, few studies in this area use non-patient comparison groups, and in many studies the range is truncated as inpatients are the sample used (Bellack, Morrison, Wixed, & Mueser,1990; Bellack et al., 1994, Penn et al.,1995).

Neuropsychological Impairment and Social Functioning

Neuropsychological dysfunction has recently been identified as an important outcome measure in relationship to social functioning (Green, 1996). Delayed verbal memory and card sorting, but not psychotic symptoms, have been found to be predictors

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of social and occupational functioning (Jaeger & Douglas, 1992; Goldman et al., 1993). Information processing deficits, a widely cited impairment in schizophrenic patients, has been attributed to poor social functioning (Penn et al., 1995) and less accurate labeling of facial affect and emotion recognition by schizophrenics (Mueser et al., 1996; Morrison & Bellack, 1988). Impaired visual processing and recognition memory have also been linked to poor social functioning and faulty social cue perception (Corrigan, Green, & Toomey, 1994). Indeed, intact information processing is vital to interpersonal situations. One must be able to focus on the speaker, tune out environmental distractor, retain the information conveyed by the speaker and give an appropriate reply.

Dissociation Between Residual Symptoms and Neuropsychological Functioning

Evidence that cognitive deficits are not the result of symptoms comes from two separate observations: (1) NP deficits exist prior to the onset of overt psychotic symptoms. For example, retrospective studies of IQ and academic performance suggest that a significant number of children who later become schizophrenic exhibited significant impairments in comparison to their siblings and peers. Several high risk studies have found that early attentional dysfunction is predictive of and predates the development of serious psychiatric illness (Cornblatt & Erlenmeyer, 1985; Marcus et al., 1985; Asarnow et al., 1994). (2) Cognitive dysfunction remains during periods of symptom stabilization. One of the most compelling pieces of evidence for the relative dissociation between symptoms and NP deficits comes from the effects of neuroleptic medication on cognition. Even after medication-mediated symptom improvement, the typical measure of treatment success, individuals with schizophrenia continue to experience a variety of cognitive deficits as well as difficulty reintegrating into the

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community. Traditional neuroleptic medications provides little direct cognitive benefit for most patients (King, 1994). The fact that so few studies have been able to demonstrate antipsychotic medication-related improvement in NP performance despite the fact that these medications are effective in the symptomatic treatment illustrates the dissociation of symptomatic and cognitive variables. Recently improved pharmacological agents have been sought as the definition of treatment success has evolved to include measures of functional outcome. Emerging reports on atypical neuroleptic medication suggest they lead to improvements in both cognitive and community functioning (Meltzer, Thompson, Lee & Ranjan,1996).

NEUROPSYCHOLOGICAL DEFICITS IN SCHIZOPHRENIA

Attention

Attentional deficiencies among of the most cited neurocognitive deficits in schizophrenia despite the varying conceptualizations and operational definitions of attention. There is a voluminous literature citing impairments on measures of sustained attention, vigilance and reaction time among schizophrenic patients. Attentional dysfunction on these types of tasks has even been identified as a trait marker in high-risk individuals and asymptomatic stabilized schizophrenic patients (Mirsky, Silberman, Latz, Nagler, 1985; Cornblatt et al., 1994). Neuchterlein, Edell, Norris, & Dawson (1986) suggest that one aspect of the attentional dysfunction in schizophrenics is their inability to selectively attend to relevant aspects of stimuli and filter irrelevancies. In comparison to controls, schizophrenics perform poorly on measures of backward visual masking and have trouble with sustained attention on simple reaction time tasks (Neuchterlein et al,

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1986). On reaction time cross-over paradigms, schizophrenic patients show an inability to effectively benefit from long predictable intervals between stimuli (Neuchterlein et al., 1986). Impaired selective attention has further been suggested based on an increased errors of omission on dichotic listening tasks, compared with controls (Helmsley & Richardson, 1980). Within the population of schizophrenic patients, differences in attentional capacity have been described based on the clinical subtype of schizophrenia. Non-paranoid schizophrenic patients show a deficiency in focused attention when a distractor is present and performance is characterized by a higher number of omissions (Rund, 1986). In contrast, paranoid or positive symptom schizophrenics show a greater number of errors of commission. These differences have been attributed to different neurobiological underpinnings associated with each type of symptomatology (Seidman, 1983).

Learning and Memory

Impairments in all stages of memory function (i.e. encoding, consolidation, retrieval and recognition) have been reported. Verbal learning and memory deficits have been described in neuroleptic naive first episode patients (Saykin et al., 1994). Some of the suggested underlying impairments in learning and memory include a poor use of elaborate encoding, a capacity limitation (Goldberg, Patterson, Taqqu, & Wilder, 1998), and impaired working memory (Gold, Carpenter, Randolph, Goldberg, & Weinberger, 1997). On measures of verbal memory, learning curves begin and end lower than those seen in normal controls and performance reflects poor organization on encoding as demonstrated by a poor use of semantic clustering (Calev, 1984). Paulsen et al. (1995)

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noted that schizophrenics performed worse than controls on the California Verbal Learning Test (CVLT) on all learning, recall and recognition memory measures. Schizophrenic patients showed a prominent retrieval deficit and a mild encoding deficit as well. About half of the schizophrenic patients were classified as having a subcortical memory profile. A small but statistically significant amount of the variance can be explained on the basis of anticholinergic dose and the severity of impairment was related to age of onset and more negative symptoms.

Executive Functions

" Executive functions can be conceptualized as having four components: (1) goal formulation; (2) planning; (3) carrying out goal-directed plans; and (4) effective performance (Lezak, 1983)." Most measures assessing executive function are relatively sensitive predictors of frontal lobe damage. Much of the literature suggests that the performance of patients with schizophrenia often resembles that of patients with frontal lobe brain-damage. Individuals with schizophrenia have difficulty on tests of concept formation and hypothesis testing- such as the Halstead-Reitan Category Test and the Wisconsin Card Sort Test (WCST) and both measures have good reliability in detecting frontal lobe dysfunction. On the WCST, schizophrenic and schizoaffective patients achieve fewer categories and make more perseverative errors (Seidman, 1994). Goldberg et al. (1987) taught the WCST to a group of schizophrenic patients. Baseline performance fell in the impaired range. However, with explicit directions on each card patients produced the correct response. Without this structure and assistance, performance degraded to baseline. In a series of studies of frontal activity and performance of patients

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with schizophrenia on the WCST, concurrent measurement of cerebral blood flow was obtained while subjects were administered a computerized version of the WCST. Data revealed hypoactivity in the frontal region as compared with normal controls and specifically suggested dorsolateral prefrontal cortical dysfunction (Weinberger,1986; Berman, Zec, & Weinberger,1986). Schizophrenics also show deficits on other measures of frontal lobe function such as on verbal and design fluency measures (Kolb & Wishaw, 1983).

Language

Schizophrenic patients show impairments on measures of expressive and receptive language functions. The expressive language of schizophrenics is often less syntactically complex. Sentences are shorter, contain less clauses and are generally more syntactically and semantically deviant. Performance impairments have been reported in verbal fluency (Allen, Liddle, & Frith, 1993; Goldberg & Weinberger, 1995), confrontational naming (Barr, Bilder, Goldberg, Kaplan, & Mukherjee, 1989), vocabulary definitions (Paulsen et al., 1995) reading comprehension (Silverberg-Shalev, Gordon, Bentin, & Aranson, 1981) and an increased frequency of morphological errors has been reported (De Lisi, 1982). Baltaxe and Simmons' (1995) investigation of language in 47 children and adolescents with early onset schizophrenia reveal communication impairments that were especially prominent in pragmatics (83%), prosody (81%), auditory processing (72%), and abstract language (64%). Difficulties in receptive and expressive language were noted in two-thirds of subjects. Variation in language function has been associated with clinical state such that a greater number of

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syntactic and semantic errors have been associated with predominantly positive symptomatology and decreased expressive syntactic complexity with negative symptoms (Thomas, King, & Fraser, 1987). Patients with an earlier age of onset (<45 years) and non-paranoid subtype reportedly displayed greater disorganization in their semantic networks than those with later onset and paranoid symptomatology (Paulsen et al., 1996).

SOCIAL COMPETENCE

Patients' reports of quality of life are often unrelated to symptoms, as even when symptoms diminish or are absent, decreased satisfaction in many life domains is the chief complaint. Quality of life among patients is strongly related to levels of social support and social functioning, including interpersonal relationships (Corrigan & Buican, 1995) - neither of which is strongly influenced by positive symptomatology (Bellack et al.,1990; Corrigan, Green, & Toomey, 1994; Corrigan & Buican, 1995). There has been much research on social skills in schizophrenia, the specific contributors to this impairment and its relationship to social functioning. The definition of social competence in most studies is based on observer ratings of the verbal content and nonverbal elements during staged role-plays. For example, Penn et al. (1995) examined the relationship between social competence and information processing in a sample of chronic schizophrenic patients and utilized the widely used definition of "social competence" described by Lieberman (1982). According to this definition, speech rate, length of speech pauses, speech fluency, level of eye contact, fidgeting, rocking, restlessness, and facial twitches are the components that comprise social competence. There is an enormous social psychology literature demonstrating how these paralinguistic and nonverbal elements are related to

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social acceptance and social integration in the community. This precisely illustrates the problem faced by patients with abnormal involuntary movements. A patient may have adequate skills per se or knowledge of how to behave yet abnormal movements cause him/her to be viewed and labeled as lacking in social competence.

Indeed, displaying the appropriate behaviors with the appropriate rate and fluidity is important for social acceptance. Social skills training programs have focused on the importance of these paralinguistic elements in interpersonal communication (Liberman, 1982) but have had mixed success at improving quality of life (Liberman, 1982; Bellack, 1984). Training programs devoted to improving social competence have directed their efforts at using behavioral techniques to identify molecular behaviors that are too frequent or infrequent and remediate the deficit or teach communication skills (Liberman et al., 1986). When the etiology of the behaviors targeted are neurological, behavioral techniques such as suppression and modeling are often insufficient in overcoming the neurological challenge.

LIKABILITY

There is large body of literature on the influences of nonverbal behavior in initial encounters and its impact in determining liking between interactants. Nonverbal behaviors can convey information about status and power (Edinger & Paterson, 1983), level of confidence, openness, enthusiasm, and trustworthiness- all of which are related to ratings of social attractiveness. The microbehaviors related to social likability and social attractiveness are similar to those that influence hiring decisions in nonclinical populations. These behaviors include: facial expression, gaze, smiling, and body

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orientation. High amounts of eye contact, (Amalfitano, 1977; Forbes & Jackson, 1980; Edinger & Paterson, 1983) facial gesturing, and smiling convey a positive impression of openness and enthusiasm. Body posture also conveys a message that influences likability (Imada & Hakel, 1977; Edinger & Paterson, 1983). Speech rate (Ito, 1994) as well as the tempo of speech and the tempo of nonverbal microbehaviors such as head nodding are factors that indicate social competence to another person in dyadic communication (Ito, 1994). The expression of appropriate affect also fosters a positive characterization of participants and expression of inappropriate affect can lead to condemnation and stigmatization (Heise, 1989).

Normal paralinguistic and nonverbal elements of dyadic communication may be affected by a variety of medication-induced movement disorders causing the patient to appear deviant or strange. For example, nonverbal elements such as decreased smiling, and decreased range and intensity of facial expression are common parkinsonian side effects and dystonic posture, poor eye contact, and absent or abnormal hand gestures may also occur in psychiatric patients. Even in the presence of adequate social and interpersonal skills, these movements may limit the interactions others may want with patients. Behaviors seen as aberrant can give rise to a set of beliefs about how intelligent, friendly, competent or dangerous an individual might be. Abnormal movements exhibited by patients, even if subtle, may signify mental illness, dangerous and a lead to a desire to maintain increased social distance.

Physical attributes and behavioral features can provide cues that allow one to infer personality characteristics. Evidence suggests that for some personality traits very little information about the target is required for judges to provide valid ratings. Albright,

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Kenny & Malloy (1988) coined the term "consensus at zero acquaintance" to refer to an agreement among observers on the rating of a target, even if they have not interacted with this person. The validity of these judgments is measured by the degree to which the observers ratings correlate with self-reports by targets. Two personality traits, extroversion and conscientiousness, have been found to have the highest correlation across a number of studies (Albright et al., 1988; Watson, 1989; Borkenau & Liebler, 1992; Kenny, Horner, Kashy, & Chu, 1992). There is also a literature on the types of personality traits that are inferred from physical attributes. In a study by Kenny et al. (1992), rapid body movements and smiling were found to correlate well with extroversion judgments on the basis of viewing the target subject on a video for 20 seconds.

PHYSICAL ATTRACTIVENESS

Level of physical attractiveness is positively correlated with ratings of initial likability (Davis, Conger, & Conger, 1990; Riggio, Widman, Tucker, & Salinas, 1991). Physically attractive individuals are assumed to possess positive character traits and are rated as more likable, warmer and friendlier by unknown raters (Miller, 1970). Overweight subjects are perceived as less socially skilled and less likable (Davis et al., 1990; Miller, Rothblum, Barbour, & Brand, 1990). Facial expression is one component of facial attractiveness. Target individuals who pose for a photograph with a sad expression are rated as less attractive than when posing with a neutral or happy expression (Mueser, Bellack, Morrison, & Wade, 1990). Factors that influence an observer's impression can also vary with the gender of the target. In females, facial

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expressiveness correlated higher than speaking and gestural fluency with initial impressions of likability while positive ratings for males were related to speaking fluency, postural shifts, and head movements (Riggio & Friedman, 1991). Facial beauty and expressive behaviors were of primary importance in overall judgments of attractiveness and overall attractiveness ratings significantly predicted favorability of initial impression (Riggio et al., 1991).

THE PRESENT STUDY

The obstacles to successful social integration for schizophrenics living in the community are multidimensional in cause and include known factors such as difficulty obtaining employment and housing, and a lack of social supports and satisfying social relationships. Neuropsychological deficits in information processing, executive functioning, and verbal learning, have emerged as strong factors that independently contribute to difficulty with social integration (Green, 1996). Psychiatrically stabilized patients with little or no remaining symptoms continue to experience difficulty assimilating into mainstream society. There is a paucity of literature, however, on the impact of neuromotor abnormalities on independent functioning. In a preliminary study by Jaeger (1995) with 33 consecutive patients three months and six months after discharge from a psychiatric rehabilitation program, social and vocational outcome measures were examined. Patients were administered the Brief Psychiatric Rating Scale, The Social Adjustment Scale (SAS), Wisconsin Card Sorting Test (WCST), and the Gestural and Expressive Stigmata Scale (GESS), a rating scale designed to measure neuromotor factors which affect the patient's overall appearance during dyadic

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communication. WCST was predictive of instrumental role functioning as measure by the SAS three months later; this effect was independent of estimated Verbal IQ and psychopathology. Additionally, GESS total score at baseline was predictive of SAS Social Leisure ratings at 6 month follow up. Correlations were significant for the Global SAS measures ($r=.60$, $p<.001$), with trends for Social Leisure ($r=.33$, $p=.059$) and Role performance ($r=.31$, $p=.08$). After covariance for concurrent psychopathology, statistical trends remained for each of these SAS measures; only r square for change of the Social Leisure measure (.1866) remained significant at alpha <.05.

Neuromotor abnormalities in schizophrenic patients, whether iatrogenically produced or due to the disease itself, negatively impact quality of life. This study sought to examine the impact of stigmatizing gestural and expressive behavior on social assimilation in psychiatrically stabilized adults with schizophrenia and schizoaffective disorder reintegrating into the community after an acute exacerbation of their illness. It was expected that the movement disorders, either subtle or frank, would negatively impact on social integration and social likability. To this end, patients were assessed in the following domains (1) neuromotor functioning including neuromotor signs affecting appearance and abnormal involuntary movements, (2) social integration, (3) social likability, (4) psychopathology, and (5) neuropsychological functioning.

Because available instruments for rating abnormal movements do not address the stigmatizing effect of movement disorders, the Gestural and Expressive Stigmata Scale (GESS), was developed by at Hillside Hospital to address this need. It is an 11 item rating scale designed to measure neuromotor factors that affect the patient's overall appearance during dyadic communication. Thus, another aim of the study was to test the

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hypothesis that the GESS will be a more sensitive predictor of stigmata than traditional movement disorder rating scales and that stigmata as assessed by the GESS will be associated with social disability in psychiatrically stabilized patients.

The following hypotheses were tested: (1) In a cross-sectional sample, presence and severity of stigmatizing gestural and expressive behavior, as measured by the GESS, will be associated with lower social functioning, independent of level of psychopathology and neuropsychological deficits. (2) Patients displaying even subtle movement disorders will be rated as less likable than those with no movement disorders. (3) Patients with orofacial TD will demonstrate greater impairment in social functioning than patients with limbotruncal TD. (4) Patients with movement disorders will show greater impairment on measures of learning and attention than patients without movement disorders. It is expected that patients with limbotruncal TD will have greater NP impairment than patients with orofacial TD.

METHODS

Subjects

127 patients with a DSM-IV Axis I diagnosis of schizophrenia or schizoaffective disorder and stabilized symtomatology were recruited up to six months after discharge from the inpatient units and partial hospital programs at Hillside Hospital and other affiliated hospitals. This sample was selected because it is broadly representative of patients with persistent schizophrenic and schizoaffective disorders who are returning to the community following an episode of hospitalization.

Patients who satisfied the following inclusion criteria were selected for

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recruitment into the study: (1) A diagnosis of schizophrenia or schizoaffective disorder as confirmed by the Structured Clinical Interview for DSMIV Axis I Disorders Patient Edition (SCID-I/P) (Spitzer, Gibbon, & Williams, 1995), (2) between 18 - 54 years of age (3) a history of a serious psychiatric disorder for at least one year, (4) informed consent to participate. Exclusion criteria included any primary neurological disorder. See Table1 for a description of the sample.

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Table 1: Demographic and Illness Severity of Subjects

	Subjects		
VARIABLES	**N**	**MEAN**	**SD**
Age	127	35.83	8.53
Years of Education	127	12.25	2.53
Age at onset of symptoms	124	18.90	7.69
Age first treated by a mental health professional	126	19.99	7.61
Gender: (N = 127)			
Male	80		
Female	47		
Race: (N = 127)			
Caucasian	61		
African American	45		
Hispanic	17		
Asian	4		
Diagnosis: (N = 127)			
Schizophrenia, Paranoid Type	70		
Schizophrenia, Disorganized Type	1		
Schizophrenia, Undifferentiated Type	3		
Schizoaffective Disorder	53		
Highest Degree: (N = 127)			
None	40		
High-School	56		
GED	12		
Associates	2		
BA	16		
MA	1		
Marital Status: (Total N = 127)			
Never Married	99		
Married	9		
Divorced	13		
Separated	5		
Widowed	1		

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Procedure

After obtaining IRB approval at Hillside Hospital and Creedmore Hospital for the use of human subjects, patients were identified from the hospitals' discharge lists and the census lists of these hospitals ambulatory clinics. Patients were approached in person, if attending an outpatient ambulatory program at Hillside or Creedmore Hospital, or they were telephoned to participate in the study after a period of symptom stabilization not exceeding six months. Subjects were informed that the study was seeking to understand the factors that affect social and occupational functioning in psychiatric patients reintegrating into the community after a hospitalization. Subjects were assured that all information they provided would not be shared with their treatment team without their permission and that all information disclosed was confidential to the extent permitted by law (i.e. unless danger to self or others was revealed). They were further informed that all data would be identified by a subject ID number, not a name.

Consenting patients who met study criteria were administered the SCID (Clinician version for DSM-IV) to confirm the diagnosis. Testing was conducted in two sessions within a week but in some cases extended out over additional sessions depending on the patient's availability and stamina. Breaks were incorporated into each session to ensure the comfort of the patient and to minimize the effect of fatigue on performance. The movement disorder ratings, neuropsychological evaluation, independent functioning measurement, and psychopathology evaluation required approximately four hours to complete. During either session, based on the availability of the Hillside Hospital Video Center, patients engaged in a video taped social role-play. Subjects were informed that another aim of the study (particularly the videotaping) was to examine the effects of

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movement disorders on social perception, and that the video tapes would be shown to Queens College students who would not know they were seeing psychiatric patients. Twenty-seven subjects were not videotaped. Eight subjects refused to be videotaped and the remaining 19 were not taped because they were unavailable to travel to the Hillside Hospital video studio. Since not all of the subjects agreed to all aspects of the study, there a different sample sizes for some of the procedures.

Measures

After the initial diagnostic interview, patients were assessed in the following domains: independent functioning, neuromotor behavior, psychopathology, attention and memory functioning, and social likability (See Table 2).

Table 2: Schematic Representation of Domains Measured and the Instruments in Each Area

Diagnostic Interview	Neuropsychological Assessment
Structured Clinical Interview for the DSM-IV (SCID)	Wechsler Memory Scale-Revised (WMS-R) subtests: Digits Span Backwards, Visual Span Backwards, Visual Reproduction II, Verbal Paired Associates II
Independent Functioning	
Social Adjustment Scale-II (SAS II)	Trails B Concentration Endurance Test (d2)
DSM-IV Social and Occupational Functioning Scale (SOFAS)	Wechsler Adult Intelligence Scale-Revised (WAIS-R) subtests: Arithmetic Digit Symbol
Hillside Neurorehabilitation History Form	Letter Number Span
	Neuromotor Assessment Measures
Psychopathology	Gestural and Expressive Stigmata Scale
Positive and Negative Symptom Scale (PANSS)	Simpson Dyskinesia Scale
	Modified Simpson-Angus Extrapyramidal Scale

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DIAGNOSTIC INTERVIEW

The Structured Clinical Interview for the DSM-IV (SCID) (First et al., 1995) Mood and Psychotic modules were used to confirm the chart diagnosis of schizophrenia. This is the current standard for assuring accurate diagnosis using the DSM-IV criteria and allows for comparison of subjects across studies (Ventura, Liberman, Green, Shaner, and Mintz, 1998).

SOCIAL AND OCCUPATIONAL FUNCTIONING

Demographic Interview

The Hillside Neurorehabilitation History Form includes demographic information, phone numbers and addresses of patients and other contact information. Clinical history items include: age of illness onset, familial psychiatric history, ECT history, current medication, head injury/neurological disorder history, current disability due to medication side effects, drug abuse history modified to include items from the Toolkit for Evaluating Substance Abuse in Persons with Severe Mental Illness (Mueser et al., 1995), legal history, lifetime education and work history, and treatment and residential service utilization for the past month. The history form has a Patient Self-Report Questionnaire, which the patients could take home to verify information to make collecting information for the history form more accurate.

Social Adjustment

The Social Adjustment Scale II (SAS II) (Schooler et al., 1979) is a widely used instrument for global ratings of independent functioning (IF) in vocational and social domains. It is an adaptation of the Social Adjustment Scale (Weissman, 1975) and was

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specifically designed for use with ambulatory individuals with chronic schizophrenia (Wallace, 1986). The SAS II is a semi-structured interview of 52 items that includes measurement of role functioning (work, school, homemaker), relationships with household members, relatives and friends, leisure activities and personal well-being. This measure has been used in many large scale, multicenter studies evaluating the efficacy of neuroleptics and longitudinal outcome studies of schizophrenia (Schooler, Keith, Severe, and Matthews, 1989). The SAS II global rating for Social Leisure was used to assess level of social functioning.

The Social and Occupational Functioning Assessment Scale (SOFAS) of the Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition (DSM-IV) (American Psychiatric Association, 1994) was also used. This is global clinical rating that focuses exclusively on impairment in social and occupational functioning and is not influenced by severity of psychological symptoms.

MOVEMENT DISORDER MEASURES

Neuromotor Stigmata Assessment

Current abnormal movement rating scales address the kinetic severity but not the stigmatizing effects of abnormal movements. The Gestural and Expressive Stigmata Scale (GESS) (See Appendix I) was developed by Judith Jaeger, Ph.D, the mentor of this project, to observe the impact of neuromotor signs, from the most subtle to the frankly obvious, on social/vocational opportunities. It is an 11-item rating scale designed to measure neuromotor factors that affect the patient's overall appearance during dyadic communication. The GESS can be completed on the basis of a 5 to 10 minute verbal

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interaction with the patient. Patients are rated in the role of listener, speaker and both as speaker and listener in interpersonal communication. Examination of the scale's interrater and test-retest reliability have yielded satisfactory results. Coefficients were computed with patients with a variety of psychiatric diagnoses (mostly schizophrenia) who were participating in the Aftercare Psychiatric rehabilitation program at Hillside Hospital. Each patient was interviewed on two occasions and ratings were made at both times. On the first occasion, there was only one skilled rater, and on the second occasion (within three weeks of the first occasion) there were two additional (total of three) skilled raters (the authors of the GESS scale). Interrater reliability among the three raters, as well as test-retest reliability for the one rater who rated on two occasions, were computed using the Intraclass Correlation Coefficient (ICC) (Shrout & Fleiss, 1979). Results of these analyses showed that test re-test reliability for the global rating was .87 while the ICC for interrater reliability among all three raters was .79. This is within the conventionally acceptable range. Ongoing work in this area is being directed at examining individual scale items and for this purpose, we have to date rated approximately 20 additional patients (with all three raters) who were selected on the basis of global impression to represent a wide range of severity in gestural and expressive stigmata. The expanded sample analyses demonstrated that the scale meets conventional standards for reliability (interrater reliability for total score and global rating ICC = .84 and .77 respectively; test re-test reliability ICC = .87, coefficient alpha = .86)..

Traditional Movement Disorder Ratings

Movement disorder ratings of tardive dyskinesia and extrapyramidal symptoms were obtained with conventionally used movement disorder scales, the Simpson

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Dyskinesia Scale (Simpson, et al., 1979) and the Modified Simpson-Angus Extrapyramidal Scale (Simpson & Angus, 1970).

The Simpson Dyskinesia Scale (SDS) is a widely used movement disorder scale in which specified abnormal movements are recorded on a severity continuum from 0 (absent) to 5 (severe). Items include 35 ratings of specific body regions in the face, lips, jaw, tongue, neck, trunk, upper and lower extremities, and entire body.

The Modified Simpson-Angus Extrapyramidal Scale (MSAEPS) assesses the severity of EPS frequently associated with conventional neuroleptics. Items include ratings of gait, fine motor tremor, hypersalivation and motor rigidity.

The Abnormal Involuntary Movement Scale (AIMS) is another widely used scale for TD assessment. It examines abnormal movements, with the specific exclusion of tremors, under seven headings (facial expression, lips and perioral area, jaw, tongue, upper and lower limbs, and neck, shoulders and hips) on a five point scale of severity, from 0 (absent) to 4 (severe). Ratings on each item are contained in the global ratings of the SDS. The SDS scale was chosen over the AIMS as it is more inclusive and forces the rater to consider each body region in greater detail.

Training Procedure for Conducting Movement Disorder Examinations

Prior to the start of data collection, this author underwent extensive training in identifying and measuring abnormal movements. This training procedure took approximately nine months and was conducted by the research department at Hillside Hospital. Hillside Hospital has a number of longitudinal projects examining factors related to the emergence and persistence of TD and staff are expert in its identification,

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measurement and diagnosis. The initial training procedures involved: (1) learning the examination procedure, (2) viewing approximately 20 hours of video recorded examinations, and (3) observing examinations conducted on outpatients, inpatients, and patients in community programs in order to observe a wide range of TD severity. A psychiatrist and a licensed registered nurse, who were both expert raters, then supervised training in conducting and rating the motor examinations. After conducting 15 supervised examinations and achieving consensus with the expert raters, inter-rater reliability was established by viewing and rating a series of 10 videotaped examinations used to establish inter-rater reliability. To be deemed reliable, ratings must not differ from the "gold standard" rating by more than one point on any global item.

PSYCHOPATHOLOGY ASSESSMENT

The Positive and Negative Syndrome Scale (PANSS) (Kay, Fizbein, & Opler, 1987) is a structured clinical interview between 30 and 40 minutes in length, in which ratings on 30 items are made using a severity scale of 1 to 7. The PANSS measures severity of psychopathology and yields a total score as well as a positive and negative symptom scores. Items assessing psychomotor factors were excluded from the total score.

Training Procedure for Conducting Psychopathology Assessment

Again, prior to the start of data collection, this author underwent several months of training on the PANSS at Hillside Hospital's Center for Neuropsychiatric Outcome and Rehabilitation Research. A staff psychologist and Psychiatric Rehabilitation Assessment Specialist, who was trained by Paul Ramirez Ph.D., certified PANSS trainer

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and professor of Clinical Neuropsychology, conducted the training. This staff member received the designation of expert rater allowing him to both administer and train qualified health professional and qualified graduate students to administer this interview. The initial training procedures involved (1) learning the interview and the anchors, and (2) observing at least ten interviews conducted by the expert rater. Training continued by observing and rating ten additional interviews and reviewing the ratings with the expert rater. This was followed by semi-independently (i.e. conducting the interview together with the expert) and then independently (with the expert observing) conducting and rating ten interviews. At this point, this author was regarded as competent to conduct the interview by the expert rater and achieved consensus with the expert rater on the symptom ratings when conducting the interviews independently.

NEUROPSYCHOLOGICAL ASSESSMENT

Attention

The Concentration Endurance Test (d2 Test) is a type of cancellation test where the subject is asked to visually scan, locate, and "cancel" (by marking with pencil) target stimuli that are embedded in an array of distracting stimuli. Cancellation tests have been used widely in clinical and experimental neuropsychology, and such tests are among the most widely used measures of vigilance. Normative data given in the test manual are derived from large samples (n=3,132) of normal students and adults ages 9 to 60 years (Brickenkamp, 1981).

The Wechsler Adult Intelligence Scale - Revised (WAIS-R) (Wechsler, 1981) is an extensively used, well standardized measure of intellectual function. The WAIS-R is

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comprised of 6 verbal subtests and 5 performance subtests, which test language, attention, executive and visuospatial functions. These tests render separate subtest raw, scaled and age corrected scaled scores, and composite Verbal, Performance, and Full Scale intelligence quotients. Explicit administration and scoring procedures as well as information on reliability and validity are furnished in the manual. Normative data was obtained on 1,880 people. Split half coefficients are very high (.97, .93, .97, for Verbal IQ, Performance IQ, Full Scale IQ). Validity has been established through correlation with other intelligence tests such as the Stanford Binet (r=.85), through factor analysis, and correlation with academic success (r=.50). Age corrected subscale scores were used for the Arithmetic and Digit Symbol subtests.

The Trail Making Test (TMT) assesses visual scanning, motor speed, speed of hand-eye coordination, the ability to alternate between two sets of stimuli, and executive function. It requires that subjects connect, by making straight lines with a pencil, 25 encircled numbers in the correct order (Trails A) and 25 alternating numbers and letters in the proper order (Trails B).

Memory

The Wechsler Memory Scale - Revised Edition (WMS-R) (Wechsler, 1987) is a widely used battery for the measurement of memory and learning (Lezak, 1995) that includes measures of immediate and delayed retention of verbal and visual material. Verbal measures include word-pair associate learning and the recall of paragraph-length story passages. Visual measures include immediate recognition of geometric designs, visual paired associates, and recall (by reproduction) of line drawings. Selected subtests

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that measure delayed memory and working memory were utilized in the analysis.

The Letter Number Span Test (LNS) was developed by Gold et al. (1997) as a measure of auditory working memory. Lists containing both numbers and letters are read aloud to the subject. The subject must rearrange the list so that the numbers are said first in increasing order followed by the letters in alphabetical order. There are 24 strings that range from 2 items to 7 items and are arranged in groups of 4 for each level of difficulty. All items at given difficulty level must be failed for the test to be discontinued. The score used is the total number correct.

SOCIAL LIKABILITY

One-hundred patients and thirty-five normal controls were videotaped engaged in a three minute Social Role-Play Situation (SRS) involving ordering a meal in a restaurant, with a research assistant acting as a social confederate. This took place in the research video studio at Hillside Hospital, which contains an interview room and a videotaping room equipped with three video cameras, videotaping and editing equipment. The patient was thoroughly informed about the SRS and his/her role in the role-play before entering the video studio. Videotaping began as soon as the patient entered the door with the cameras focusing on the patient. The social confederate was seated by the patient and was not seen, only heard in the background. To maintain confidentiality, patients were asked to refrain from stating their name, mentioning medications, doctors or anything that would refer to their disability status. Each person posed with a smiling face during the video and a freeze frame of this pose was used for the video-stills.

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EVALUATIONS OF SOCIAL LIKABILITY

The videotaped SRS as well as video-stills depicting the patient in a stationary pose were evaluated by 218 raters divided into 19 groups of approximately ten per group. Raters were Queens College undergraduates who ranged in age from 18-52 years and were blind to the disability status of the patients. A sign-up sheet with a brief description of the project, screening venue and evaluation date was posted. Participation in this phase of the study took two hours for each evaluator and served as partial fulfillment of a Psychology 101 course requirement. As perception of behavior and evaluation of social likability can differ with characteristics of the judge and/or the subject judged, the use of groups of raters differing in age, gender and ethic background was utilized to aid in equalizing this effect (Turner, Beidel, Hersen, & Bellack, 1984). See Table 3 for demographic data on the evaluators.

Table 3: Demographic Information on Evaluators

Demographic	N	Mean	SD	Range
Age	218	22.06	6.25	18-52
Race (N=218)	**Percentages**			
African American	7.9			
American Indian	.5			
Asian	21.8			
Caucasian	41.8			
Hispanic	17.6			
Other	10.6			

Each evaluation session involved rating the likability and attractiveness of ten to twenty patients in either a dynamic presentation (the SRS video) or in a static presentation (a freeze frame video-still depicting the patient in a stationary pose with a

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smiling face). No evaluator rated the same patient in both presentations. Ultimately each patient was rated in both a static and dynamic presentation. To help minimize the potential impact of an order effect and initial response bias, data from the first three subjects in each session were discarded in the analysis. Evaluators were informed that they would be excused from the study, with full credit for participation, if they recognized any of the individuals. One evaluator recognized one patient as familiar from a previous job. This person was excused and the data was not included in the analysis.

Each group of evaluators was read the following instructions.

> "We are conducting a pilot study on how people form impressions. We want your help in selecting some stimuli that range from 'not at all likable' to 'very likable' that we will use in a future study. For this project, stimuli are people. We would like you to rate each of these stimuli on the basis of how likable the person is, their physical attractiveness and how comfortable you would anticipate feeling with the person in various social situations. We are looking for stimuli that range from 'extremely likable' to 'not at all likable'.
>
> We would like to maintain your anonymity so your names will not appear anywhere on the rating scales or the survey. You all will be assigned a rater number. As these ratings are anonymous and confidential, we would like you to be as frank as possible while giving us your ratings.

This slight deception about the purpose of the ratings was used to help avoid the possibility of socially correct responding.

Initial Likability Impression Rating Scale

Evaluations of likability were made using the Initial Likability Impression Rating Scale (ILIKRS) (Appendix II). The ILIKRS is a nine-item likert scale, designed for the current project to capture ratings of 'How likable a person is as a possible social

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acquaintance and/or as a co-worker'. It requires evaluators to anticipate their level of comfort with the target on an eleven-point scale based on increased levels of proximity. The ILIKRS also required the judges to indicate their initial overall impression of the target.

Since there were no available instruments to assess likability, this scale was constructed largely from items used by Riggio et al. (1991) in a series of studies on factors relating to social attractiveness. In this study, groups of undergraduate evaluators rated targets either on the basis of a photograph or a one minute video. Separate groups of evaluators, using a nine point likert scale, rated targets on only one of the following items general likability, likability as a friend, or likability as a co-worker. These items from Riggio's study were chosen for use in present study and all items had $\alpha \geq .77$.

Static Ratings

Judges were handed packets of ILIKRS rating forms with evaluator numbers and the targets' number pre-printed on them. The number sequence on the evaluation packet corresponded to the sequence of the stills shown, to minimize administrative error. Judges were instructed that they would view a series of stills of smiling men and women. Each still was shown for a period of 10 seconds. Evaluators were given as much time as was necessary to complete each rating.

Dynamic Ratings

As with the above procedure, packets of pre-coded ILIKRS forms were distributed to the judges. Fifteen video segments, of three-minute duration, were shown

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consecutively. After each segment, judges rated the target on the ILIKRS.

Physical Attractiveness

The literature suggests that overall attractiveness has a significant impact on social likability, thus a rating of attractiveness was obtained from each of the evaluators for each individual depicted. The purpose of measuring this variable (for our purposes an extraneous variable) was to exclude any impact that atypical neuromotor movements may have on the raters' impression of attractiveness.

RESULTS

Descriptive analyses of the neuromotor, attention and memory, social and occupational functioning, social likability and psychopathology data are presented. Two sets of canonical correlation or set correlations were conducted. The first set of canonical analyses examined the level of association between movement disorder ratings and social and occupational functioning (SOF), partialling out the contributions of psychopathology and attention and memory performance. The second set of canonical correlations examined the level of association between movement disorder ratings and attention and memory functioning, partialling out for duration of illness and psychopathology. Finally, multiple regression analysis was conducted on the likability, movement disorder and social and occupational functioning ratings. Overall findings support the principle hypotheses and suggest that movement disorder ratings are associated with lower social functioning, lower social likability, and performance deficits on measures of attention

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and memory, independent of psychopathology.

Movement Disorder Ratings

Global ratings on the GESS and the Simpson Dyskinesia Scale were used in the analyses. Additionally, ratings on individual items of the Simpson Dyskinesia Scale were dichotomized to yield two scores based on the topography of tardive dyskinesia- orofacial and limbotruncal. The orofacial TD score was derived from the mean of the global ratings for face, lips, jaw and tongue, and the limbotruncal TD score was the mean of the global ratings for neck and trunk, upper extremities and lower extremities. To be rated on either type of TD, a patient must have received at least one score of two (mild) on one global rating in the appropriate body region on the SDS. Parkinsonism was based on the sum of items 1-9 on the Modified Simpson-Angus Extrapyramidal Scale. Akathisia was based on the score of item ten on the Modified Simpson-Angus Extrapyramidal Scale.

Subjects displayed a mild level of neuromotor impairment across the movement disorder rating scales. On the Simpson Dyskinesia Scale 36.5% of subjects displayed no observable signs of TD, 27% displayed a questionable level of TD, 32.2% displayed mild TD, 3.5% exhibited moderate TD and only one case, representing .9% of the total sample, displayed severe TD. Subjects displayed a greater severity of orofacial TD than limbotruncal TD (See Table 4).

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Table 4: Percentage of All Patients Exhibiting Tardive Dyskinesia (N = 115)

Simpson Dyskinesia Scale					
BODY REGION	**RATING**				
FACE	**Absent**	**Questionable**	**Mild**	**Moderate**	**Mod Severe**
1. Blinking	92.2	3.5	4.3	0	0
2. Facial Tics	99.1	0	0	.9	0
3. Grimacing	95.7	1.7	2.6	0	0
4. GLOBAL FACE	**90.4**	**4.3**	**4.3**	**.9**	**0**
5. Pouting of (lower) lip	98.3	.9	.9	0	0
6. Puckering of lip/sucking/pressing	62.6	13	20.9	3.5	0
7. Smacking of lips	97.4	.9	1.7	0	0
8. GLOBAL LIPS	**63.5**	**14.8**	**20**	**1.7**	**0**
9. Chewing Movements	95.7	.9	2.6	0	.9
10. Lateral/vertical jaw movements	45.2	24.3	27.8	2.6	0
11. GLOBAL JAW	**55.7**	**22.6**	**20.0**	**.9**	**.9**
TONGUE					
12. Bon Bon Sign	98.2	1.8	0	0	0
13. Tongue Protrusion	75.7	11.3	12.2	.9	0
14. Choreathetoid tongue	46.1	20.9	31.3	1.7	0
15. GLOBAL TONGUE	**44.3**	**31.3**	**24.3**	**0**	**0**
16. Head nodding	100	0	0	0	0
17. Retrocollis	94.8	4.3	.9	0	0
18. Spasmodic Torticollis	99.1	.9	0	0	0
19. Torsion Movements (trunk)	99.1	0	.9	0	0
20. Axial Hyperkinesis	100	0	0	0	0
21. Rocking Movements	92.2	2.6	4.3	.9	0
22. Trismus	100	0	0	0	0
23. Respiratory muscle involvement	99.1	.9	0	0	0
24. GLOBAL NECK &TRUNK	**92.2**	**4.3**	**2.6**	**.9**	**0**
25. Ballistic Movements	100	0	0	0	0
26.Choreoathetoid fingers/wrists	64.9	14	18.4	2.6	0
27. Caressing face/hair/thighs	95.7	1.7	2.6	0	0
28. GLOBAL EXTREMITIES UPPER	**67.8**	**15.7**	**15.7**	**.9**	**0**
29. Rotation/flexion of ankles	98.2	1.8	0	0	0
30. Toe Movements	84.1	8.0	8.0	0	0
31. Stamping Movements	97.4	.9	.9	.9	0
32. Restless Legs	86.0	5.3	7.0	1.8	0
33. GLOBAL EXTREMITIES/LOWER	**74.6**	**14.0**	**9.6**	**1.8**	**0**
34. Holokinetic movement	100	0	0	0	0
35. Chronic dystonia	90.4	6.1	3.5	0	0
36. GLOBAL TD RATING	**36.5**	**27.0**	**32.2**	**3.5**	**.9**

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A mild level of EPS were observed (See Table 5). The greatest range of motor abnormalities was observed on the GESS, which is designed to capture subtle motor anomalies not rated on traditional neuromotor rating scales (Table 6). Ratings on this instrument spanned the range of the scale (0 to 4), where a rating of 0 represents a normal appearance and a rating of 4 indicates marked abnormality in appearance. Global ratings closely approximated a normal distribution. It is presumed that one factor accounting for the limited overall range among the movement disorder rating scales was the number of patients on the newer atypical medications, which have a low motor side effect profile (N=63 atypical; N= 41 typical).

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Table 5: Percentage of All Patients Experiencing Extrapyramidal Signs (N = 115)

Modified Simpson-Angus Extrapyramidal Scale			
Ratings	**Percent**	**Ratings**	**Percent**
1. Gait		**5. Cogwheeling**	
Normal	72.2	Not present	100
Diminution in Swing	24.3	**6. Glabella Tap**	
Marked diminution in swing	1.7	Normal	96.5
Stiff-loss of swing	1.7	Questionably Abnormal	3.6
2. Balance		**7. Tremor**	
Normal	93	Not present or barely seen	62.6
Questionably abnormal	6.1	Mild; definitely present in outstretched limb	33
Definitely abnormal	0.9	Moderate; continuously present at rest	4.3
3. Arm Dropping		**8.Salivation**	
Normal	70.2	Normal	100
Less audible contact	13.2	**9. Akinesia**	
No rebound	10.5	**None**	44.3
No slap	6.1	Mild	40.9
4. Rigidity of Major Joints		Moderate	14.8
Normal	80	**10 Akathisia**	
Slight rigidity	17.4	Absent	88.7
Moderate rigidity	1.7	Mild	8.7
Marked rigidity	.09	Moderate	2.6

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Table 1: Percentage of All Subjects with Gestural and Expressive Stigmata (N = 115)

Item	Normal	Possible	Mild	Definite	Marked	Mean	SD	Range
PATIENT AS LISTENER: FEEDBACK DURING CONVERSATION								
1. Facial Reactivity (nonverbal)	19.5	26.8	37.4	13.8	2.4	1.53	1.03	0 - 4
2. Head movements	44.7	28.5	17.5	6.5	3.3	0.95	1.09	0 - 4
3. Verbal and nonverbal vocalizations	40.7	28.5	21.1	8.9	.8	1.01	1.03	0 - 4
PATIENT AS SPEAKER: GESTURING AND ANIMATION OF COMMUNICATION								
4. Arm and hand gestures	37.4	22.8	28.5	11.4	0	1.14	1.05	0 – 4
5. Head movements	49.6	20.3	22	8.1	0	0.89	1.02	0 – 4
6. Prosody	46.3	21.1	22	7.3	3.3	1.00	1.13	0 – 4
7. Rate of speech	48	17.9	22	10.6	1.6	1.02	1.19	0 – 4
8. Volume of speech	47.2	23.6	22.8	3.3	3.3	0.92	1.06	0 – 4
9. Reduction of eye contact	49.6	21.1	19.5	8.1	1.6	0.91	1.08	0 – 4
10. Abnormality of gaze	61	21	12	4.9	.8	0.63	0.93	0 – 4
11. Facial expressions	20.3	15.4	45.5	17.1	1.6	1.64	1.04	0 – 4
12. GLOBAL RATINGS	8.1	24.4	44.7	21.1	3.3	1.84	0.91	0 – 4

Comparison of subjects on typical neuroleptic medication with those on atypical medication revealed no significant differences on the movement disorder ratings scales. Results were suggestive of greater severity of TD among subjects taking a typical neuroleptic medication compared with subjects on an atypical NL's (Table 7).

All analysis that involved a comparison with regard to medication type were conducted only on subjects taking either a typical or an atypical medication, but not both. Some of the subjects in the sample were taking both types of NL medication, and this resulted in 32 subjects being excluded from the analysis. Since the side-effect liability is known to be greater with conventional NL medication classifying a patient who is on both of these two types of antipsychotics into one or the other discrete category would be problematic. A subject termed "atypical" but also on a conventional NL may still have greater side effects associated with typical NL's or conversely may be benefiting from the lesser side effects associated with an atypical NL, depending on medication dose. Further, atypical medication is not entirely without side-effects and the combination of medications, each with different side-effect profiles, obscures the ability to analyze the influence of either medication type.

Comparison of the two diagnostic subgroups on neuromotor ratings across most measures did not reveal significant differences (See Table 8). Schizophrenic and schizoaffective subjects were similar on global TD ratings, limbotruncal and orofacial TD. GESS, parkinsonism and akathisia ratings were likewise similar for the two diagnostic subgroups. Table 9 shows the diagnostic subgroup breakdown by neuroleptic type.

Appendix III shows a correlation matrix depicting the relationship between the

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movement disorder and SOF measures. As expected, Global TD, limbotruncal and orofacial TD were significantly correlated with each other. However, TD ratings were not significantly associated with the other movement disorder ratings or the measures of SOF. GESS, parkinsonism, akathisia and DSM-IV SOFAS ratings were all significantly associated with each other. Additionally, the two measures of SOF were significantly associated with each other. Movement disorders are rated on scale of 0 to 4, a rating of zero indicates the absence of motor abnormalities and a score of 4 indicate severe abnormalities. Parkinsonism is rated on a 0 to 9 scale, and again a score of 0 indicates no motor abnormalities are present.

Table 7: Comparison of Medication Groups on Movement Disorder Ratings

	N	Mean	SD	F	Significance
GLOBAL TD					
Typical	41	1.22	.96	3.05	.08
Atypical	64	.89	.93		
LIMBOTRUNCAL TD					
Typical	41	.26	.46	.93	.76
Atypical	63	.23	.64		
OROFACIAL TD					
Typical	41	1.9	2.11	2.23	.13
Atypical	64	1.4	1.57		
GESS					
Typical	41	1.85	.83	.08	.77
Atypical	65	1.80	.93		
AKATHISIA					
Typical	41	.17	.44	.28	.59
Atypical	64	.13	.42		
PARKINSONISM					
Typical	41	2.46	1.83	.74	.45
Atypical	63	2.14	1.56		

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Table 8: Comparison of the Two Diagnostic Subgroups on Movement Disorder Ratings

	N	Mean	SD	F	Significance
GLOBAL TD					
Schizophrenia	66	1.05	.90	.008	.93
Schizoaffective	49	1.06	1.03		
LIMBOTRUNCAL TD					
Schizophrenia	65	.24	.46	.05	.80
Schizoaffective	49	26	.66		
OROFACIAL TD					
Schizophrenia	66	1.50	1.6	.90	.34
Schizoaffective	49	1.80	2.05		
GESS					
Schizophrenia	66	1.84	.96	.006	.93
Schizoaffective	49	1.83	85		
AKATHISIA					
Schizophrenia	66	.15	.40	1.36	.71
Schizoaffective	49	.12	.44		
PARKINSONISM					
Schizophrenia	66	2.06	1.81	1.46	.14
Schizoaffective	49	2.62	2.26		

Table 9: Breakdown of Diagnostic Subgroup by Neuroleptic Type

		Diagnostic Group	
		Schizophrenia	Schizoaffective Disorder
Neuroleptic Type	Typical	26	15
	Atypical	40	25

Social and Occupational Functioning

The social and occupational functioning ratings fell in the moderately to significantly impaired range on the SAS II and in the moderately impaired range on the

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DSM-IV SOFAS (Table 10). Global ratings on the SAS II, which were used in the present analysis, are rated on a seven point scale where a rating of one indicates excellent functioning and a rating of seven indicates severe maladjustment. On the DSM-IV SOFAS ratings range from 0 to 100, with 100 representing the highest possible rating. While there is often severe disability in schizophrenia, this sample was particularly impaired, perhaps because they had so recently been hospitalized. The ratings chosen in the analysis were those with the greatest range from among the SOF measures. Table 11 illustrates the limited range on selected SAS II global ratings that were not chosen for the analysis. It can be seen that most subjects fell in the poor to impaired range.

Table 10: Social Functioning Ratings for Participants

Measure	Variable	N	Mean	SD	Range
SAS II	Social Leisure	125	5.26	1.14	2-7
DSM-IV	SOFAS	127	47.56	10.16	25-75

Table 11: Scores on Global SAS II Items

Measure	Variable	Percentage of Subjects with each Rating						
		Excellent	Very Good	Good	Fair	Poor	Very Poor	Severe Maladjustment
SAS II	Role Position	.8	0	3.2	15.1	20.6	40.5	19.8
	Global Score	0	.8	8	11	38.9	37.3	10.3

Comparison of subjects with TD (i.e. a global TD rating of 2 or higher) with subjects without TD, and eliminating those with questionable TD, revealed no significant

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differences on the DMS-IV SOFAS (t=.98, p =.38). However, the two groups differed significantly on SAS II Global Social Leisure ratings; subject with TD demonstrated significantly poorer functioning (t=-2.34, p=.022).

Attention and Memory Functioning

Subjects' mean raw and z-scores on the attention and memory measures are summarized in Table 12. Z scores reflect the subjects' level of performance relative to published normative data in the test administration manuals. Below average performance was noted across all the measures. Mean z- scores on the attention measures ranged from -.67 to –3.8 and -.12 to –1.24 for measures of memory. It is important to note that since these z-scores were calculated based upon different normative samples, comparison between different tests are difficult to interpret (See Figure 1).

Table 12: Test Performance of Subjects on Measures of Attention and Memory

Domain	Variables	Raw Scores			Z Scores	
		N	Mean	SD	Mean	SD
Attention	LNS Total Correct	125	11.29	4.38	-1.69	1.68
	WMS-R Visual Span Backward	125	6.19	2.29	-.67	1.09
	WMS-R Digits Backward	126	5.59	2.13	-.57	1.01
	WAIS-R Arithmetic	126	8.64	3.77	-.76	.90
	Trails B Total time	125	139.29	92.29	-1.79	2.5
	WAIS-R Digit Symbol	125	41.66	13.52	-.85	.84
	D2 Errors	123	341.13	102.03	-3.8	2.3
Memory	WMS-R Visual Paired Associates II	122	4.73	1.75	-.47	1.2
	WMS-R Verbal Paired Associates II	122	6.74	1.49	-.12	.21
	WMS-R Visual Reproduction II	125	20.63	10.48	-1.24	1.47

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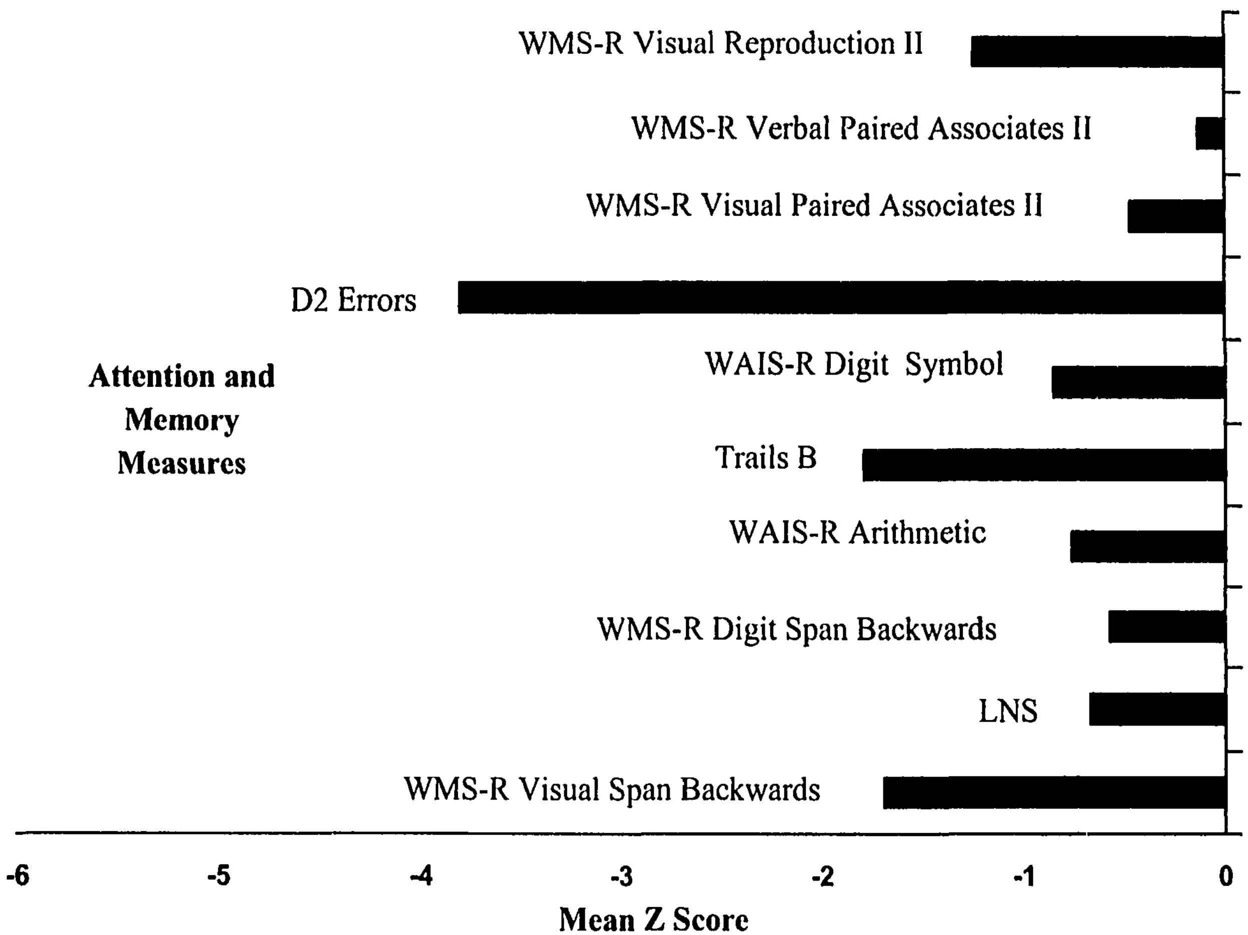
Figure 1: Mean Z Score Performance on Measures of Attention and Memory



Psychopathology

For the present study a Positive and Negative Syndrome Scale (PANSS) adjusted total score was derived based on the mean of all items with the following motor items excluded: blunted affect, motor retardation, excitement, tension, mannerism and posturing. These motor items were excluded to avoid a duplication in measurement or redundancy with the movement disorder ratings and the artificial suggestion of a relationship. Table 13 presents descriptive data on the ratings for each of the 30 PANSS items. Ratings ranged from mild to severe levels of psychopathology. Mean scores for the psychopathology items ranged from 1.5 to 3.73 (out of a possible 7, where 1 indicates that the symptom is not present). The range suggests varying levels of psychopathology across the sample.

Out of the 30 items on the PANSS, seven items constitute the Positive Scale, seven the Negative Scale, and 16 form a General Psychopathology rating. Scores are determined for each component by summing the ratings across the particular items. The range for the Positive and Negative Scale scores may span from a minimum of 7 to a maximum of 49. In this sample, the Positive Scale scores ranged from 7 to 34, and the Negative Scale scores ranged from 7 to 36. The General Psychopathology rating which may have a potential range of 16 to 112 ranged from 39 to 112 in this sample. Mean scores on these global measures are listed in Table 13 and the distribution of scores are illustrated in Figure 2.

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Table 13: Psychopathology Ratings (N=127)

PANSS Item	Mean	SD	Range
P1: Delusions	3.04	1.40	1-6
P2: Conceptual disorganization	2.75	1.27	1-6
P3: Hallucinatory behavior	2.20	1.54	1-6
P4: Excitement	2.54	1.19	1-6
P5: Grandiosity	2.17	1.30	1-6
P6: Suspiciousness/Persecution	3.73	1.26	1-6
P7: Hostility	1.80	0.91	1-6
N1: Blunted affect	2.72	1.27	1-6
N2: Emotional withdrawal	2.88	1.10	1-6
N3: Poor rapport	2.35	1.19	1-6
N4: Passive/apathetic withdrawal	3.10	1.33	1-6
N5: Difficulty in abstract thinking	3.34	1.42	1-6
N6: Lack of spontaneity & flow of conversation	2.69	1.41	1-6
N7: Stereotyped thinking	2.67	1.09	1-6
G1: Somatic concerns	2.14	1.18	1-6
G2: Anxiety	2.94	1.31	1-6
G3: Guilt Feelings	2.83	1.43	1-6
G4: Tension	2.79	1.14	1-6
G5: Mannerisms and Posturing	2.36	1.05	1-6
G6: Depression	2.85	1.35	1-6
G7: Motor Retardation	1.97	1.02	1-6
G8: Uncooperativeness	1.56	0.84	1-6
G9: Unusual thought content	2.71	1.04	1-6
G10: Disorientation	1.50	0.78	1-6
G11: Poor attention	2.20	1.16	1-6
G12: Lack of Judgment and insight	3.37	1.45	1-6
G13: Disturbance of volition	2.51	1.27	1-6
G14: Poor impulse control	1.87	0.90	1-6
G15: Preoccupation	2.09	0.94	1-6
G16: Active social avoidance	3.12	1.37	1-6
GLOBAL-Positive Score	18.22	5.73	7-34
GLOBAL-Negative Score	19.68	5.97	7-36
GLOBAL-General Psychopathology	76.60	17.65	39-112

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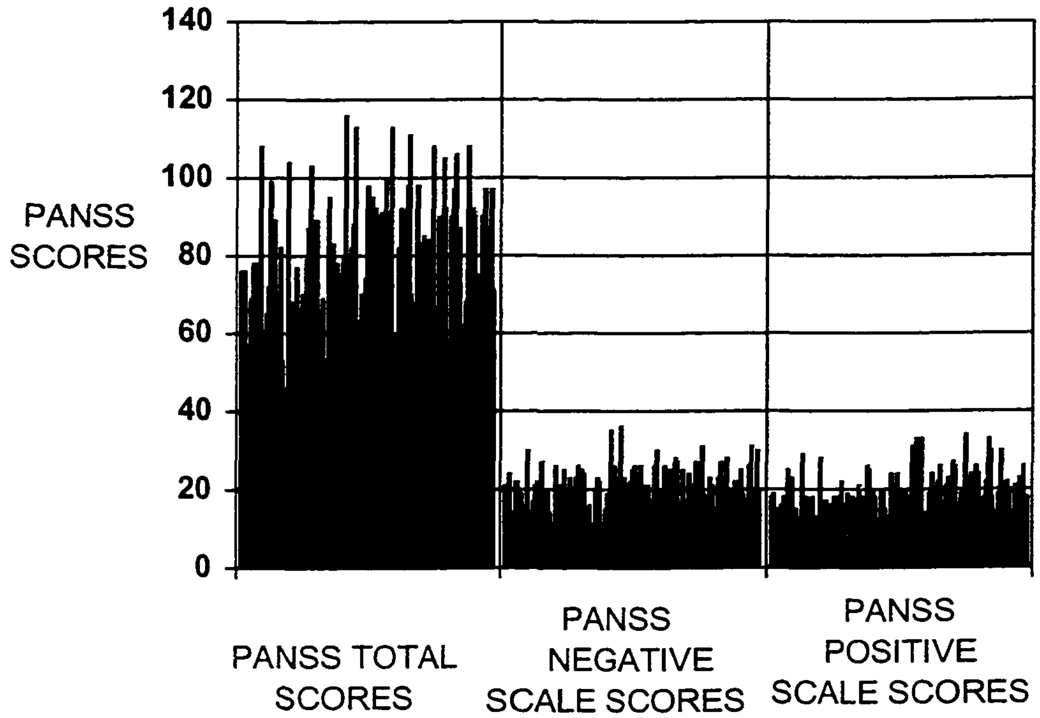
Figure 2: Distribution of PANSS Scores



Relationship Between Movement Disorder Ratings And Social And Occupational Disability

Data were analyzed using canonical correlation to examine the degree of association between a set of "explanatory variables" (movement disorder rating scores) and a set of "outcome variables" (social and occupational functioning). Regarded as an extension of factor analysis, canonical correlation extracts factors to explain associations across two sets of variables and within the same set of variables. Canonical variates, or orthogonal factors, are formed simultaneously in the two sets of variables (set one and set

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two). In the present analysis, orthogonal variates were derived from the neuromotor measures and from among the social and occupational functioning (SOF) measures and then the associations between each of the newly derived sets of variates were determined. Table 14 lists the variables that were chosen *a priori* for use in the canonical analysis.

Table 14: List of Variables Used for the Main Statistical Analysis

Set	Variables
Explanatory Set-Movement Measures	
Tardive Dyskinesia	Global rating Simpson Dyskinesia Scale
Limbotruncal TD	Simpson Dyskinesia Scale mean of global ratings of neck and trunk , upper extremities and lower extremities.
Orofacial TD	Simpson Dyskinesia Scale mean of global score for face, lips jaw and tongue
Akathisia	Modified Simpson-Angus Extrapyramidal Scale-Item 10
Parkinsonism	Modified Simpson-Angus Extrapyramidal Scale-Sum of items 1-9
Gestural and Expressive Stigmata	GESS global score
Set of Covariates	PANSS Adjusted Score – motor items removed NP measures of Trails B, WMS-R Visual Reproduction II, and WMS-R Verbal Paired Associates II
Outcome Set-SF Measures	SAS II Social Leisure Global DSM-IV SOFAS

A significant relationship was found between the movement disorder ratings and the SOF measures [R= 0.39, Wilks' Lambda = 0.81, dfl= 12, df2= 206, p= 0.03, N=111]. The standardized canonical coefficients derived for the movement disorder measures loaded highly with orofacial TD, GESS and global TD. The canonical variates derived for SOF measures loaded highly with DSM-IV SOFAS scores (Table 15). The presence of higher scores on the movement disorders ratings of orofacial TD, GESS and global TD indicate

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increased severity of movement disorders. Lower scores on the DSM-IV SOFAS indicate poorer social functioning. This analysis revealed a pattern among the movement disorder measures where high ratings on GESS and TD were associated with lower ratings on orofacial TD and on the SOF side of this correlation this was associated with low DSM-IV SOFAS ratings.

Table 15: Standardized Canonical Coefficient for Movement Disorder Ratings and Social and Occupational Functioning

Explanatory Set-Motor		Outcome Set-SOF	
Variable	**Coeff.**	**Variable**	**Coeff.**
Global TD	.82	SAS II-Social Leisure	.18
Limbotruncal TD	-.29	DSM-IV SOFAS	-.90
Orofacial TD	-.65		
Akathisia	-.13		
Parkinsonism	.02		
GESS Global Score	.85		

However, when psychopathology and measures of attention and memory were both added as covariates, this relationship was no longer significant [R= 0.34, Wilks' Lambda = 0.84, dfl= 12, df2= 192, p= 0.14, N=108].

MOVEMENT DISORDER RATINGS AND SOCIAL AND OCCUPATIONAL DISABILITY BY DIAGNOSTIC SUBGROUP

Exploratory analyses were conducted to determine whether the relationship between neuromotor impairment and SOF was more robust for either diagnostic subgroup (schizophrenia and schizoaffective). No formal analyses was conducted on the homogeneity of variance in either subgroup.

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Schizophrenia

A highly significant relationship was obtained between the movement disorder ratings and the measures of SOF when schizophrenic patients only (N=63) were included in the analysis [R= 0.50, Wilks' Lambda = 0.58, dfl= 12, df2=110, p= 0.002]. This relationship remained significant when the PANSS adjusted total score was used as a covariate. [R= 0.46, Wilks' Lambda= 0.63, dfl= 12, df2=108, p= 0.01]. However, when attention and memory performance was added as a covariate, in addition to psychopathology, the relationship was reduced to a statistical trend [R= 0.44, Wilks' Lambda= 0.68, dfl= 12, df2= 100, p= 0.06, N=62] (Table 16). The effect size indicates that 19% of the variance can be accounted for based on this diagnostic subgroup. The standardized canonical coefficients derived for the movement disorder ratings loaded highly with global TD and parkinsonism. The canonical variates derived for SOF measures loaded highly with both SAS II Social Leisure and DSM- IV SOFAS scores. The movement disorder ratings are all scaled in the same direction with higher scores indicating a higher level of severity. For the SOF measures higher scores on the SAS II indicate more impaired functioning while low scores on DSM IV SOFAS indicate impaired functioning. Thus, these trend level results suggest a possible association between increased severity of global TD, parkinsonism and impaired SOF.

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Table 16: Standardized Canonical Coefficient for Movement Disorder and Social and Occupational Functioning for All Schizophrenic Patients Only with Psychopathology and Attention and Memory as Covariates

Explanatory Set-Motor		**Outcome Set-SF**	
Variable	**Coeff.**	**Variable**	**Coeff.**
Global TD	1.0	SAS II-Social Leisure	.69
Limbotruncal TD	.36	DSM-IV SOFAS	-.51
Orofacial TD	.26		
Akathisia	-.02		
Parkinsonism	.59		
GESS Global Score	-.45		

Schizoaffective

Canonical correlation with schizoaffective patients (N=48) produced a moderate, but non-significant, correlation [R= 0.43, Wilks' Lambda= 0.78, df1=12, df2= 80, p= 0.51]. With psychopathology and attention and memory performance as covariates, the correlation and level of significance were minimally affected [R= 0.41, Wilks' Lambda= 0.74, df1=12, df2= 68, p= 0.55]. The small sample size may be a factor in the lack of statistical significance.

MOVEMENT DISORDER RATINGS AND SOCIAL AND OCCUPATIONAL DISABILITY BY NEUROLEPTIC TYPE

Again, exploratory analyses were conducted on the relationship between movement ratings and SOF was conducted separately for subsets of patients taking either a typical or an atypical neuroleptic.

Atypical

A significant relationship was observed between movement disorder ratings and SOF and 42% of the variance can be explained on the basis of this NL subgroup [R=

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0.65, Wilks' Lambda= 0.51, dfl= 12, df2= 112, p= 0.0001, N=54] (See Table 17). The standardized canonical coefficients derived for the movement disorder ratings loaded highly with global TD. The canonical variates derived for SOF measures loaded highly with both SAS II Social Leisure and DSM-IV SOFAS scores. As already noted, the presence of higher TD ratings indicates increased severity of movement disorders while for the social functioning measures low scores on the DSM-IV SOFAS indicates lowered social functioning but higher scores on the SAS II is associated with impaired functioning. Thus, results demonstrate that increased severity of TD was associated with lowered levels of social functioning on both SOF measures.

Table 17: Standardized Canonical Coefficient for Movement Disorder Ratings and Social and Occupational Functioning for All Patients on Atypical Neuroleptics Only

Explanatory Set-Motor		**Outcome Set-SOF**	
Variable	**Coeff.**	**Variable**	**Coeff.**
Global TD	.96	SAS II-Social Leisure	.65
Limbotruncal TD	-.14	DSM-IV SOFAS	.59
Orofacial TD	-.28		
Akathisia	-.20		
Parkinsonism	.36		
GESS Global Score	.40		

Typical

A moderate, but non-significant, correlation was observed among patients taking typical NL medication (N=38) [R= 0.48, Wilks' Lambda = 0.69, dfl = 12, df2 = 60, p = 0.47]. A possible explanation for the failure to achieve statistical significance could be the small sample size.

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INITIAL LIKABILITY IMPRESSION RATING SCALE

Intraclass correlations (ICC) were computed to assess the reliability of ratings made by the student evaluators on the ILIKRS, and Cronbach alpha coefficients were computed to assess the internal consistency of the scale.

Shrout and Fliess' (1979), seminal article in Psychological Bulletin entitled 'Intraclass Correlations: Uses in Assessing Rater Reliability" presented several guidelines for selecting the proper coefficient to assess rater reliability. Of these models, the two-way mixed effects model, or two-way ANOVA model, was used in the present analysis. This model is appropriate when the evaluators are a random sample from a larger population of evaluators who rate n targets, also randomly selected from a larger pool of targets as in the present study. This ICC, which measures absolute agreement, found that raters differed significantly in their judgements of patients (Theta= 0.035138).

Cronbach alpha coefficients, computed to measure the internal consistency of the ILIKRS, were very high. Average ratings across all items for all subjects during the dynamic presentation yielded a mean $\alpha = .88$, sd =.09. Ratings of the ILIKRS internal consistency during the static presentation were also high (mean $\alpha = .90$, sd = .06, Range = .50-.98).

Relationship Between Social Likability Ratings and Movement Disorder and Social and Occupational Functioning Measures

One hundred patients were evaluated on the ILIKRS during both the dynamic

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(video) and static presentations (video-still). This is a smaller number than the total sample because 27 subjects refused to agree to the videotaped portion of this study. Mean likability ratings were derived based on the mean score for a single item, the overall likability item, which was rated on an 11-point likert scale that ranged from zero to ten. A rating of zero indicated "not at all likable" and a rating of ten indicated "extremely likable". This rating was averaged across raters to yield a global mean likability score for each subject during both the dynamic and static presentations. This individual score provides a good estimate of general likability given the high internal consistency of the scale. It is further justified to use this single score as this item correlates highly with the combined mean of the remaining social distance items in the scale (r=.77).

Multiple regression analysis was conducted on both the dynamic and static ratings to assess the ability of several independent predictors (Global TD, Limbotruncal TD, Orofacial TD, GESS, Parkinsonism, Akathisia, SAS II Social Leisure, and DSM-IV SOFAS ratings) to account for changes in the dependent variable (likability). Analysis for both diagnostic subgroups in each the dynamic and static presentations were conducted with the mean likability and attractiveness scores across evaluators during the still presentation as a covariate. The multiple regression values in each of the tables reflect a series of independent analyses.

DYNAMIC PRESENTATION RATINGS

Mean likability ratings for the patients during the video presentation were in the lower end of the scale indicating a low level of overall likability compared with the thirty-five controls. Controls were rated significantly more likable and attractive

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compared with the patients (See Table 18).

Table 18: Paired T-Test Comparison of Patients and Controls on Likability and Attractiveness

Variable	Group	Mean	SD	Range	T	Sig
Likability	Controls (N=35)	6.74	2.02	1 -10	14.35	.000
	Patients (N=100)	4.81	2.49			
Attractiveness	Controls (N=35)	5.37	2.49	1-10	16.49	.000
	Patients (N=100)	2.75	2.40			

* *1= not at all likable; 10= extremely likable*

MULTIPLE REGRESSION ANALYSIS OF DYNAMIC RATINGS

Results of the multiple regression analysis demonstrate the direction of the relationship and indicate that higher severity on the GESS and parkinsonism was associated with lower social likability ratings by the student evaluators (See Table 19). The results reflected in Table 19 represent a series of multiple regression analyses mean likability during the dynamic presentation as the dependent variable and with mean static presentation ratings of attractiveness and likability as covariates .

Table 19: Results of Multiple Regression Analyses for Dynamic Presentation Ratings of Likability for All Subjects (DV= Likability, Dynamic, Covariates= Static attractiveness and Static likability)

Variable	N	R^2	Slope	T	Significance
Global TD	93	-.29	-.93	-.11	.35
Limbotruncal TD	92	-.30	-.63	-1.62	.10
Orofacial TD	92	.28	.03	.16	.87
GESS Total	94	-.37	-.50	-3.84	.0002
Parkinsonism	93	-.35	-.16	-2.95	.004
Akathisia	92	.28	-.08	-.33	.74
SAS II Social Leisure	93	.05	.07	.81	.41
DSM-IV SOFAS	94	.12	-.05	-.06	.95

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<u>Likability Ratings of Schizophrenic Subjects During the Dynamic Presentation</u>

Analysis with the schizophrenic subgroup revealed a low overall level of likability (N=53, mean = 4.78, sd=1.36). As with the previous multiple regression analyses, results with the schizophrenic subgroup only demonstrated that lower likability ratings were associated with higher severity of GESS and parkinsonism (See Table 20).

Table 20: Results of Multiple Regression Analyses for Dynamic Presentation Ratings of Likability for All Schizophrenic Subjects Only (DV= Likability, Dynamic, Covariates= Static attractiveness and Static likability)

Variable	**N**	**R^2**	**Slope**	**T**	**Significance**
Global TD	50	.15	.04	.25	.80
Limbotruncal TD	50	-.15	-.03	-.04	.96
Orofacial TD	50	-.15	-.29	-.08	.93
GESS Total	51	-.29	-.56	-3.01	.004
Parkinsonism	50	-.24	-.22	-2.38	.02
Akathisia	50	.16	.31	.77	.44
SAS II Social Leisure	51	-.04	-.02	-.17	.86
DSM-IV SOFAS	51	.06	.35	.31	.75

<u>Likability Ratings of Schizoaffective Subjects During the Dynamic Presentation</u>

Similar to results already obtained, analysis with the schizoaffective subgroup only demonstrated that lower likability ratings were associated with higher severity of GESS and parkinsonism (See Table 21).

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Table 21: Results of Multiple Regression Analyses for Dynamic Presentation Ratings of Likability for All Schizoaffective Subjects (DV= Likability, Dynamic, Covariates= Static attractiveness and Static likability)

Variable	N	R2	Slope	T	Significance
Global TD	40	-.28	-.19	-1.15	.25
Limbotruncal TD	40	-.29	-.71	-1.50	.14
Orofacial TD	40	.25	.11	.37	.71
GESS Total	41	-.39	-.73	-3.54	.001
Parkinsonism	40	-.34	-.17	-2.25	.03
Akathisia	40	-.29	-.55	-1.43	.15
SAS II Social Leisure	40	.04	.15	1.10	.27
DSM-IV SOFAS	41	.03	1.47	1.23	.22

STATIC PRESENTATION RATINGS

Overall likability ratings of patients during the video-still presentation did not differ significantly from results obtained during the dynamic presentation (See Table 22). However, attractiveness ratings for patients during the video-still were significantly higher compared to ratings during the dynamic presentation. Likability and attractiveness ratings were significantly higher for controls than for patients during the static presentation. Comparison between the two presentations indicated a non-significant trend for controls to have high likability ratings during the dynamic presentation than during the static presentation. Additionally, attractive ratings were significantly higher for the controls during the dynamic presentation compared with static ratings. This is the opposite of what was observed for the patients where higher attractiveness ratings were given during the static, rather than the dynamic, presentation.

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Table 22: Paired T-Test Comparison Between Static and Dynamic Presentations for the Patient Group and Control Group

Group	Variable	Presentation				Paired T-Test	
		Static		Dynamic			
Patient		Mean	SD	Mean	SD	T	Sig.
	Likability	4.84	2.09	4.81	2.49	-.30	.75
	Attractiveness	3.24	2.26	2.75	2.40	-5.1	.000
Control	Likability	6.40	2.02	6.74	2.02	1.7	.07
	Attractiveness	4.79	2.44	5.37	2.49	2.27	.01

MULTIPLE REGRESSION ANALYSIS OF STATIC RATINGS

In contrast to results during the dynamic presentation in which lower likability ratings were associated with higher severity of GESS and parkinsonism ratings, movement disorder ratings were not significantly associated with likability during the static presentation. However, there was a trend for higher GESS severity to be associated with lower likability. Also, in contrast to ratings made during the dynamic presentation, lower likability ratings were significantly associated with poor SOF as measured by the DSM-IV SOFAS. The results reflect a series of separately computed multiple regression analyses (See Table 23).

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Table 23: Results of Multiple Regression Analyses for Static Presentation Ratings of Likability for All Subjects (DV= Likability, Dynamic, Covariates= Static attractiveness and Static likability)

Variable	N	R_2	Slope	T	Significance
Global TD	91	.50	.07	1.10	.22
Limbotruncal TD	91	.51	.26	1.24	.21
Orofacial TD	91	.51	.14	1.21	.23
GESS Total	93	.52	.13	1.82	.07
Parkinsonism	91	-.51	-.03	-1.17	.24
Akathisia	91	.51	.02	.17	.86
SAS II Social Leisure	92	-.04	-.23	-1.31	.19
DSM-IV SOFAS	93	.12	.49	2.22	.001

Likability Ratings of Schizophrenic Subjects During the Static Presentation

Analysis with the schizophrenic subgroup during the static presentation revealed a low overall level of likability (N=52, mean= 4.83, sd=.98, range= 3-7.4). Again, unlike results obtained with the schizophrenic subgroup during the dynamic presentation that demonstrated lowered likability ratings were associated with higher severity on GESS and parkinsonism, movement disorder ratings were not associated with ratings of likability by the evaluators during the static presentation. However, in contrast to the dynamic ratings, lower likability was associated with poor SOF on DSM-IV SOFAS (See Table 24).

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Table 24: Results of Multiple Regression for Static Likability Ratings of Schizophrenic Subjects (DV= Likability, Dynamic, Covariates= Static attractiveness and Static likability)

Variable	N	R_2	Slope	T	Significance
Global TD	50	.56	.04	.41	.68
Limbotruncal TD	50	.56	.22	.59	.55
Orofacial TD	50	-.56	-.04	-.24	.80
GESS Total	51	-.53	-.12	-1.25	.21
Parkinsonism	50	-.57	-.06	-1.21	.23
Akathisia	50	-.56	-.01	-.07	.94
SAS II Social Leisure	51	-.04	-.08	-.37	.71
DSM-IV SOFAS	51	.16	5.09	2.51	.01

Likability Ratings of Schizoaffective Subjects During the Static Presentation

In contrast to results obtained during the dynamic presentation in which both GESS and parkinsonism were associated with lowered likability, results for the schizoaffective subgroup during the static presentation indicated a trend for lower likability to be associated with lowered SOF on the DSM-IV SOFAS and a trend for higher severity of orofacial TD to be associated with lower likability (See Table 25).

Table 25: Results of Multiple Regression for Static Likability Ratings of All Schizoaffective Subjects (DV= Likability, Dynamic, Covariates= Static attractiveness and Static likability)

Variable	N	R_2	Slope	T	Significance
Global TD	40	.40	.10	1.11	.27
Limbotruncal TD	40	.41	.29	1.16	.25
Orofacial TD	40	.44	.28	1.88	.06
GESS Total	41	-.42	-.13	-1.09	.28
Parkinsonism	40	-.39	-.02	-.66	.51
Akathisia	40	.39	.10	.51	.61
SAS II Social Leisure	40	-.05	-.37	-1.37	.17
DSM-IV SOFAS	42	.07	4.0	1.73	.09

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RELATIONSHIP BETWEEN MOVEMENT DISORDER RATINGS AND ATTENTION AND MEMORY

The hypothesis that increased severity of movement disorders would be associated with impaired performance on measures of attention and memory was tested using canonical correlation placing movement disorder measures in the predictor set and attention and memory measures in the outcome set (See Table 26). If this hypothesis was confirmed, it was anticipated that individuals with limbotruncal TD would have greater impairment on the NP measures than those with orofacial TD.

Table 26: List of Variables Used to Test Relationship Between Movement Disorder Ratings and Attention and Memory Functioning

NP Domain	Variable
Attention	LNS Total Correct
	WMS-R Visual Span Backward
	WMS-R Digits Backward
	WAIS-R Arithmetic
	Trails B Total time
	WAIS-R Digit Symbol
	D2 Errors
Memory	WMS-R Visual Paired Associates II
	WMS-R Verbal Paired Associates II
	WMS-R Visual Reproduction II
Neuromotor Set	**Variables**
Tardive Dyskinesia	Global rating Simpson Dyskinesia Scale
Limbotruncal TD	Simpson Dyskinesia Scale mean of global ratings of neck and trunk, upper and lower extremities.
Orofacial TD	Simpson Dyskinesia Scale mean of global ratings facial, lips jaw and tongue
Akathisia	Modified Simpson-Angus Scale- Item 10
Parkinsonism	Modified Simpson-Angus Scale sum of items 1-9

A highly significant relationship was obtained between movement disorder

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ratings and attention and memory functioning [R= 0.59, Wilks' Lambda= 0.34, df1= 60, df2= 471, p= 0.0008, N=105]. This relationship remained highly significant even after patient age, duration of illness and psychopathology were used as covariates [R= 0.55, Wilks' Lambda= 0.33, df1= 60, df2= 439, p= 0.001, N=105] (Table 27). The standardized canonical coefficients derived for the movement disorder measures loaded highly with parkinsonism and GESS. The canonical variates derived for the attention and memory measures loaded highly with WMS-R Verbal Paired Associates II and Trail Making Test B. High values on WMS-R Verbal Paired Associates II indicate better performance while low scores on Trails B Total Time indicate better performance. All of the movement disorder measures are scaled in the same direction; high values indicate greater severity. Thus, results demonstrate that increased severity of parkinsonism and GESS was associated with impaired verbal learning and visuomotor attention (Verbal Paired Associates II and Trail Making Test B).

Table 27: Standardized Canonical Coefficients for Movement Disorder Ratings and Attention and Memory with Psychopathology, Age of Patient and Duration of Illness as Covariates

Explanatory Set-Motor		**Outcome Set-NP**	
Variable	**Coeff.**	**Variable**	**Coeff.**
Global TD	.17	WAIS-R Arithmetic	.12
Limbotruncal TD	.22	WAIS-R Digit Symbol	.11
Orofacial TD	-.34	LNS Total Correct	.19
Akathisia	-.44	WMS-R Visual Paired Associates II	.39
Parkinsonism	.54	WMS-R Visual Reproduction II	-.40
GESS Global Score	.63	Trails B Total time	.67
		WMS-R Visual Span Backward	.37
		WMS-R Digits Backward	.14
		D2 Errors	-.30
		WMS-R Verbal Paired Associates II	-.56

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MOVEMENT DISORDER RATINGS AND ATTENTIONAL AND MEMORY PERFORMANCE BY DIAGNOSTIC SUBGROUP

Schizophrenia

Exploratory canonical correlation was repeated to examine the influence of diagnostic subgroup on the observed relationship between movement disorder ratings and attention and memory functioning. The analysis with only schizophrenic patients (N=59) showed a large, but not significant, correlation [R= 0.63, Wilks' Lambda = 0.23, df1= 60, df2= 230, p= 0.13] with this subgroup accounting for 39% of the variance. The standardized canonical coefficients derived for the movement disorder ratings loaded highly with limbotruncal TD and global TD. The canonical variates derived for measures of attention and memory loaded highly with WAIS-R Digit Symbol and Verbal Paired Associates II. The results are summarized in Table 28.

Table 28: Standardized Canonical Coefficients for Movement Disorder Ratings and Neuropsychological Performance for All Patients with Schizophrenia Only

Explanatory Set-Motor		**Outcome Set-NP**	
Variable	**Coeff.**	**Variable**	**Coeff.**
Global TD	[redacted]	WAIS-R Arithmetic	.35
Limbotruncal TD	[redacted]	WAIS-R Digit Symbol	[redacted]
Orofacial TD	-.03	LNS Total Correct	.30
Akathisia	-.13	WMS-R Visual Paired Associates II	.40
Parkinsonism	.01	WMS-R Visual Reproduction II	-.27
GESS Global Score	.21	Trails B Total Time	.31
		WMS-R Visual Span Backward	.38
		WMS-R Digits Backward	-.36
		D2 Errors	-.38
		WMS-R Verbal Paired Associates II	[redacted]

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Schizoaffective

The results were suggestive of a relationship but did not reach statistical significance [R=.74, Wilks' Lambda=.11, dfl=60, df2=162, p=.06, N=46] (See Table 29).

Table 29: Standardized Canonical Coefficients for Movement Disorder Ratings and Attention and Memory Performance for All Patients with Schizoaffective Disorder

Explanatory Set-Motor		**Outcome Set-NP**	
Variable	**Coeff.**	**Variable**	**Coeff.**
Global TD	-.65	WAIS-R Arithmetic	-.29
Limbotruncal TD	.79	WAIS-R Digit Symbol	-.003
Orofacial TD	.21	LNS Total Correct	.31
Akathisia	-.02	WMS-R Visual Paired Associates II	-.42
Parkinsonism	.34	WMS-R Visual Reproduction II	-.31
GESS Global Score	.53	Trails B Total Time	.52
		WMS-R Visual Span Backward	1.08
		WMS-R Digits Backward	-.22
		D2 Errors	-.16
		WMS-R Verbal Paired Associates II	-.03

MOVEMENT DISORDER RATINGS AND ATTENTION AND MEMORY PERFORMANCE BY NEUROLEPTIC TYPE

Exploratory analysis was repeated with a subset of patients taking only one neuroleptic type, as some of the patients in the total sample were taking both a typical and atypical neuroleptic. This resulted in 32 subjects being excluded from the analysis

Atypical

The relationship between movement disorder ratings and attention and memory functioning was highly significant in this subset taking only atypical NL medication (N=63), even with psychopathology and duration of illness as a covariate [R= 0.71,

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Wilks' Lambda= 0.15, dfl= 60, df2= 251, p= 0.0008]. The standardized canonical coefficients derived for the movement disorder ratings loaded highly with limbotruncal TD and global TD. The canonical variates derived for attention and memory loaded highly with WMS-R Visual Span Backwards, Letter Number Span and WMS-R Digit Backwards. The results are summarized in Table 30.

LNS Total Correct, WMS-R Digits Backward and WMS-R Visual Span Backward are scaled in the same direction with higher values indicating better performance. Higher values on the movement disorder ratings indicate greater movement disorder severity. These results showed that with regard to the movement disorder ratings increased severity of limbotruncal TD was associated with lower global TD ratings and on measures of attention and memory this was associated with poor performance on WAIS-R Digit Span Backwards. Unexpectedly, both Letter Number Span and Visual Span Backwards were in the opposite of the expected direction and did not show a decline.

Table 30: Standardized Canonical Coefficients for Movement Disorder Ratings and Attention and Memory for All Patients Only on an Atypical Neuroleptic

Explanatory Set-Motor		**Outcome Set-NP**	
Variable	**Coeff.**	**Variable**	**Coeff.**
Global TD	[redacted]	WAIS-R Arithmetic	-.25
Limbotruncal TD	[redacted]	WAIS-R Digit Symbol	.04
Orofacial TD	.11	LNS Total Correct	[redacted]
Akathisia	.07	WMS-R Visual Paired Associates II	-.34
Parkinsonism	.22	WMS-R Visual Reproduction II	-.26
GESS Global Score	-.008	Trails B Total Time	-.18
		WMS-R Visual Span Backward	[redacted]
		WMS-R Digits Backward	[redacted]
		D2 Errors	.09
		WMS-R Verbal Paired Associates II	-.11

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Typical

A high correlation was observed in this small sample (N=32), but results failed to reach statistical significance. However, it is notable that movement disorder ratings accounted for 66% of the variance shared with measures of attention and memory in the subset of patients taking typical NL's [R=.81, Wilks' Lambda=.5, dfl=60, df2=88, p=.34].

DISCUSSION

Results were partially supportive of the principal hypotheses that increased severity of movement disorders would be associated with greater impairment on measures of SOF and with decreased social likability. Corollary hypotheses included: (1) GESS will be a more sensitive predictor of social and occupational disability than traditional neuromotor rating scales. (2) Subjects displaying orofacial TD will have more impaired SOF and lower social likability ratings in comparison to subjects with limbotruncal TD. Results failed to establish a relationship between orofacial TD and either SOF or social likability, and results also failed to demonstrate that the GESS was more sensitive in detecting social and occupational disability compared to traditional neuromotor measures. However, severity of GESS and parkinsonism was related to lowered social likability.

The secondary set of hypotheses proposed that increased severity of movement abnormalities would be associated with greater impairment on measures of learning and attention. Results confirmed a robust relationship between measures of memory and attention and motor functioning, even with duration of illness and psychopathology as

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covariates. Corollary hypotheses included: (1) GESS severity will be related to NP impairment (2) Subjects with limbotruncal TD will demonstrate greater NP impairment than subjects with orofacial TD. Both GESS and limbotruncal TD were significant contributors to the relationship between neuromotor behavior and NP functioning.

DESCRIPTION OF SAMPLE

The sample fell in the moderately impaired range of social and occupational functioning. This narrow and impaired range of functioning was probably seen because subjects were recent discharges from inpatient hospitalization. A few subjects lived at home with their families, and a minority lived on their own. Most subjects were living in supervised community residences or in supportive housing programs. The vast majority attended day programs and did not engage in active socializing in the community. Further, the majority of subjects were not employed, although a small number worked competitively, and several subjects were in supportive employment programs or sheltered workshops.

The prevalence of TD was 36.6% in this sample. This rate is somewhat higher than prevalence rates among patients receiving long-term treatment with NL medication which have variously been reported to range from 20%-25% (Kane & Smith, 1982; Yassa & Jeste, 1992). But, it is well within the range of reported rates, which have ranged as high as 56% in medicated samples (Kane & Smith, 1982) and as high as 50.4% in NL naive samples (Owens, Johnstone & Frith, 1982).

This was a young, but chronic sample, with an average age of 35.83 years and an average duration of illness of 11 years. Prevalence rates can vary widely across studies

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depending on a number of factors, including the population being studied, the assessment method, the institutional setting, and the age of the subjects. For example, state hospitals and studies of older or chronic samples report higher prevalence rates, while prevalence rates are lower in younger samples or samples with a shorter duration of illness. Further, there is no one accepted definition for TD, and differences in the diagnostic criteria can affect prevalence rates. This study employed the RDC-TD criteria in designating a case as TD, which is a conservative method. However, an ordinal scale of severity was used rather than a nominal categorization scale. Prevalence rates are often higher in those studies that employ an ordinal scale (Kane & Smith, 1982).

There was limited range in the severity of abnormal involuntary movements on the traditional neuromotor measures with most subjects exhibiting no TD, questionable TD or mild TD. Comparability to other studies is difficult as severity rates are not often reported and subjects exhibiting severe TD are included in the same group as those with mild TD. The majority of the patients in the present study were on atypical neuroleptics, which have a lower motor side effect profile compared with typical NL medication. The greatest range was on the GESS, a measure designed to capture subtle motor anomalies not rated on traditional neuromotor scales. Global ratings on this instrument closely approximated a normal distribution.

The sample shared neuropsychological impairment across all measures of learning and attention. This is consistent with the literature that patients with schizophrenia and schizoaffective disorder have severe and persistent neuropsychological deficits. However, the consequences of these deficits are still relatively unknown. As a group, subjects were most impaired on measures of working memory (Letter Number

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Span and Trails B) and delayed visual memory (WMS-R Visual Reproduction II). Performance on these measures fell below the 11^{th} percentile and on a cancellation task (D2 errors) performance fell below the 1^{st} percentile compared to normative reference groups.

The level of psychopathology in this patient group fell in the moderate range. Again, these patients were recent discharges presenting with residual psychopathology. Subjects' scores spanned the range of the PANSS with some exhibiting a mild level of psychopathology and others with severe symptomatology. There were no significance differences between the positive and negative subscales of the PANSS.

RELATIONSHIP BETWEEN MOVEMENT DISORDER RATINGS AND SOCIAL AND OCCUPATIONAL FUNCTIONING

The first set of canonical correlations evaluated the relative importance of several domains of neuromotor behavior on SOF, independent of the level of psychopathology. A significant relationship was found such that increased severity of GESS and TD, but lower orofacial TD, was associated with poorer SOF (DSM-IV SOFAS). However, when psychopathology and NP functioning were added as covariates, the relationship between movement ratings and SOF was significant for subjects on atypical NL's only. Results of subjects on atypical medication revealed a significant relationship between TD and SOF (SAS II and DSM-IV SOFAS).

To date there is a paucity of research on the stigmatizing effects of motor abnormalities among psychiatric patients. Yassa (1989) and Yassa & Jones (1989) presented an overview of the medical and psychosocial complications of TD and reported

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that 54% of their patient sample with TD complained of embarrassment caused by their movement disorder. Subjects felt people were looking at them in public places although none of these patients had clinical evidence of paranoid delusions. Because of the perceived stigma, two patients discontinued university courses and were forced to seclude themselves in their apartments. Some family members and fellow patients reacted negatively to these patients with TD. This led to re-hospitalization or longer stays and thus delay in their rehabilitation and reintegration in the community. In the only study, aside from the present study, to directly evaluate the stigmatizing effect of TD, Boumans et al. (1994) examined the influence of orofacial dyskinesia on the social acceptability of psychiatric patients. The raters, first year social science students, informed they were viewing psychiatric patients, viewed patients in pairs in which one had orofacial dyskinesia and the other did not. These raters then made judgments about which person they would select for a hypothetical job working in a staff dining room. Patients were assessed in two different presentations, in a still photograph where the movement disorder was not visible and during a video presentation. In the video, the orofacial dyskinesia was visible and the patients' popularity as a job candidate was significantly lower.

The present results failed to support a relationship between orofacial TD, GESS and social disability, as hypothesized. This was surprising not only because of the relatively high prevalence of orofacial TD but also because microbehaviors relating to facial appearance have been well described as relating to community functioning. A person's overall likability and the likelihood of being selected for a job have been related to facial expression, gaze, smiling, high amounts of eye contact, and facial gesturing

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(Amalfitano & Kalk, 1977; Forbes & Jackson, 1980; Edinger & Paterson, 1983), behaviors that are rated on the GESS and are also affected by orofacial dyskinesia. Yet, neither GESS scores nor orofacial dyskinesia were significantly associated with SOF. However, since the GESS was designed to measure less frank motor abnormalities than the traditional movement disorder ratings scales its failure to significantly contribute to the relationship among the neuromotor measures is not surprising. This scale measures a different dimension of motor behavior than the traditional neuromotor scales. Thus, it appears that several factors, including the limited range of severity on the Simpson Dyskinesia Scale, the scales' limited sensitivity in detecting subtle motor anomalies, and the limited range of severity on measures of social functioning may be responsible for the lack of a significant association between orofacial TD, GESS and SOF.

While results did not support the ecological validity of Bouman's laboratory findings, results did demonstrate a relationship between motor behavior and social disability. Unlike Bouman's study, the present study addressed actual community functioning as it is affected by movement disorders rather than the hypothetical question "Would you hire this person?" Community functioning can be affected by a number of factors including level of psychopathology, intellectual and neuropsychological functioning, and social skills. Bouman et al. used a small number of subjects (eight). These subjects were inpatients who were matched only for age and gender but no other relevant clinical factors such as chronicity, NL level, social skill, or grooming. Although subjects were matched for age, there were three instances where there was a 13 to 20 year age difference between subjects and controls, with controls being younger. While encouraging, Bouman's study is preliminary and much more research is needed

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examining the effects of TD and topography on social functioning in the community.

The study of orofacial dyskinesia is particularly important as it is more common in unmedicated samples and is considered by many to represent part of the inherent clinical presentation in schizophrenia regardless of medication status. Barnes, Kidger, & Taylor (1978) noted "[orofacial movements] present an obvious stigma of 'madness' and constitute a severe social handicap by causing embarrassment to the family and friends and apprehension on the part of potential employers (p.147)."

RELATIONSHIP BETWEEN MOVEMENT DISORDER RATINGS AND SOCIAL FUNCTIONING BY DIAGNOSTIC SUBGROUP

Exploratory analyses on the relationship between movement disorders and SOF was examined separately for the schizophrenic and schizoaffective subgroups. A highly significant relationship was found when schizophrenic patients only were included in the analysis, even with psychopathology as a covariate. However, when both psychopathology and attention and memory performance were added as covariates, this relationship was reduced to a statistical trend. With these added covariates in the analysis, global TD and parkinsonism contributed most strongly among the movement disorder ratings to impaired SOF. The trend level relationship is suggestive of an independent role of neuromotor factors, global TD and parkinsonism, in social disability. However, these findings remain speculative since no formal testing was conducted on the two diagnostic subgroups for homogeneity of variance. Additionally, overall results should be cross validated with a Monte Carlo or a leave out method.

The failure to obtain significant results with the introduction of attention and

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memory as covariates suggests that cognitive factors also play an influential moderating role in the relationship between motor behavior and social and occupational functioning. Findings suggest that motor and cognitive functioning are both independent contributors to the impairment in community functioning in schizophrenic patients. The role of cognitive factors in social disability is not a novel finding. It is well known that NP performance is related to social functioning (Green, 1991). Poor social functioning has been attributed to impairments in delayed verbal memory, card sorting (Jaeger & Douglas, 1992; Goldman et al., 1993), information processing (Penn et al., 1995), visual processing and recognition memory (Corrigan, 1994). The present findings together with the findings described in the section "Relationship between Movement Disorder Rating and Neuropsychological Performance" highlight the contribution of NP functioning to the social disability in this patient population and particularly to patients with neuromotor abnormalities.

In contrast to findings suggestive of a relationship between global TD, parkinsonism and SOF in schizophrenic subjects, a non-significant correlation was observed between the motor and SOF measures among schizoaffective subjects. This was unexpected for several reasons. First, the two diagnostic subgroups did not differ significantly on any of the movement disorder measures. Second, given the higher severity of parkinsonism among schizoaffective individuals together with the significant relationship between parkinsonism and SOF in schizophrenic subjects, there is no reason to suggest that schizoaffective individuals should be any less vulnerable to social stigmatization than individuals with schizophrenia, especially since mean scores for two diagnostic subgroups on at least one of the SOF measures, the SOFAS but not the SAS II,

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demonstrated that schizoaffective subjects were significantly more impaired than schizophrenic subjects. It may be that the small sample size of schizoaffective subjects is responsible for the lack of significant results. A larger, prospective investigation with a greater number of schizoaffective subjects would better address the question of diagnostic subgroup, motor functioning and SOF. It is known that affective disorder patients show an increased vulnerability to developing TD compared with schizophrenic patients (Yassa, Nair, & Schwartz, 1984; Kane, Woerner, & Lieberman, 1988*b*) and parkinsonism is an early risk factor for the later development of TD. Prospective investigations of the course of movement disorders and well as its impact on community functioning would aid in better understanding the motor determinants of social disability.

RELATIONSHIP BETWEEN MOVEMENT DISORDER RATINGS AND SOCIAL AND OCCUPATIONAL FUNCTIONING BY NEUROLEPTIC TYPE

To observe the effect of neuroleptic type on the relationship between movement and SOF, exploratory analyses were conducted on a subset of patients taking only one type of neuroleptic. In these analyses, some subjects in the sample were eliminated, as they were taking both a typical and an atypical neuroleptic. Results with subjects on typical NL medication demonstrated that increased severity of TD was associated with lower SOF (SAS II Social Leisure and DSM-IV SOFAS). This was not true of patients taking typical neuroleptics, where a non-significant correlation was observed. The small sample size of thirty-eight subjects may be partially responsible for the failure to reach significance among subjects treated with conventional NL medication.

There is abundant evidence of a lower motor side-effect profile associated with

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atypical NL medication. The severity of motor disorders across the movement measures were non-significantly lower for subjects on atypical neuroleptics, with a non significant trend for patients on typical NL's to have a higher total mean score for global TD. Recent studies suggest that the lower motor side-effect profile associated with the atypical neuroleptics may result in increased medication compliance and improved social functioning and quality of life. (Lindstrom, 1994). The present finding of lowered SOF among subjects on atypical medication may not necessarily be related to this medication type. Subjects taking atypical NL medication represented the majority in this sample and the failure to find this relationship in subjects treated with typical NL medication may be related to power. It may also be that there are differences in neuromotor functioning between these two groups that are not medication related and are intrinsic to their illness but that current neuromotor measures lack the sensitivity to effectively capture.

Initial Likability Impression Rating Scale

Intraclass correlation coefficients on the ILIKRS of the ratings made by the student evaluators were low. However, when measuring subjective traits such as likability and one's comfort level with people unknown to the evaluators, it is difficult to obtain high levels of agreement. Other rating instruments which report high ICC's usually employ objective rating criteria with well defined anchors or raters who are extensively trained in the use of the scale. In this study, raters were not instructed on the values they should assign to targets. Thus, when making subjective ratings in the absence of specific instruction, there can be systematic biases among evaluators that can influence their ratings and adversely affect the reliability across evaluators. As one example, some

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evaluators may be more parsimonious in their ratings and rarely assign a value of ten to a particular individual, while others may be more generous with a more frequent tendency to assign high ratings. In contrast to the low agreement between raters, however, the internal consistency of the scale was very high, demonstrating that the same construct is being measured throughout the scale. The fact that there can be individual biases is the purpose of aggregating data across raters. Aggregating data is a way of controlling for idiosyncratic rating styles and raters biases, and the high internal consistency of the scale provides justification for aggregating ratings (Funder & West, 1993).

RELATIONSHIP BETWEEN SOCIAL LIKABILITY RATINGS AND MOVEMENT DISORDER AND SOCIAL AND OCCUPATIONAL FUNCTIONING RATINGS

Neuromotor impairments produce prominent physical signs in neuroleptic treated patients and can create a barrier to successful social and vocational opportunities. These physical signs, referred to as "stigmata," can suggest dysfunction to prospective employers, neighbors, and mates. Results from the previous set of analysis suggested that these signs contribute to the social isolation, unemployment and underemployment among patients.

Results of the likability ratings further confirmed the hypothesis that observable physical features among psychiatric patients cause them to stand out even when knowledge of their diagnosis is not made public. Recall raters did not know that some of the targets were psychiatric patients. Yet, mean social likability and attractiveness

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ratings of subjects during both the dynamic and static presentations were lower for patients compared with normal controls. This is a compelling finding and suggests there are observable nonverbal features that distinguished patients from controls. Further, increased severity of movement disorder ratings on the GESS and parkinsonism were associated with lower likability ratings for patients in the dynamic presentation. Since these two movement disorder measures are highly correlated, it is expected that a significant effect found with one measure would be obtained for both measures.

Orofacial TD was not associated with likability ratings during the dynamic presentation as hypothesized. Again, the present results were unable to replicate the findings of Boumans et al. In contrast, there was a trend for orofacial TD to be associated with lower likability during the static, but not dynamic, presentation. However, during the dynamic presentation there are more aspects of behavior for the viewer to attend to including whole body movements, speech content, and dress. When orofacial abnormalities are not severe and obvious, as was the case with the present sample, they are likely to be overlooked. While during a static viewing, there is less to attend to as the viewer is seeing only a face shot where abnormalities affecting facial appearance may be more noticeable.

As previously noted there was a relatively restricted range of TD severity. Consequently, abnormal movements in the face, as well as in the extremities, had to be elicited during the movement disorder examination for the majority of subjects and were not easily seen on the videotapes. Moderate TD was more easily noticeable in the videotapes. Patients with moderate TD displayed grimacing, tongue protrusions, and choreathetoid movements in their fingers during the video SRS. But this was a small

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portion of the total sample. Whereas akathisia, parkinsonian signs, and abnormalities likely to be rated on the GESS were more easily observable, and as a result, patients with a lack of spontaneous movements and speech were more likely to stand out.

It was hypothesized that likability ratings would be associated with movement disorders during the dynamic presentation in which subjects' motor abnormalities would be conspicuous, while during the static presentation, no such association was expected. This hypothesis was confirmed. In contrast to results during the dynamic presentation indicating lower likability with a higher severity of GESS and parkinsonism, movement disorder ratings were not significantly associated with likability ratings during the static presentation. However, there was a trend during the static presentation for higher GESS severity to be associated with lower likability. Also, in contrast to ratings made during the dynamic presentation, lower patient likability ratings were significantly associated with poor SOF as measured by the DSM-IV SOFAS during the static presentation. It is not surprising to find GESS and parkinsonism being significantly related to likability since motoric abnormalities influencing these ratings were more easily seen on the video than frank TD. Further, the two movement disorders are highly correlated. GESS measures abnormal facial and gestural movements as well as a lack of appropriate movements. However, the ratings do not capture whether a particular score was given because of movement excess or paucity and the two ratings (GESS and parkinsonism) may be measuring similar motor behavior.

Separate analysis with the schizophrenic and schizoaffective subgroups during the dynamic presentation demonstrated that lowered likability ratings were associated with higher severity on GESS and parkinsonism. Yet, movement disorder ratings were not

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significantly associated with likability ratings by the evaluators during the static presentation. However, there was a non-significant trend for higher orofacial TD ratings to be associated with lower social likability for schizoaffective subjects only. In contrast to the dynamic ratings of both patient subgroups, results during the static presentation revealed lower likability was significantly associated with poor SOF on the DSM-IV SOFAS among schizophrenic patients and the relationship reached the level of statistical trend among schizoaffective patients. Thus, even in the absence of dynamic motor features there appears to be some observable features, which may be akinesia, that results in decreased likability of patients in comparison to controls regardless of presentation.

Attractiveness ratings were lower for patients compared with controls during each of the presentations and an opposite pattern of ratings was observed for the two groups (controls and patients) across the two presentations. Attractive ratings were significantly higher for controls during the dynamic presentation compared with static ratings. Presumably, spontaneous gestures, which were more obvious to the raters during the dynamic presentation, contributed to the higher ratings in the dynamic, rather than the static, presentation. An opposite pattern of ratings was observed for the patients. Higher attractiveness ratings were given during the static, rather than the dynamic, presentation. Again, it is presumed that lack of appropriate gestures and facial reactivity resulted in lower ratings of attractiveness during the dynamic presentation. While during the static presentation, in which gestural features play a less crucial role, attractiveness ratings rose.

Gestural and expressive abnormalities play an influential role in moderating one's opinion of attractiveness and likability. Even when adding attractiveness a covariate, nonverbal behavior significantly influenced likability. In the control group, there was a

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trend for higher likability ratings to be given during the dynamic, rather than the static, presentation and attractiveness, as already noted, was significantly higher in the dynamic presentation. Dynamic facial and gestural factors appeared to benefit this group in increasing a favorable impression. Whereas for patients, there was no difference in likability across the two presentations and dynamic aspects did not increase likability. The finding that abnormalities in nonverbal behavior are related to social functioning and social likability is particularly relevant to psychiatric patients who as a group are overwhelmingly underemployed and socially isolated. The effects of nonverbal behavior on likability and hireability has been extensively studied in nonclinical populations. Length of eye contact, hand gestures, head nods, smiling, appropriate tone of voice, voice modulation, and speech fluency are some of the behaviors regarded as important in making a positive impression. These features suggest ambition, motivation, an ability to communicate, and intelligence to the observer (Arvey & Campion 1982; Gifford, Ng, & Wilkinson, 1985; McGovern & Tinsley, 1978; Wexley, Fugita & Malone 1975; Tessler & Sushelsky 1978; Imoda & Hakel, 1977). McGovern (1976) reported that applicants seeking employment who display above-average nonverbal behaviors such as amount of eye-contact, high energy level, speech fluency, and voice modulation were evaluated as worth seeing for a second interview. It is also reported that applicants who engaged in more eye contact are judged as more alert, assertive, dependable, confident, responsible and as having more initiative (Amalfitano & Kalt, 1977). The pattern of results in most studies suggests that increased eye contact, smiling, speech qualifying gestures, and head nods by an applicant produce favorable outcomes in job interviews (Imada et al., 1977; Forbes & Jackson, 1980). Considering that lack of long term success of various

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psychiatric vocational programs, and the economic burden placed on families and society because of the low rate of employment among psychiatric patients, these findings strongly indicate the needs for a change in the focus of patient employment training programs and increased education of individuals within patients' support networks.

RELATIONSHIP BETWEEN MOVEMENT DISORDER RATINGS AND MEASURES OF ATTENTION AND MEMORY

Abnormal involuntary movements in schizophrenia have variously been suggested to be associated with basal ganglia dysfunction (Egan et al., 1997; Bartels & Themelis, 1983). In severe cases, TD can resemble diseases of the basal ganglia system. It has been suggested that the NP impairment in schizophrenic individuals with TD should be similar to that seen in individuals with other basal ganglia disorders such as idiopathic Huntington's Chorea and Parkinson's Disease (Myslobodsky et al., 1985). Impairments in learning and attention are the most cited NP impairments in these disorders and are frequently cited as impairments among schizophrenic patients with TD (Paulsen et al. 1994).

A highly significant relationship was obtained between the movement disorder measures and attention and memory measures, even with partialling for possible confounding factors (age of patient, duration of illness, psychopathology, or anticholinergic medication). Severity of parkinsonism and GESS were associated with impairment in verbal learning and visuomotor attention (Verbal Paired Associates II and Trail Making Test B). This finding is consistent with the literature citing greater NP impairment among patients with neuromotor dysfunction.

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More severe impairments in attention (Paulsen, Heaton, & Jeste, 1994) visual and verbal learning (DeWolf, Ryan, & Wolf, 1988; Sorokin, Giordani, Mohs, Losonczy, Davidson, Siever, Ryan, & Davis, 1988) and Trails B (Wegner, Catalano, Gilbralter, & Kane, 1985) have been reported in schizophrenic subjects with TD compared with schizophrenia subjects without TD. It is not surprising to find a relationship between parkinsonism and NP impairment. Brown (1991) reported that schizophrenic patients with drug-induced parkinsonism demonstrated greater NP impairment compared to non-dyskinetic subjects or subjects with no EPS. Hoffman et al. (1987) found severity of parkinsonism predicted poor performance on visuopatial measures of attention, reasoning, and planning.

EPS, including parkinsonism, has been identified as a risk factor for the later emergence of TD. The American Psychiatric Association reported that early onset of movement disorders was associated with a threefold risk of subsequently developing TD. This was a relatively young sample with a mean age in the middle thirties. Parkinsonism may represent an early manifestation of what may potentially develop into a more serious neuromotor impairment and neuropsychological impairment is but one sign of the neurobiological impairment.

The present examination of neuromotor functioning and NP impairment has overcome some of the methodological problems of many previous studies in this area. These shortcomings have included mixing affective disorder, dementia, organic brain damaged and leucotomy patients in the same sample and failing to separately analyze each group. A large portion of these studies did not use standardized NP tests and many

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used only a single test or a screening test of basic orientation. Finally, the study of NP deficits in TD is dominated by studies of elderly, long-term institutionalized in-patient samples, the results of which are inappropriate to explain NP deficits in younger, community samples of schizophrenic patients.

Another important and novel contribution of this study is the finding that the GESS, which measures subtle neuromotor abnormalities in dyadic communications, bore a relationship NP performance. Given the controversy over the relationship between movement disorders and cognition, these findings indicate there is a motor component to schizophrenia. This motor component, which may or may not be medication related, is not being completely captured with the traditional movement disorder instruments and is related to attention and memory dysfunction in schizophrenia. This dysfunction may be a mediating factor in impaired social functioning.

RELATIONSHIP BETWEEN MOVEMENT DISORDER RATINGS AND ATTENTION AND MEMORY PERFORMANCE BY DIAGNOSTIC GROUP

Based on exploratory follow-up analyses, the relationship between neuromotor and NP functioning cannot be attributed to either diagnostic group alone. When schizophrenic patients only were examined, the relationship was not significant. The results for the schizoaffective subgroup were suggestive of a relationship but also did not reach statistical significance. Since parkinsonism, a neuromotor contributor to the relationship between movement and attention and memory, was significantly higher in this group than in schizophrenic subjects, the failure to reach significance is probably

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related to the small sample size.

RELATIONSHIP BETWEEN MOVEMENT DISORDER RATINGS AND ATTENTION AND MEMORY PERFORMANCE BY NEUROLEPTIC TYPE

A highly significant relationship was found between neuromotor impairment and attention and memory functioning when exploratory analyses were conducted on the subset of subjects taking only atypical neuroleptics. Neuromotor measures loaded highly with limbotruncal TD and global TD. Attentional and memory measures loaded highly with WMS-R Visual Span Backwards, Letter Number Span and WMS-R Digit Backwards, all of which are measures of working memory. These measures are scaled in the same direction with higher values indicating better performance. Conversely, higher values on the movement disorder ratings indicate greater movement disorder severity. In the predictor set of variables, results showed that increased severity of limbotruncal TD was associated with lower global TD ratings. This was associated in the outcome set with poor performance on WAIS-R Digit Span Backwards while Letter Number Span and Visual Span Backwards were in the opposite of the expected direction and showed no impairment.

The criteria for limbotruncal TD was less stringent than the criteria for global TD. Limbotruncal TD was assigned on the basis on a single global rating of mild (2). However, in order to receive a global rating of TD, there must be at two global ratings of mild or a global rating of moderate. Therefore, it is possible to be designated with limbotruncal TD without meeting the full criteria for TD. This somewhat lenient criterion for limbotruncal and orofacial TD was chosen as it conforms to other studies

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(Pauslen, Heaton, & Jeste, 1994).

It was puzzling to find a pattern where poor performance on WAIS-R Digit Span Backwards would be associated with better performance on Letter Number Span and Visual Span Backwards, as the latter two tasks place greater demands on working memory. The differences in performance across the tasks cannot be explained on the basis of a relative strength in one processing modality over another. Both the WAIS-R Digit Span Backwards and the Letter Number Span tasks are measures of auditory working memory. These test result findings are difficult to interpret and contrary to the literature and expectations and are in need of replication.

The canonical correlation on the relationship between attention and memory was high for subjects taking only typical neuroleptics but did not reach statistical significance. Therefore, it may be that relationship between movement disorder ratings and attention and memory could hold for both groups and the failure to reach significance may be related to a smaller sample size of patients on typical neuroleptics. An alternate explanation may be that that the movement disorder among those subjects in the typical group are not medication related at all but are part of the inherent illness as described by Kraeplin (1919) and others of unmedicated subjects. The association between movement disorder and working memory may reflect a common underlying dysfunction.

The literature on the relationship between TD and NP deficits remains conflicted with respect to the issue of greater NP impairment in TD subjects. While the majority of studies have found that TD is associated with greater NP impairment, some have failed to find a difference between patients with limbotruncal and orofacial TD (Gold, 1991). Few

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studies have directly assessed the issue of topography by comparing an orofacial sample with a limbotruncal group. In those studies that have addressed topography, the majority reports greater cognitive impairment in patients' with orofacial TD (Gilleard, 1986; Waddington, 1987, Gureje, 1988) but this is usually by examining elderly, long term institutionalized samples. Others suggest increased NP deficits among patients with limbotruncal TD (Brown, 1991b; Brown, 1992; Paulsen, 1994) which is more common in younger samples.

SUMMARY

Results from both diagnostic subgroup failed to demonstrate a significant relationship between movement disorder ratings and SOF measures when psychopathology and attention and memory functioning were used as covariates. Results were suggestive of a relationship between TD, parkinsonism and SOF for schizophrenic subjects only, but not schizoaffective subjects. However, the relationship between movement disorder ratings (Global TD) and SOF was significant only among subjects taking atypical neuroleptics and not for those taking typical NL medications. Additionally, social likability ratings indicated that increased severity of GESS and parkinsonism was related to lower ratings of social likability from the student evaluators.

A highly significant relationship was obtained between movement disorder and attention and memory measures, even with patients' age, duration of illness and psychopathology as covariates. Overall, results demonstrated that increased severity of parkinsonism and GESS was associated with poorer performance on measures of verbal

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learning and visuomotor attention. Analysis with respect to the influence of diagnostic group did not produce significant results. Limbotruncal TD was associated with an impaired auditory attention span for subjects on atypical NL's.

LIMITATIONS AND FUTURE DIRECTIONS

This was a very functionally disabled sample. There was limited range on measures of social and vocational functioning, with most of sample falling in the very severely impaired range. With the current trend toward shorter hospital stays, patients are being released into the community while remaining symptomatic, stabilizing in day treatment and community outpatient programs and taking a longer time to assimilate into the mainstream. To better address the question of the relationship between neuromotor behavior and SOF, a different sampling procedure may be more appropriate. This could be accomplished by using a community based clinic sample or increasing the length of time from discharge to testing in order to broaden the range on community functioning measures.

There was a limited range of neuromotor impairment in the present sample. A broader range of TD severity would make it easier to address the question of the effects of TD topography and severity on social and occupational disability. This may be better accomplished with a matched group design. However, with recent advances in antipsychotic medication, fewer patients are presenting with the more severe forms of TD. In spite of decreases in TD severity, neuromotor impairments will continue to be part of the clinical presentation of schizophrenia. The effects of both overt and subtle, as

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well as medication and non-medication related, motor and neurological abnormalities on social and vocational functioning remain largely unexplored.

Parkinsonism and GESS emerged as strong overall factors across all the analysis. Increased severity of GESS and parkinsonism was related to lower social likability ratings from the student evaluations and both were related to poor verbal learning and visual attention. Further, there was a trend for increased severity of parkinsonism to be related to poor SOF. It may be that there may other factors mediating this relationship that need to be more fully explored. For example, an initiation or activational deficit may be responsible for the cognitive and behavioral slowing. This slowing may be related to poor performance on attention and working memory tasks, lowered perceptions of likability because patients appear dull, and poor initiation in seeking social and vocational opportunities. These findings do not imply that the lack of appropriate behaviors and akinesia is more stigmatizing than motoric excesses. Frank movements such choreic movements, ballisms, and tics are obvious signs of dysfunction. However, this sample did not present wide a range and severity of frank movement abnormalities but were more notable for their lack of appropriate movements.

The finding that lower social likability and SOF was related to how the patients "looked" provides evidence that movement disorders could be a strong mediating factor in social disability. However, there could be other factors such as grooming, weight, social skill or neuropsychological impairment that could be confounding factors. For example, many patients are overweight as a result of their medications. Overweight individuals are often viewed as less socially desirable. However, this was a well-groomed sample and many subjects dressed up, shaved or put on make-up when arriving

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for video taping. Also, recall attractiveness was a covariate and even with it removed from the equation, subjects were still rated as less socially likable. The fact that patients were rated as less likable and less attractive in the static presentation suggests that the method of obtaining this rating may have been problematic. Namely, asking patients who have had parkinsonism or other movement abnormalites to smile for a videostill may have had the unintended effect of causing them to stand out and appear unusual or unnatural to the raters. In the future, it would be more appropriate to have none of the stimuli smile for static attractiveness ratings. Finally, there was little opportunity for social skills to play a role in the SRS. It was a relatively standardized procedure with each target being guided by through by the confederate in ordering a meal.

With regard to influence of medication type, the present study queried about medication use at the time of testing only, so it was not known how long a patient was on a typical or atypical medication. Some patients may have had long-term exposure to typical neuroleptics and were grouped as "atypical" for the analysis because at time of testing they happened to be on an atypical neuroleptic. It would be important to take detailed medication histories to understand the role, if any, of the type of neuroleptic medication on SOF. It is possible that the motor abnormalities seen among patients on atypical medication neither results from their current medication nor from past use of typical NL medication, but reflects an inherent motor abnormality as described in never medicated schizophrenia samples.

The role of TD topography on NP functioning remains unclear. A number of risk factors and clinical correlates have been identified in the literature but the specific clinical factors that give risk to each purported subtype of TD is unknown. It has been

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hypothesized that each may represent distinct subtypes, with specific clinical features, and underlying pathophysiological mechanisms. Clinically it is known that limbotruncal TD is more common among younger patients while orofacial is more common in the elderly and in patients presenting with primarily negative symptoms. In this sample of young adults, orofacial TD was more prominent but limbotruncal TD was associated with greater NP impairment. This finding is in contrast to most of the TD literature that cites greater NP in orofacial samples. However, the problem with many of these studies, as noted previously, is that these findings were largely based on samples of elderly patients measured with poorly standardized NP instruments. Additionally, few studies have directly compared the two topographic subtypes. More research is needed with younger, community samples on the effects of both frank and subtle neuromotor abnormalities on NP functioning. Replication of the findings of the relationship between GESS and attention and memory functioning is needed, as well as longitudinal studies to examine the stability of the relationship between neuromotor and NP functioning over time.

According to Cohen & Cohen (1993) the benefits of studying TD are as follows: (1) the TD syndrome has many features in common with other movement disorders whose etiologies are partially or relatively well elucidated and this allows for clear points of departure and comparison (Wade et al., 1987); (2) TD provides yet another opportunity to investigate the role of the basal ganglia and associated structures and projections in the modulation of movement and cognition; (3) TD is being closely associated with neuroleptic treatment which allows for the possible localization of various sites of action of neuroleptic drugs and speculation on bio-chemical correlates of cognitive functioning.

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Most social and vocational skills training programs recognize the importance of paralinguistic and nonverbal elements as well as the cognitive and verbal factors of interpersonal communication (Liberman 1982, Liberman, Mueser & Wallace 1986, Liberman, Kopelowicz and Young 1994, Bellack, Morrison, Wixted & Mueser 1990, Wong et al., 1993, Finch & Wallace 1977, Furman et al., 1979). In spite of their clearly negative effects, the significance of neuromotor stigmata on job hireability has not been quantitatively examined in psychiatric patients. Residual social and occupational dysfunction in psychiatric populations constitutes the largest portion of their economic cost to society exceeding the costs of direct care by as much as threefold (Hall, Goldstein, Andrews, Lapsley, Bartels, & Silove, 1985; Andrews, Hall, Goldstein, Lapsley, Bartels, & Silove, 1985; Gunderson, & Mosher, 1975)

Despite recent advances in pharmacotherapy, neuromotor impairment in schizophrenia remains a critical issue affecting social, occupational and neuropsychological functioning. One of the factors that appear to contribute to the difficulty of persistently mentally ill psychiatric patients in getting a job is how they 'look'. The importance of nonverbal and paralinguistic factors is widely acknowledged in social and vocational skills programs, yet the effects of these stigmatizing movements on community functioning including hireability, rate of employment and frequency and quality of social functioning has been largely unexplored.

An increased understanding of the interplay of neuromotor impairment, neuropsychological impairment and psychopathology may be critical for understanding the underlying disability as well as the underlying neuropathophysiology of schizophrenia. It is particularly relevant that current medication prescribing practices are

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resulting in the increased use of atypical medication. This will certainly result in changes in the prevalence rates of TD and perhaps the long-term course of schizophrenia. First episode patients may never require exposure to conventional NL medication. Prospective studies of these patients may reveal important factors regarding the tendency for abnormal movements to be a part of the clinical picture in schizophrenia. To further elucidate the inter-relationships between tardive dyskinesia, extrapyramidal symptoms, psychopathology, NP impairment and SOF on the functional outcome of individuals with schizophrenia, prospective studies that study large cohorts with a broad range of neuromotor and SOF are critical. Knowledge of the specific determinants of functional disability in schizophrenia may lead to a better understanding of schizophrenic patients among mental health workers and to more effective treatment and intervention strategies. The knowledge of social, cognitive, and motoric disabilities in psychiatric patients should continue to act an impetus for pharmaceutical companies to measure a drugs' efficacy not only by the ability to remit symptoms but also by the ability to positively impact a patient's community functioning.

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APPENDIX I

Gestural and Expressive Stigmata Scale

Judith Jaeger, PhD, MPA and Helen Bakst, CSW, CRC

[0=normal 1=possible 2=mild 3=definite 4=marked]

PATIENT AS LISTENER: FEEDBACK DURING CONVERSATION

1. Facial reactivity (nonverbal) in response to speech. (e.g. affective reactivity like smiling, frowning, puzzlement, surprise, disgust etc)
   0= normal facial mobility (recognizable facial expressions)
   2= mild rigidity or possible rigidity (facial expressions appear muted; decreased affective range).

2. Head movement in response to communication (Refers to nodding of head while listening to another person. Rate rigidity or excessive nodding only where it impedes socially appropriate responsivity in communication.)

0= normal mobility (appropriate nodding of head)

2= mild or possible (some diminution or excess in head nodding)

4= marked (no or minimal recognizable gestural motions or markedly abnormal head nodding).

3. Verbal and nonverbal vocalizations acknowledging the words of another speaker (such as "yes," "yeah," "really," "uh huh" or "mmm"). Also rate appropriateness of quantity and timing of speech

0= normal rate, volume and timing of vocalizations.

2= mild reduction in rate or volume or inappropriate timing of vocalizations.

4= near or total absence of audible vocalizations.

PATIENT AS SPEAKER: GESTURING & ANIMATION OF COMMUNICATION

4. Arm and hand gestures while speaking. (Movements which normally accompany speech, sometimes for emphasis.)

0= normal mobility (appropriate gesturing of hand/arm).

2=mild rigidity or possible rigidity (some diminution and/or peculiarity of arm/hand movements).

4= marked rigidity (No or minimal recognizable gestural motions and/or marked peculiarity).

5. Head movements (as in those often providing emphasis while speaking. Do not include facial expressions)

0= normal mobility. (Appropriate mobility of head).

2= mild rigidity or possible rigidity (some diminution and/or peculiarity of head movement).

4= marked rigidity. No movement and/or marked peculiarity of head movement.

6. Prosody (melodic component of speech).

0= normal prosody or melodic component reflecting an appropriate range of affect.

2= diminished melodic component relative to expressed affect.

4= monotonous. No melodic range.

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7. Rate of speech.
   0= normal rate.

   2= some retardation or acceleration.

   4= marked retardation or rapid speech.

8. Volume of speech.
   0= normal volume for the setting.
   2= seemingly too soft or too loud. Possible significance.

   4= volume too loud or too soft for the setting.

PATIENT AS BOTH SPEAKER AND LISTENER:

9. Reduction of eye contact.
   0= normal frequency of eye contact.
   2= reduced eye contact. Suggested.
   4= marked reduction in eye contact.

10. Abnormality of gaze. (e.g. starring with or without normal blinking, absence of socially appropriate deviation of gaze, other peculiarity in patient's gaze.)
   0= no abnormality of gaze.
   2= mild or suggestive peculiarity of gaze.

   4= marked peculiarity.

11. Facial expression. (To be distinguished from facial reactivity in item 1. Rate quantity and quality of facial mobility including masked faces, bizarre or peculiar movements, inappropriate or mood incongruent expressions of affect. Rate on observed behavior without consideration to etiology, e.g. Tardive Dyskinesia).
   0= normal facial mobility (recognizable facial expressions/no peculiarity of fac. expr.).
   2= mild (facial expressions appear muted, decreased range, or they appear mildly peculiar).
   4= marked (no recognizable facial expression and/or marked peculiarity of expression).

GLOBAL RATING

12. In your experience with normal and impaired individuals, to what degree does this person appear deviant in conversational behavior in the manner described above. Consider how they might be viewed by a lay observer.
   0= normal overall appearance
   2= Mild or possible peculiarity somewhat noticeable to a lay observer
   4= Marked peculiarity, readily noticeable to any lay observer

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APPENDIX II
Initial Likability Impression Rating Scale (ILIKRS)

Please help us select stimuli by rating the person shown in the videotape/still photograph:

1. On a scale of 0 to 10, how likable is this person?
0..............1..........2..........3..........4..........5..........6..........7..........8..........9..........10
Not at all Neutral Extremely Likable

2. On a scale of 0 to 10, how likely is it that you would:

a) Ask directions from this person, if you got lost?
0..............1..........2..........3..........4..........5..........6..........7..........8..........9..........10
Not at all Neutral Extremely Likely

b) Sit next to this person on a long train ride?
0..............1..........2..........3..........4..........5..........6..........7..........8..........9..........10
Not at all Neutral Extremely Likely

c) Talk to this person at a party, if they approached you and said 'Hello'?
0..............1..........2..........3..........4..........5..........6..........7..........8..........9..........10
Not at all Neutral Extremely Likely

d) Want to work closely with this person?
0..............1..........2..........3..........4..........5..........6..........7..........8..........9..........10
Not at all Neutral Extremely Likely

e) Want this person as a neighbor?
0..............1..........2..........3..........4..........5..........6..........7..........8..........9..........10
Not at all Neutral Extremely Likely

f) Rent a room to this person in your house?
0..............1..........2..........3..........4..........5..........6..........7..........8..........9..........10
Not at all Neutral Extremely Likely

g) Trust this person to take care of your children, if he/she had the right references?
0..............1..........2..........3..........4..........5..........6..........7..........8..........9..........10
Not at all Neutral Extremely Likely

3. On a scale of 0 to 10, how physically attractive is this person?
0..............1..........2..........3..........4..........5..........6..........7..........8..........9..........10
Not at all Attractive Neutral Extremely Attractive

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APPENDIX III

Correlation Matrix of Movement and Social and Occupational Functioning Scales

	Global TD	Orofacial TD	Limbotruncal TD	Global GESS	Akathisia	Parkinsonism	SAS II Social Leisure	DSM-IV SOFAS
Global TD	**1.00**	.750**	.396**	.144	-.145	-.007	.167	-.098
Orofacial TD	.750**	**1.00**	.270**	.174	-.177	.092	.008	-.004
Limbotruncal TD	.396**	.270**	**1.00**	.148	-.032	.043	-.015	-.017
Global GESS	.144	.174	.148	**1.00**	.485**	.286**	.164	-.353**
Akathisia	-.145	-.177	-.032	.485**	**1.00**	.219*	.135	-.266**
Parkinsonism	-.007	.092	.043	.286**	.219*	**1.00**	-.043	-.058
SAS II Social Leisure	.167	.008	-.015	.164	.135	-.043	**1.00**	-.456**
DSM-IV SOFAS	-.098	-.004	-.017	-.353**	-.266**	-.058	-.456**	**1.00**

** Correlation is significant at the .01 level

* Correlation is significant at the .05 level

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