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Neurocognition and social skill in older persons with schizophrenia and major mood disorders: An analysis of gender and diagnosis effects

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Abstract

Effective social interactions necessary for getting affiliative and instrumental needs met require the smooth integration of social skills, including verbal, non-verbal, and paralinguistic behaviors. Schizophrenia is characterized by prominent impairments in social and role functioning, and research on younger individuals with the illness has shown that social skills deficits are both common and distinguish the disease from other psychiatric disorders. However, less research has focused on diagnostic differences and correlates of social skills in older persons with schizophrenia. To address this question, we examined diagnostic and gender differences in social skills in a community-dwelling sample of 183 people older than age 50 with severe mental illness, and the relationships between social skills and neurocognitive functioning, symptoms, and social contact.

Individuals with schizophrenia had worse social skills than those with bipolar disorder or major depression, with people with schizoaffective disorder in between. Social contact and cognitive functioning, especially executive functions and verbal fluency, were strongly predictive of social skills in people with schizophrenia and schizoaffective disorder, but not those with mood disorder. Other than blunted affect, symptoms were not predictive of social skills in either the schizophrenia spectrum or the mood disorder group. Older age was associated with worse social skills in both groups, whereas female gender was related to better skills in the mood disorder group, but not the schizophrenia group. The findings suggest that poor social skills, which are related to the cognitive impairment associated with the illness, are a fundamental feature of schizophrenia that persists from the onset of the illness into older age.

Keywords

Schizophrenia; Mood disorders; Severe mental illness; Social skill; Rehabilitation; Neurocognitive; Symptoms; Aging

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Impaired language skill is a characteristic feature of schizophrenia that has long been thought to contribute to the severe functional disability associated with the disorder (Bleuler, 1911/1950). The broader construct of *social skills* refers to a complex set of behaviors and perceptual abilities, including both verbal and nonverbal communication behaviors, that are necessary for successful role performance, interpersonal functioning, and gratification of needs in adulthood (Liberman et al., 1986). Conceptualizing communication behavior in terms of social skills that can be broken down into constituent elements has proven useful in the development of interventions for improving social functioning in schizophrenia (Bellack, Mueser, Gingerich, & Agresta, 2004), other psychiatric disorders (Liberman, DeRisi, & Mueser, 1989), and non-psychiatric populations (Shapiro, 2004). These *social skills training* interventions involve the systematic teaching of skills based on the principles of modeling, behavioral rehearsal, positive reinforcement, and shaping.

Research on social skills has often employed simulated social interactions, or *role-play tests*, in which individuals are presented with a social situation involving a confederate who plays the scripted role of another person (e.g., initiating a conversation, making a complaint, solving a problem), with the interaction audiotaped or videotaped and subsequently rated on dimensions such as eye contract, emotional expressiveness, appropriateness of verbal content, and overall skill. Role-play tests of social skills for schizophrenia have been shown to have high reliability, validity, and stability over time (Bellack, 1983; Bellack, Hersen, & Lamparski, 1979; Mueser, Bellack, Douglas, & Morrison, 1991), and are a sensitive indicator of psychosocial or community functioning (Appelo et al., 1992; Bellack, Morrison, Mueser, Wade, & Sayers, 1990; Dickinson, Bellack, & Gold, 2007; Patterson, Moscona, McKibbin, Hughs, & Jeste, 2001; Penn, Mueser, Spaulding, Hope, & Reed, 1995). Furthermore, people with schizophrenia have been found to have more impaired social skills performance on role-play tests compared to other psychiatric disorders (e.g., mood disorders) and non-psychiatric controls (Bellack, Morrison, Wixted, & Mueser, 1990; Bellack, Mueser, Wade, Sayers, & Morrison, 1992; Bellack, Sayers, Mueser, & Bennett, 1994; Donahoe et al., 1990; Mueser, Bellack, Douglas, & Wade, 1991; Yamashita, Mizuno, Nemoto, & Kashima, 2005; Zanello, Perrig, & Huguelet, 2006).

The utility of the social skills construct for better understanding social dysfunction in schizophrenia, and growing evidence supporting the effectiveness of social skills training for the disorder (Kurtz & Mueser, 2008), have led to an interest in the determinants of impaired social skills in this population. Many of the cognitive functions required for understanding and producing speech and language are impaired in people with schizophrenia, including attention, learning and memory, executive functions, and social cognition (Champagne-Lavau, Stip, & Joanette, 2006; Heaton et al., 1994; Penn, Corrigan, Bentall, Racenstein, & Newman, 1997). Cognitive impairments typically present at the first episode of psychosis (Addington & Addington, 2008) and are relatively stable over the course of the disorder in the absence of intervention (Addington, Saeedi, & Addington, 2005; Kurtz, 2005). Not surprisingly, deficits in cognitive functioning, social skill, and social functioning commonly co-occur (Evans et al., 2003; Green, Kern, Braff, & Mintz, 2000).

The relationship between social skills performance and impairment in a wide range of cognitive functions has been evaluated. The most consistent findings across studies are that impaired early information processing and attention (Addington & Addington, 2000; Addington, McClearly, & Munroe-Blum, 1998; Bowen et al., 1994; Bowie et al., 2008; Ikebuchi, Anzai, & Niwa, 1988; Penn et al., 1995; Zanello et al., 2006), verbal memory (Addington & Addington, 1999, 2000; Bellack et al., 1994; Corrigan & Toomey, 1995; Dickinson et al., 2007; Mueser et al., 1991; Yamashita et al., 2005), and executive functions (Addington & Addington, 1999, 2000; Addington et al., 1998; Dickinson et al., 2007; Hatashita-Wong, Smith, Silverstein, Hull, & Willson, 2002) are related to worse social

skills. Social cognition skills such as the ability to understand the perspectives of others (i.e., theory of mind) (Champagne-Lavau et al., 2006; Frith, 2004) and emotion recognition have also been linked to worse social skill (Addington, Saeedi, & Addington, 2006; Bellack et al., 1992; Corrigan & Toomey, 1995; Mueser et al., 1996).

Gender is also associated with social skills and overall language ability in both the general population and in schizophrenia. In the general population, women tend to have stronger verbal processing skills (Kimura, 1999; Maccoby & Jacklin, 1974) and emotion recognition skills (Hall, 1984). On role-play tests of social skill, women with schizophrenia demonstrate better performance than men (Bellack et al., 1992; Mueser, Bellack, Morrison, & Wade, 1990; Mueser et al., 1993). Women with schizophrenia have also been found to have more intact abilities for processing emotional prosody and semantics than their male counterparts (Bozikas et al., 2006; Scholten, Aleman, & Kahn, 2007). The relative preservation of emotion processing and social skills in women with schizophrenia compared to men may partly account for the more benign course of the illness in women, including fewer psychiatric hospitalizations and better psychosocial functioning (Canuso & Pandina, 2007; Haas & Garratt, 1998).

Although a substantial body of research has evaluated the nature and correlates of impaired social skills in schizophrenia, the vast majority of studies have focused on younger adults, and less is known about these relationships among older persons with the disorder. There are two main reasons for examining social skills in older persons with schizophrenia. First, due to advances in psychiatric and medical treatment, the number of older persons with severe mental illness who are living in the community is rapidly increasing (Jeste et al., 1999). However, most psychiatric rehabilitation approaches have been developed for the younger population. It is critical that psychosocial interventions such as social skills training be adapted to the special needs of this aging population in order to maximize the quality of their lives and to sustain their ability to live in the community (Pratt, Van Citters, Mueser, & Bartels, 2008). Second, age-associated declines in cognitive functioning and associated impairments in psychosocial functioning in schizophrenia (Bartels, Mueser, & Miles, 1997; Harvey et al., 2000) underscore the importance of evaluating the contribution of cognitive impairment to social skills, as well as exploring whether gender differences persist into old age.

Two studies have recently examined the relationship between cognitive functioning and social skills in older persons with schizophrenia. Bowie et al. (2006) reported a strong relationship (r =.63) between overall performance on a comprehensive neurocognitive test battery and overall functional capacity assessed by a role-play test on the University of California at San Diego Performance-Based Skills Assessment (Patterson et al., 2001) in 78 older persons (mean age 58 years old) with schizophrenia or schizoaffective disorder living in the community. Moderate to strong relationships were also found between functional capacity and informant ratings of interpersonal skills (r =.23), community activities (r =.40), and work skills (r =.54). All study participants were required to have recently experienced a hospitalization or emergency room visit for an exacerbation of psychosis (with the past two years), or to have moderately severe psychotic symptoms at the time of study entry. Gender composition of the sample was not reported, nor were gender differences in functional capacity.

Sitzer et al. (2008) examined demographic, symptom, social contact, and cognitive correlates of social skills in a large cohort of middle-aged and older people with schizophrenia or schizoaffective disorder (mean age 55 years) and community controls. Cognitive functioning was assessed with the Mattis Dementia Rating Scale (Mattis, 1973), whereas social skills were measured with the Social Skills Performance Assessment

(Patterson et al., 2001), which was specifically designed for older persons with severe mental illness. As expected, the control group had significantly better social skills and cognitive abilities. Within the group of participants with schizophrenia, better social skills were associated with less severe symptoms, better cognitive functioning, and, surprisingly, less frequent social contact. The authors suggested that people with worse social skills may be less attuned to their social interactions with others, but also noted that more impaired individuals may live in group homes, resulting in higher rates of social interaction. They were unable to evaluate this second point because most of the people in their study were living in group homes. There were no gender differences in social skill.

The Bowie et al. (2006) and Sitzer et al. (2008) studies provided support for the relationship between cognitive functioning and social skills in older persons with schizophrenia. However, several limitations are noteworthy. First, while both studies evaluated individuals living in the community, they focused on the most impaired—either those living in group homes (Sitzer) or those with significant psychotic symptoms (Bowie), limiting the generalizability of findings to the broader population of older persons with schizophrenia. Second, the Mattis Dementia Rating Scale used in Sitzer et al. was developed as a screening tool and is a relatively crude measure of cognitive functioning that does not provide a thorough evaluation of the broad range of domains of cognitive functioning. Although Bowie et al. employed a comprehensive neurocognitive battery, only a composite score was used in the analyses to examine the relationship with a composite measure of functional capacity. Thus, there is a need to examine the contribution of specific areas of cognitive functioning to specific social skills in older persons with schizophrenia.

Third, both the Bowie et al. and Sitzer et al. studies lacked a psychiatric control group, raising the question of whether impairments in social skill distinguish older persons with schizophrenia from those with other psychiatric disorders, as has been shown in younger populations. In addition, an intriguing question is whether cognitive impairment contributes to social skill deficits in people with severe mood disorders, as has been found in the schizophrenia population. Similar, although sometimes less severe, cognitive impairments characteristic of schizophrenia are present in younger people with bipolar disorder (Atre-Vaidya et al., 1998; Dickerson, Boronow, Stallings, C., 2004; Dickerson, Boronow, Stallings, C. R., 2004; Zihl, Gön, & Brunnauer, 1998) and psychotic mood disorders (Smith, Barch, & Csernansky, 2009). Cognitive impairment, especially poor verbal memory (Atre-Vaidya et al., 1998; Dickerson, Boronow, Stallings, C., 2004; Dickerson, Boronow, Stallings, C. R., 2004; Laes & Sponheim, 2006; Martínez-Arán et al., 2004) and executive functions (Laes & Sponheim, 2006; Martínez-Arán et al., 2002), is also predictive of worse psychosocial functioning in younger people with bipolar disorder. However, the association between cognitive functioning and social skills in people with severe mood disorders has not been evaluated, to our knowledge, in either younger or older persons.

The present study sought to overcome some of the limitations of the research on the cognitive and gender correlates of social skills in older people with schizophrenia by evaluating neurocognitive performance on a comprehensive battery, and assessing social skills with a role-play test, in a large sample of older community dwelling individuals with either schizophrenia or schizoaffective disorder or a severe mood disorder. Based on the previously reviewed research on younger cohorts, we hypothesized that social skills would be better in people with mood disorders than in people with schizophrenia or schizoaffective disorder, and better in women than men. We also hypothesized that cognitive functioning would be more impaired in the schizophrenia group than in the mood disorder group. Finally, we hypothesized that cognitive impairment, especially verbal memory, would be predictive of social skills in the schizophrenia spectrum group, and speculated that similar associations would be found in the mood disorder group.

2. Methods

The data for these analyses were drawn from the baseline assessment of a multi-site randomized controlled trial comparing an integrated social rehabilitation and health care management program with usual services for older people with severe mental illness (Pratt, Bartels, Mueser, & Forester, 2008). The study was conducted at three public mental health centers, including two in Boston and one in New Hampshire. All study procedures were approved by local institutional review boards.

2.1. Participants

Inclusion criteria for the study were: 1) age 50 or older; 2) designated by the state of New Hampshire or Massachusetts as having a severe mental illness, defined as a DSM-IV Axis I diagnosis of major depression, bipolar disorder, schizoaffective disorder, or schizophrenia, based on the Structured Clinical Interview for DSM-IV (First, Spitzer, Gibbon, & Williams, 1996) and persistent impairment in multiple areas of functioning (e.g., work, school, or ability to care for oneself); 3) enrollment in outpatient services for at least 3 months; and 4) ability and willingness to provide informed consent for participation. Exclusion criteria were: 1) residing in a nursing home or other institutional setting; 2) primary diagnosis of dementia or significant cognitive impairment as defined by Mini Mental Status Exam (Folstein, Folstein, & McHugh, 1975) score less than 20; and 3) terminal physical illness expected to cause death within one year.

A total of 183 participants provided written informed consent for the study and completed the baseline assessment. Demographic and diagnostic characteristics of the study sample are summarized in Table 1.

2.2. Measures

This paper focuses primarily on diagnostic and gender differences in social skill, cognitive functioning, and social contact, and the inter-relationships among these three domains. In addition, since major psychiatric disorders are defined primarily in terms of the type and course of symptoms, we also compared the different groups on standard measures of symptomatology. These measures are described below.

2.2.1. Psychiatric symptoms—Symptoms were assessed by trained interviewers with three widely used psychiatric rating scales. A broad range of psychiatric symptoms were assessed with the expanded version of the Brief Psychiatric Rating Scale (BPRS) (Lukoff, Nuechterlein, & Ventura, 1986). The BPRS includes 24 items, each rated on a 7-point Likert scale with high scores indicating more severe psychopathology. Four subscales were derived from the BPRS based on the factor analysis of Velligan et al. (2005), including depression/anxiety, retardation, psychosis, and activation. Negative symptoms were evaluated with the Scale for the Assessment of Negative Symptoms (SANS) (Andreasen, 1984), which includes 20 items, each rated on 5-point scales with higher scores indicating more severe symptoms. Three subscales were derived from the SANS based on the factor analysis of Sayers, Curran, and Mueser (1996), including diminished expression, inattention-alogia, and social amotivation. Because of the prominence of depression as a psychiatric problem in older age, depression was also assessed, using the Center for Epidemiologic Studies Depression Scale (CESD) (Radloff, 1977).

2.2.2. Cognitive functioning—Cognitive functions were assessed using several selected subtests taken from a collection of commonly used cognitive measures that were co-normed and published together as the Delis-Kaplan Executive Functioning System (DKEFS) (Delis, Kaplan, & Kramer, 2001). The DKEFS includes: standard measures of verbal fluency

(Letter Fluency, which is the FAS test, Category Fluency, Category Switching) (Reitan & Wolfson, 1993); Color-Word Interference, which is similar to a classically used measure of attention and mental flexibility, the Stroop Test (Stroop, 1935); an expanded version of the Trails Test (Reitan & Wolfson, 1993), an easily administered test of visual conceptual and visuomotor tracking (involving motor speed and attention functions); the California Verbal Learning Test-II (Delis, Kramer, Kaplan, & Ober, 2000), a widely used measure of verbal learning and memory; a card sorting task; a modified Tower of London task; a proverbs test; a word context test, which involves defining a made-up word based on its use in a series of sentences; and a "twenty questions" test. The subtests used in this study included: the fluency measures, Color-Word Interference, the California Verbal Learning Test-II, and the Trails tests.

In order to reduce the number of variables included in the statistical analyses of cognitive data, we performed a principal components factor analysis with varimax rotation on 20 variables derived from the DKEFS. Six factors had eigenvalues over 1.0, but a scree test and inspection of the factor loadings indicated that a four-factor solution best fit the data. The eigenvalues for the four factors were 5.973, 2.852, 1.744, and 1.274, which together explained 59.2% of the total variance. The four factors corresponded to the following dimensions of cognitive performance: memory, verbal fluency, psychomotor speed, and executive functions. Factor scores were formed by standardizing and summing the neuropsychological variable that loaded highest on each factor. The rotated component matrix for the factor analysis is presented in Table 2.

In addition, we formed a composite cognitive score by standardizing and summing seven specific test scores that span the broad range of cognitive functions, including attention (Color-Word Interference Inhibition), verbal fluency (Letter Fluency & Category Fluency), psychomotor speed (Trails 2), memory (CVLT Trials 1–5, CVLT Long Delay Free Recall), and executive functions (Color-Word Interference Inhibition/Switching, Trails 4).

2.2.3. Social skills—Social skills were assessed with the Social Skills Performance Assessment (SSPA), a role-play test designed for older people with severe mental illness (Patterson et al., 2001). Participants receive instructions about the role-play tasks and then read descriptions of scenarios to which they are to pretend to respond. The role-plays are audiotaped for scoring purposes. The first role-play is a one-minute practice scene that is not scored but serves to familiarize the participant with the task. In the next role-play (Scene 1), the participant is instructed to play the role of a tenant meeting a new neighbor (interviewer). Participants are scored on how well they are able to initiate a socially appropriate, extended conversation for three minutes. In the next role-play (Scene 2), the participant is instructed to play the role of a tenant who has a leak in his/her ceiling, and has previously notified the landlady of this problem. The interviewer plays the part of the landlady, who is reluctant to repair the leak in a timely manner. In this three-minute scene, participants are rated on their ability to negotiate a compromise and persist in their efforts to get the leak fixed. Participants are rated on anchored 5-point Likert scales not only on demonstration of the component skills, but also on performance of several linguistic and paralinguistic skills including interest/disinterest (level of motivation and engagement in the interaction); fluency (flow of the conversation); clarity (logical content and flow of speech); focus (ability to maintain role in the scene); affect (paralinguistics such as tone of voice, voice volume, inflection, body posture, and facial expression); and overall performance.

In a study comparing older people with schizophrenia or schizoaffective disorder and non-mentally ill older adults on performance on the SSPA, inter-rater reliability (*ICC* = .91), and one-week test-retest reliability (r = .92) were high (Patterson et al., 2001). In the schizophrenia group, lower total scores on the SSPA were correlated with longer duration of

illness, more severe negative symptoms, more cognitive impairment, worse well-being, and worse performance on a role-play test of independent living skills, providing evidence for the validity of the SSPA. Performance on the SSPA was not related to self-reported social functioning as measured by the SAS-M (Cooper, Osborn, Gath, & Feggetter, 1982).

Recently, the SSPA was expanded to include two new role-plays to assess skills for communicating with health care professionals (Pratt et al., 2007). Scene 3 evaluates skills for reporting physical symptoms (of back pain) to a doctor and asking for treatment options. Scene 4 evaluates skills for reporting side effects of medication (for hypertension) and negotiating medication issues. Ratings for Scenes 3 and 4 also include the same paralinguistic and linguistic skills as those assessed on the original SSPA. The participant is generally expected to take the lead in the role-plays. For example, in both Scenes 3 and 4, the "doctor" does not provide a prompt or state the specific reason for the visit (unless the participant is still unable to mention "back pain" or "the high blood pressure medicine" after the interviewer carefully re-reads the scene's description aloud). Psychometric properties of the expanded SSPA, including validity and reliability (inter-rater and test-retest) were demonstrated to be strong (Pratt et al., 2007).

2.2.4. Social contact—We administered the Social Network Questionnaire (Seeman & Berkman, 1988) along with selected items measuring frequency of contact with family members and friends from the Quality of Life Interview (Lehman, Kernan, & Postrado, 1995). We computed coefficient α in order to evaluate whether the social contact items were significantly inter-related. Coefficient α was .55 (N = 177), indicating that the items were moderately inter-correlated. Therefore, for the gender and diagnosis analyses we analyzed the individual social contact items, as well as an overall measure of social contact formed by averaging the four items. For the remaining analyses we used the composite measure of social contact.

2.3. Study procedures

All measures were administered by research assessors who completed a several month long training in the study instruments and demonstrated high inter-rater reliability prior to evaluating research participants. Inter-rater reliability for the symptom ratings (BPRS, SANS), were evaluated with live assessments that were co-rated by both research interviewers. Inter-rater reliability for the role-play tests was evaluated based on ratings of five audiotapes (Scenes 1–4) by six trained raters. Inter-rater reliability on the total score for Scenes 1–4 was excellent (*ICC* = 1.00). Inter-rater reliability for the total score on Scenes 1 and 2 of the SSPA (*ICC* = .99), and for the total score on Scenes 3 and 4 (*ICC* = .99) were also very high. Participants were paid for completing the assessments.

2.4. Statistical analyses

We first examined whether the demographic characteristics or the number of days spent in the hospital over the past year in the study sample differed as a function of gender or diagnosis by conducting analyses of variance (ANOVAs) for continuous variables and logistic regression analyses for binary variables. For these analyses, gender, diagnosis, and their interaction were independent variables and demographics or days in the hospital were the dependent variables. We next evaluated whether gender, diagnosis, or their interaction were related to symptoms (on the BPRS, SANS, and CESD), neurocognitive functioning (using the factors derived from the DKEFS), social skill performance (on the expanded SSPA), and social contact by performing ANOVAs, as described above.

Pearson correlations were then computed to explore the relationships between neurocognitive functioning factors and social skills. In order to evaluate whether these

associations differed as a function of gender or diagnosis, parallel analyses were also performed comparing the males and females, and comparing the four diagnostic groups (schizophrenia, schizoaffective disorder, bipolar disorder, major depression). Because much stronger associations were found between social skills and cognitive functioning in the persons with schizophrenia or schizoaffective disorder, we also performed a canonical correlation analysis in order to simultaneously examine the relationships between the two sets of variables and identify the minimum number of factors (variates) shared by both sets (Stevens, 1986).

Finally, we examined the prediction of social skill from gender, symptoms, social contact, and neurocognitive functioning by performing two hierarchical multiple regressions, one for the schizophrenia-schizoaffective disorder group and the other for the mood disorder group. For each regression, the dependent variable was overall social skill on the SSPA. Gender, age, the symptom measures (CESD, subscales on the BPRS and SANS), and overall social contact were entered stepwise in the first block of the equation, followed by stepwise entry of the composite cognitive score and the cognitive factors in the second block. This approach provided a test of whether neurocognitive functioning predicted social skill after controlling for gender, age, social contact, and symptoms. Because of the exploratory nature of these analyses, the *p* level for a variable to enter the regression equation was set at .1.

3. Results

3.1. Demographic and background characteristics

The analyses examining the relationships between diagnosis, gender, and demographic characteristics revealed three significant differences. The ANOVA on age was significant, $F(3175) = 4.076$, $p = .008$. The Tukey HSD test indicated that people with schizoaffective disorder were significantly younger (mean = 56.89 years) than those with major depression (mean = 61.77) or bipolar disorder (mean = 62.07), whereas persons with schizophrenia (mean = 60.77) did not differ from any other diagnostic group. The logistic regression predicting ever vs. never married was also significant for both diagnosis, Wald ($df = 3$) = 20.235, $p = .000$, and gender, Wald ($df = 1$) = 6.662, $p = .01$. Women (76.4%) were more likely to have been married than men (48.1%), and people with schizophrenia or schizoaffective disorder were less likely to have been married (43.1% and 51.9%, respectively) than those with bipolar disorder (86.1%) or major depression (86.4%). Also, the logistic regression predicting living situation was significant for diagnosis Wald ($df = 3$) = 12.300, $p = .006$, and gender, Wald ($df = 1$) = 8.618, $p = .02$, and followed the same pattern as marital status, with women (64.2%) more likely to be living independently than men (33.8%), and people with schizophrenia or schizoaffective disorder less likely to be living independently (27.5% and 50%, respectively) than those with bipolar disorder (63.9%) or major depression (70.5%). None of the other analyses indicated any differences in demographic characteristics between diagnostic groups or men and women.

There were two significant differences in clinical history. The ANOVA on the number of times hospitalized over the past year was significant for diagnosis, $F(3170)= 2.998$, $p =.008$. The Tukey HSD test indicated that people with schizophrenia had significantly fewer hospitalizations (mean= .12) than those with schizoaffective disorder (mean = .67), with neither of the groups differing significantly from people with major depression (mean=.35) or bipolar disorder (mean= .68). The gender effect for the ANOVA on number of drinks per day was significant, $F(1173)= 8.978$, $p =.006$, with men drinking more (mean=.66 drinks) than women (mean= .17 drinks).

3.2. Symptomatology

The means for the overall scores and the subscales of the SANS, BPRS, and CESD for the gender and diagnostic subgroups are provided in Table 3. None of the ANOVAs on the SANS indicated significant diagnosis or gender effects, or diagnosis by gender interactions. The ANOVAs on the BPRS and CESD indicated several significant diagnosis effects, but no gender or gender by diagnosis effects.

For the BPRS, the effect for diagnosis was significant for two subscales: activation, F (3175)=2.906, p= .036, and psychosis, F (3175)=7.332, p=.000. Tukey HSD tests indicated that people with schizophrenia and schizoaffective disorder had significantly more activation than those with major depression, with bipolar disorder not significantly different from any group. For psychosis, the Tukey HSD test indicated that people with schizophrenia or schizoaffective disorder had significantly more severe symptoms than those with bipolar disorder or major depression. There was also a significant effect for gender on the activation subscale, F (1175)=3.999, p=.047, with men having higher levels than women. There were no gender effects on the other BPRS subscales, nor any gender by diagnostic group interactions.

For the CESD, the diagnosis effect was significant, F (3173)=7.170, p =.000. The Tukey HSD test indicated that the schizophrenia group had significantly less severe depression than the other three diagnostic groups, which did not differ from each other. The gender effect and gender by diagnosis interaction were not significant.

3.3. Social skill and social contact

The means for the SSPA ratings of social skill and the Social Network Questionnaire for the gender and diagnostic subgroups are provided in Table 4. The ANOVAs on the SSPA indicated several significant diagnosis effects for interest, F (3152) =5.609, p =.001, fluency, F (3152) =4.534, p =.004, and overall social skill, F (3152) = 5.609, p = .001. For both interest and fluency, Tukey HSD tests indicated that people with schizophrenia performed significantly worse than people with major depression or bipolar disorder, whereas people with schizoaffective disorder fell in between and did not differ significantly from the other diagnostic groups. For overall social skills, the Tukey HSD test indicated that people with schizophrenia did not differ from those with schizoaffective disorder, but had significantly worse social skills than those with either bipolar disorder or major depression. In addition, people with schizoaffective disorder had worse social skills than those with depression, but did not differ from people with bipolar disorder.

There were also significant effects on the SSPA for gender on fluency, F (1152)= 7.103, p = .009 and overall social skill, F (1152) = 3.993, p =.047. For both measures, women had better social skills than men. Finally, there was a significant gender by diagnosis interaction for affect on the SSPA, F (3168) = 4.239, p= .007. Men with schizophrenia (mean= 2.75) or major depression (mean=2.78) tended to have the worst affect ratings whereas men with bipolar disorder (mean= 3.62) and women with major depression (mean= 3.60) had the highest. There were no diagnosis, gender, or interaction effects for SSPA ratings of clarity, focus, or appropriateness.

For the Social Network Questionnaire, there were significant gender effects indicating that women had talked more than men on the phone over the past two weeks with family members, F (1173) = 7.877, p = .006, and friends, F (1172) =4.131, p= .044, but there were no gender differences in the number of in-person contacts they had with either family or friends, nor on the overall social contact composite measure. No diagnosis effects or diagnosis by gender interactions were significant on the Social Network Questionnaire.

3.4. Neurocognitive functioning

The means for the neurocognitive factors and the composite cognitive measure for the gender and diagnostic subgroups are provided in Table 5. The ANOVAs examining diagnostic and gender differences on the neurocognitive measures indicated effects for the memory factor and the composite cognitive measure, but not the verbal fluency, psychomotor speed, or executive functioning factors. For memory and the composite measure there was a significant diagnosis effect, F (3175)= 3.484, p = .017 and F (3175) =4.498, p =.005 (respectively), and a diagnosis by gender interaction, F (3175) = 5.787, p =. 001 and F (3175) = 4.480, p = .005 (respectively). A similar pattern for both measures was apparent for gender: women with major depression and men with bipolar disorder had the best cognitive functioning, whereas women with schizophrenia and men with schizoaffective disorder had the worst cognitive functioning (see Table 5).

3.5. Social skill and neurocognitive functioning

A comparison of the correlations between the neurocognitive and social skill measures for the males and females indicated a similar pattern. However, comparison of the correlations between the different diagnostic groups indicated a very different pattern. Cognitive functioning was similarly and significantly correlated with most dimensions of social skill in people with schizophrenia and schizoaffective disorder, with 25 out of 35 correlations significant. In contrast, only 7 correlations were significant in the major depression group, and only one correlation was significant in the bipolar disorder group. These correlations are depicted in Table 6.

The canonical correlation analysis of the relationship between social skills (the six component skill ratings on the SSPA) and neurocognitive functioning (the four cognitive factor scores) in the schizophrenia-schizoaffective disorder group indicated one significant canonical correlation of .588, χ^2= 86.404, df=24, p= .000, explaining 35% of the variance shared across the two sets of variables. Table 7 provides the correlations between the social skill and neurocognitive variables with the first canonical root. Social skill ratings for interest, fluency, clarity, and focus were most strongly correlated with the canonical root, while executive functions and verbal fluency were the neurocognitive variables most strongly correlated with it.

3.6. Prediction of social skills from symptoms and neurocognitive functioning

The hierarchical multiple regression predicting overall social skills from symptoms, social contact, and neuropsychological functioning was significant for the schizophrenia-schizoaffective disorder group. In the first block, age, t= 2.023, β =−.020, p = .046, social contact, t= 3.888, β = .009, p= .000, and diminished expression on the SANS, t=−2.873, β = −.265, p = .005, entered the equation, but not gender, accounting for 40% of the variance in social skill. In the second block, executive functioning, t= 3.633, β = .370, p = .000 and verbal fluency, t= 2.048, β =.187, p = .044, both entered the equation and accounted for an additional 15% of the variance in social skills. The total model was highly significant, F (5,83) =19.946, p =.000, R =.739, R^2 = .546.

The multiple regression for the mood disorder group was also significant. In the first block, three variables entered the equation, including gender, t= 4.203, β =.808, p =.000, age, t =2.524, β=−.027, p =0.15, and diminished expression, t= 1.788, β =−.211, p = .079, accounting for 31% of the variance. None of the cognitive variables entered the equation in the second block. The total model was highly significant, F (3,55) =8.084, p= .000, R= .553, R^2= .306. Exploratory analyses using the same approach to predicting social skills separately in participants with bipolar disorder and major depression did not result in stronger models.

4. Discussion

Older people with schizophrenia disorder had worse fluency, interest, and overall social skills on the role-play test (SSPA) than those with a mood disorder, with people with schizoaffective disorder falling in between. These findings are generally consistent with other studies that have demonstrated impaired social skills in younger people with schizophrenia compared to mood disorders or non-psychiatric controls (Bellack, Morrison, Wixted et al., 1990; Bellack et al., 1994). The findings also extend those of Sitzer et al. (2008), who showed that older persons with schizophrenia had worse social skills performance on the SSPA than non-psychiatric controls.

Social skills were also related to gender, with women demonstrating better overall social skills and fluency than men. In the general population, women tend to have stronger verbal ability than men (Kramer, Delis, & Daniel, 1988; Maccoby & Jacklin, 1974). However, in the multiple regressions predicting social skills within each of the two broad diagnostic groups studied here, this advantage for women was observed only in people with a mood disorder and not in those with schizophrenia or schizoaffective disorder. Similarly, Sitzer et al. (2008) failed to find gender differences in social skills in their older sample of more severely impaired people with schizophrenia. Women with schizophrenia tend to have a later age of illness onset and a more benign course of illness (Angermeyer, Kuhn, & Goldstein, 1990; Häfner, Maurer, Löffler, & Riecher-Rössler, 1993), including better social skills (Mueser et al., 1990). It has been hypothesized that the antipsychotic effects of estrogen confer protection against the development of schizophrenia in women, which is consistent with the loss of these gender differences following menopause (Haäfner & an der Heiden, 2003). This study suggests that some of the advantages women with schizophrenia have in social competence may be lost as they age, possibly as a function of reduced estrogen production. We return to the potential role of estrogen and social behavior later when discussing the interactions between neurocognitive functioning, gender, and diagnosis.

Social skill and neurocognitive functioning were strongly associated with each other in the schizophrenia-schizoaffective disorder group, with appropriateness the only dimension of social skill that was not related to any of the cognitive measures (Table 6). These findings are consistent with prior research on the neurocognitive correlates of social skills in younger samples (Addington & Addington, 1999,2000;Addington et al., 1998;Bellack et al., 1994;Bowen et al., 1994;Corrigan & Toomey, 1995;Dickinson et al., 2007;Hatashita-Wong et al., 2002;Kern, Green, & Satz, 1992;Mueser et al., 1991;Penn et al., 1995;Zanello et al., 2006). The canonical correlation analysis examining the associations between the social skills and neurocognitive measures in the schizophrenia-schizoaffective disorder sample indicated that one significant canonical variate was shared across the two sets of measures. The specific social skills that loaded most heavily on this root were interest, fluency, clarity, and focus, whereas among the cognitive measures executive functions and verbal fluency loaded most heavily. Executive functions have been shown to be related to social skills in younger samples of people with schizophrenia (Hatashita-Wong et al., 2002;Zanello et al., 2006). More recently, Sitzer et al. (2008) found that conceptualization on the Dementia Rating Scale in their older sample of people with schizophrenia was strongly related to social skills performance.

Executive functions are strongly implicated in the pragmatics of speech, or the ability to comprehend and communicate intention based on a set of socially accepted rules (Covington et al., 2005; Grice, 1975). People with schizophrenia are especially prone to pragmatic errors in their communication with others (Langdon, Coltheart, Ward, & Catts, 2002; Linscott, 2005; Marini et al., 2008). Everyday conversation requires the accurate perception of contextual information in the social situation, such as emotion perception and “theory of

mind" skills regarding the other person's intentions, and the ability to organize and plan one's own messages. These areas, which recruit brain activity in the prefrontal cortex, are substantially impaired in schizophrenia (Frith, 2004; Penn et al., 1997; Wölwer & Gaebel, 2002) and may account for pragmatic deficits in communication ability in the disorder (Champagne-Lavau et al., 2006). In addition to these cooperative aspects of conversation ability, the role-play situations used to assess social skills in the SSPA also require problem solving skills (e.g., getting a landlord to fix a leak, negotiating medications with a doctor), the hallmark of executive functions that are impaired in schizophrenia (Bellack et al., 1994) and are associated with reduced activation of the dorsolateral prefrontal cortex in people with the disease (Weinberger, Berman, & Zec, 1986).

Verbal fluency, which involves the ability to search semantic memory, select words, and speak them in a timely and understandable fashion, was also strongly related to social skills among the older people in this sample with schizophrenia or schizoaffective disorder, as indicated by the correlations in Table 6, the canonical correlation analysis (Table 7), and the multiple regression predicting overall social skill. Covington et al. (2005) note that difficulties in lexical access and retrieval are common in schizophrenia, as reflected by problems such as word approximation, inefficient retrieval of words, neologisms, and stilted speech. Previous research has shown that verbal fluency is strongly associated with social skills in younger samples of people with schizophrenia (Yamashita et al., 2005), and the present findings suggest similar associations among older individuals.

The importance of verbal fluency to social skill in this study is also consistent with those reported by McClure et al. (2007), who evaluated the relationship between neurocognitive functioning, functional capacity measured on the UCSD Performance Based Skills Assessment (Patterson et al., 2001), and social competence (or social skills) measured on the SSPA in people with schizophrenia older than age 50. Their canonical correlation analysis found two canonical roots: social skills were most strongly related to verbal fluency and memory, while functional capacity was most strongly related to processing speed, executive functions, and episodic memory, although most of the cognitive measures loaded on both roots. It should be noted that the verbal fluency factor used in the present study's analyses likely also reflect aspects of executive functioning, since both letter and category fluency loaded on this factor.

Verbal fluency was also moderately related to social skill among the people with major depression, but not among those with bipolar disorder. Problems with verbal retrieval are a common consequence of aging, which may in part reflect age-related diminution in the effort required for verbal fluency tasks (Lezak, 2004). People with bipolar disorder may be less likely to experience declines in effort related to verbal tasks, including social skills performance, than those with schizophrenia, schizoaffective disorder, or major depression given the problems with amotivation and effort that characterize these disorders. Alternatively, difficulty retrieving words in conversations can be embarrassing for older people (Critchley, 1984), and people with bipolar disorder may respond differently than individuals with the other disorders to this and other effects of age-related declines in verbal fluency on their social interactions. Compared to people with schizophrenia, schizoaffective disorder, or major depression, people with bipolar disorder may be less adversely affected in areas such as social self-efficacy, social drive, and motivation by the normal effects of aging on verbal fluency, resulting in less impairment in social skill.

Memory was also correlated with overall social skill, clarity, and focus in the schizophrenia-schizoaffective disorder group, but not with interest, fluency, or affect, in contrast to executive functions and verbal fluency, which were correlated with all six measures of skill (Table 6). Similarly, in contrast to executive functions and verbal fluency, memory was not

uniquely predictive of overall social skills in the multiple regression analysis for the schizophrenia-schizoaffective disorder group. Previous research has shown that poor social skills are associated with impaired memory in both younger (Bowen et al., 1994;Mueser et al., 1991) and older (McClure et al., 2007;Sitzer et al., 2008) people with schizophrenia or schizoaffective disorder.

It is interesting that despite the greater importance of executive functions and verbal fluency than memory to social skill performance in the schizophrenia-schizoaffective disorder group, social skills and memory were related to diagnosis and gender, whereas executive functions, verbal fluency, and psychomotor speed were not. It is possible that in the presence of both age- and illness-related memory impairments in schizophrenia, social skills may be more strongly determined by compensatory cognitive skills in the areas of executive functions and verbal fluency. Thus, those individuals with better social-cognition skills, planning ability, and lexical access may be more able to compensate for the effects of impaired memory in their social interactions.

However, the pattern of the associations between gender and social skill was somewhat different from those between gender and memory. While women and people with a mood disorder had better social skills, as previously reported in samples of younger people, there was a complex interaction between diagnosis and gender for memory. Specifically, women with schizophrenia were especially impaired in memory, while women with major depression had the best memory, and women with schizoaffective disorder and bipolar disorder had intermediate performance. Men with bipolar disorder had the best memory, whereas men with other disorders were relatively similar. To our knowledge, these interactions between diagnosis and gender have not been previously reported in younger samples. The difference in memory performance among the females between diagnoses raises the intriguing question of whether depression may confer some advantage in terms of reduced estrogen following menopause. Estrogen is strongly related to verbal memory (Luine, 2008; Sherwin & Henry, 2008), with reductions in estrogen due to menopause or surgery associated with reductions in verbal memory (Henderson, 2008; Rocca et al., 2007; Sherwin, 2007). If higher levels of depression were associated with relatively less reduction in estrogen following menopause, one might expect the corresponding impact on memory to follow the observed pattern, with women who have schizophrenia most affected and those with major depression least affected.

We explored the possibility that poor memory in the men with depression was related to cognitive impairment due to heavy drinking. Although our study was limited by lack of data on lifetime substance abuse, measures of recent drinking did indicate higher levels of drinking in the men with major depression, but the difference was not statistically significantly.

In addition to executive functions and verbal fluency, higher social contact was uniquely predictive of social skill in the multiple regression for the schizophrenia-schizoaffective disorder group. The relationship between social skill and social contact is in the opposite direction to that reported by Sitzer et al. (2008), who interpreted their findings as reflecting the fact that many of their participants were severely impaired and living in group homes, which increased their social contact and led to the spurious correlation. Approximately one-half of this sample was living independently, and the observed association was in the expected direction, although the nature of the relationship is unclear. People who had more social contact may have had more opportunities to improve or maintain their social skills. On the other hand, more socially skilled individuals may have been more likely to seek and have social contact with others, or a combination of the two may account for the association. These appear to be the most plausible explanations. Longitudinal research that examines the

associations between social skill and social contact over time is necessary to address this question.

Blunted affect was also uniquely predictive of social skills in the multiple regressions for both the schizophrenia-schizoaffective disorder and the mood disorder groups. Social skills have been shown to be related to blunted affect in previous studies of younger (Bellack, Morrison, Wixted et al., 1990) and older people (Sitzer et al., 2008) with schizophrenia, but this has not been reported for people with mood disorders. The present findings that people with schizophrenia or schizoaffective disorder had comparable levels of blunted affect and other negative symptoms to people with mood disorders differs from most research on younger samples that has shown greater severity of negative symptoms in schizophrenia (Bellack, Morrison, Wixted et al., 1990). Further research is needed to better understand the significant levels of negative symptoms in older persons with mood disorders. There is a clear overlap in the clinical rating of diminished expression on the SANS and social skills (e.g., ratings of affect and fluency), which could account for its relationship to social skill.

Social, clinical, and cognitive measures were much more predictive of social skills in the schizophrenia-schizoaffective disorder group than the mood disorder group, despite adequate range and variance in all measures across both groups. Among people with schizophrenia or schizoaffective disorder, these measures and demographic characteristics accounted for 55 percent of the variance in overall social skill, compared to only 31 percent of the variance in the mood disorder group. Furthermore, neither social contact nor cognitive functioning were uniquely predictive of social skill in the mood disorder group, but they were strong predictors in the schizophrenia-schizoaffective disorder group. This difference suggests that impairments in social skill may be more closely related to the disease of schizophrenia, including its social, clinical, and neurocognitive aspects. Such an interpretation is consistent with the earliest descriptions of schizophrenia dating back to Kraepelin (1919/1971) and Bleuler (1911/1950), who emphasized social aspects of the disease such as reduced social drive, inability or unwillingness to follow social conventions, and communication problems in accurately receiving, interpreting, and sending messages. Considering the importance of verbal understanding and communication to social skills, these findings also appear consistent with Crow's (2008) theory that the origins of psychosis can be traced to the unique faculty for language that characterizes humans.

The determinants of impaired social skills in people with mood disorders, on the other hand, may be more heterogeneous and less directly the result of their psychiatric disorder, and therefore less predictable. One potential source of heterogeneity in this group is depression secondary to mild cognitive impairment. Research on the comorbidity of dementia and depression, which often present clinically around the same time, indicates that depression typically develops in the early stages of cognitive decline (Chen, Ganguli, Mulsant, & DeKosky, 1999). The presence of some individuals in the mood disorder group with depression secondary to cognitive decline, could contribute to heterogeneity in the determinants of social skill and community functioning.

In summary, compared to older people with mood disorders, people with schizophrenia demonstrated marked impairments in specific social skills such as fluency and interest, as well as in overall social skill, similar to those reported in many studies of younger people. Cognitive functioning, but not psychotic symptoms, was most predictive of social skills in the schizophrenia-schizoaffective disorder group, similar to studies of language impairment (Linscott, 2005; Rodriguez-Ferrera, McCarthy, & McKenna, 2001). Among these individuals, executive functioning was the most potent predictor of social skills, followed by verbal fluency, underscoring the importance of frontal lobe pathology to schizophrenia, and to the social dysfunction that characterizes the disorder. Although neither cognitive

functioning nor depression predicted social skills in the mood disorder group, age was a significant predictor of skills in both this group and the group with schizophrenia or schizoaffective disorder. This suggests that social skills training programs adapted to the unique needs of older persons with severe mental illness (Granholm et al., 2005; Pratt, Bartels et al., 2008) may be especially critical to bolstering or preventing age-related deterioration of social skills, and the associated loss of social functioning. Cognitive remediation may facilitate the ability of older people with schizophrenia to benefit from skills training, given evidence that such remediation has been found to improve functional outcomes in younger people only when it is provided in conjunction with a psychosocial rehabilitation program (McGurk, Twamley, Sitzer, McHugo, & Mueser, 2007).

The findings reported here for a group of older individuals contributes to the existing knowledge base on language and communication in schizophrenia particularly as regards social communication skills. The similarity of the pattern of associations between cognitive functioning and social skills found here and in samples of younger people with schizophrenia, coupled with the coming expansion of the aged population, suggest the need to adapt and make widely available psychosocial rehabilitative models for older people with schizophrenia.

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Table 1

Characteristics of study sample.

	Diagnosis			
	Schizophrenia N (%)	**Schizoaffective N (%)**	**Bipolar N (%)**	**Major depression N (%)**
Gender				
Male	32 (62.7)	24 (46.2)	10 (27.8)	11 (25.0)
Female	19 (37.3)	28 (53.8)	26 (72.2)	33 (75.0)
Race/Ethnicity: non-latino Caucasian				
Male	26 (81.3)	19 (79.2)	8 (80.0)	11 (100.0)
Female	17 (89.5)	23 (82.1)	24 (92.3)	29 (87.9)
Marital status: never married				
Male	23 (71.9)	11 (45.8)	4 (40.0)	2 (18.2)
Female	6 (31.6)	14 (50.0)	1 (3.8)	4 (12.1)
Education: high school graduate				
Male	25 (78.1)	18 (75.0)	7 (70.0)	6 (54.5)
Female	13 (68.4)	23 (82.1)	19 (73.1)	23 (69.7)
Residential: independent				
Male	8 (25.0)	8 (33.3)	5 (50.0)	5 (45.5)
Female	6 (31.6)	18 (64.3)	18 (69.2)	26 (78.8)
	Mean (SD)	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**
Age				
Male	59.64 (7.30)	56.01 (5.30)	58.38 (5.43)	58.38 (5.43)
Female	62.67 (8.82)	57.65 (6.33)	63.49 (7.79)	61.71 (9.45)
Days in hospital past year				
Male	0.16 (.45)	0.58 (1.06)	0.8 (1.87)	.60 (.70)
Female	0.06 (.24)	0.75 (1.65)	0.63 (.92)	.27 (.80)
Duration of illness (years since first hospitalization)				
Male	29.65 (10.03)	27.50 (10.49)	24.48 (15.46)	24.06 (13.53)
Female	30.11 (11.87)	29.20 (12.41)	32.31 (10.70)	22.39 (16.92)
Number of drinks/day past 3 months				
Male	.41 (1.3)	.43 (1.3)	.40 (1.3)	1.4 (2.50)
Female	.11 (.46)	.07 (.38)	.19 (.49)	.30 (.81)

Table 2

Rotated component matrix for factor analysis of selected DKEFS subscales.[a]

DKEFS Subscales	Factor 1	Factor 2	Factor 3	Factor 4
	Memory	Psychomotor speed	Executive functions	Verbal fluency
Color-Word Interference Test				
Color Naming	.005	.032	.079	**.418**
Word Reading	−.133	.205	−.147	**.459**
Inhibition	.341	**.475**	.167	.425
Inhibition/Switching	−.036	−.092	.023	**.573**
Trail Making Test				
Visual Scanning	−.015	.725	.091	.069
Number Sequencing	.127	**.837**	.106	−.071
Letter Sequencing	.181	**.828**	.126	.054
Number-Letter Switching	.149	**.512**	.278	.429
Motor Speed	−.048	**.701**	.071	.098
Verbal Fluency Test				
Switching Accuracy	.109	.117	**.878**	.051
Letter Fluency	.125	.184	.425	.610
Category Fluency	.208	.248	.663	.292
Total Switching	.11	.107	**.895**	.081
California Verbal Learning Test-II				
Trials 1–5	**.84**	.19	.317	−.096
d[1]	**.795**	.085	.141	−.052
Semantic Clustering	**.512**	−.105	−.219	−.037
Long Delay Free Recall	**.873**	.031	.094	.062
Short Delay Free Recall	**.837**	.005	.124	.146
Trial 1	**.481**	.153	.434	−.262
Trial 5	**.773**	.237	.195	.017
Eigenvalve	5.973	2.852	1.744	1.274
% Variance	2.9865	14.258	8.719	6.369

[a]The strongest factor leading for each subscale is in bold.

Table 3

Symptom measures by gender and psychiatric diagnosis.[a]

		Diagnosis								
		Schizophrenia		Schizoaffective		Bipolar		Major Depression		Significant Difference
		N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	
Brief Psychiatric Rating Scale										
Depression/Anxiety:	Male	32	2.55 (.99)	24	2.65 (1.16)	10	2.77 (.97)	11	2.66 (.84)	
	Female	19	2.42 (.87)	28	2.96 (1.08)	26	2.62 (1.11)	33	2.96 (.93)	
Retardation:	Male	32	2.70 (.61)	24	2.39 (.70)	10	2.20 (.40)	11	2.55 (.69)	
	Female	19	2.38 (.52)	28	2.20 (.65)	26	2.33 (.65)	33	2.18 (.57)	
Psychosis:	Male	32	2.86 (1.21)	24	2.53 (1.04)	10	1.73 (.47)	11	1.88 (.76)	SZ =SA> BP =MD
	Female	19	2.14 (1.15)	28	2.35 (1.12)	26	1.65 (.68)	33	1.73 (.58)	
Activation:	Male	32	2.16 (.74)	24	2.08 (.77)	10	1.57 (.28)	11	1.79 (.60)	SZ =SA>MD
	Female	19	1.63 (.46)	28	1.90 (.62)	26	1.73 (.68)	33	1.54 (.44)	
Scale for the Assessment of Negative Symptoms										
Diminished expression:	Male	32	2.33 (.91)	23	2.25 (.72)	10	2.12 (.52)	10	2.48 (.67)	
	Female	19	2.33 (.77)	28	2.15 (.71)	22	2.14 (.67)	31	1.98 (.80)	
Inattention Alogia:	Male	32	1.65 (.55)	23	1.70 (.67)	10	1.47 (32)	11	1.48 (.31)	
	Female	19	1.53 (.37)	28	1.74 (.67)	23	1.68 (.65)	31	1.51 (.52)	
Social amotivation:	Male	32	3.13 (.68)	23	3.00 (.76)	10	2.50 (.45)	11	3.01 (.62)	
	Female	19	2.94 (.66)	28	2.84 (.79)	25	2.93 (.68)	33	3.02 (.68)	
CESD Total:	Male	32	17.09 (9.86)	23	23.96 (11.62)	10	22.40 (11.58)	11	26.18 (13.64)	MD= BP= SA> SZ
	Female	18	13.72 (9.89)	28	22.18 (12.60)	26	22.27 (13.80)	33	29.76 (13.91)	

[a]SZ = Schizophrenia, SA = Schizoaffective Disorder, BP = Bipolar Disorder, MD = Major Depression.

Table 4

Social Skill and Social Contact by Gender and Psychiatric Diagnosis.[a]

		Diagnosis								
		Schizophrenia		Schizoaffective		Bipolar		Major Depression		Significant difference
		N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	
Social Skills Performance Assessment										
Interest	Male	30	3.46 (1.17)	21	3.64 (1.18)	9	4.39 (.72)	8	3.94 (.95)	BP=MD>SZ
	Female	15	3.32 (1.07)	27	3.93 (.77)	20	4.10 (.63)	30	4.34 (.71)	
Fluency	Male	30	3.17 (1.18)	21	3.83 (.95)	9	4.00 (.77)	8	4.09 (.79)	BP=MD>SZ, F>M
	Female	15	3.95 (1.05)	27	3.91 (1.14)	20	4.51 (.40)	30	4.44 (.43)	
Clarity	Male	32	4.25 (.89)	21	4.57 (.47)	9	4.47 (.54)	8	4.28 (.99)	
	Female	15	4.22 (.99)	27	4.31 (.83)	20	4.70 (.43)	30	4.74 (.44)	
Focus	Male	30	3.93 (1.08)	21	3.93 (.87)	9	4.50 (.64)	8	4.09 (.91)	
	Female	15	3.65 (.88)	27	3.97 (.94)	20	4.28 (.56)	30	4.14 (.80)	
Affect	Male	32	2.75 (.85)	24	3.00 (1.00)	10	3.63 (.68)	9	2.78 (.62)	BP=MD>SZ, MD> SA, F >M
	Female	19	3.03 (.89)	28	2.97 (1.12)	31	3.05 (.96)	23	3.60 (.99)	
Appropriateness	Male	30	4.52 (.82)	21	4.58 (.39)	9	4.19 (.83)	8	4.31 (.80)	
	Female	15	4.48 (.66)	27	4.56 (.74)	20	4.70 (.43)	30	4.67 (.48)	
Overall	Male	30	2.70 (.94)	21	2.92 (.87)	9	3.14 (.66)	8	2.81 (.61)	
	Female	15	2.62 (.85)	27	2.98 (.87)	20	3.40 (.75)	30	3.72 (.64)	
Social Network Questionnaire										
Contact with friends past 2 weeks	Male	32	6.09 (9.56)	24	4.79 (8.96)	10	11.60 (11.20)	11	8.91 (10.82)	
	Female	18	5.00 (9.71)	27	10.78 (12.22)	26	7.15 (10.15)	32	8.78 (11.18)	
Contact with family past 2 weeks	Male	32	4.81 (9.20)	23	8.61 (12.42)	9	10.33 (14.76)	11	9.55 (13.30)	
	Female	19	7.89 (12.04)	27	9.81 (12.12)	26	6.54 (10.57)	33	13.00 (13.54)	
Phone contact with friends	Male	32	4.25 (9.01)	24	4.83 (9.90)	9	8.33 (10.58)	11	2.55 (4.50)	F > M
	Female	19	4.95 (7.92)	27	11.37 (13.77)	26	11.35 (24.58)	32	10.34 (11.63)	
Phone contact with family	Male	32	5.03 (8.82)	24	5.04 (9.33)	9	6.00 (8.12)	11	11.00 (11.82)	F > M
	Female	19	8.68 (10.47)	27	14.00 (13.04)	26	9.73 (11.22)	33	15.00 (12.61)	
Overall:	Male	32	20.19 (21.35)	23	23.65 (33.73)	8	40.38 (21.41)	11	32.00 (17.61)	
	Female	18	27.28 (18.34)	27	45.96 (36.27)	26	34.77 (41.00)	32	47.06 (29.23)	

[a]. SZ = Schizophrenia, SA = Schizoaffective Disorder, BP = Bipolar Disorder, MD = Major Depression, F = Female, M = Male.

Table 5

Neurocognitive functioning by gender and psychiatric diagnosis.[a,b]

		Diagnosis								
		Schizophrenia		Schizoaffective		Bipolar		Major Depression		
Neurocognitive measures		**N**	**Mean (SD)**	**N**	**Mean (SD)**	**N**	**Mean (SD)**	**N**	**Mean (SD)**	**Significant Differences**
Memory	Male	32	.07 (.70)	24	−.20 (.64)	10	.43 (.56)	11	−.08 (.59)	M–BP =F–MD>M–SA=F–SZ
	Female	19	−.59 (.76)	28	−.03 (.91)	26	−.10 (.70)	33	.39 (.69)	
Verbal fluency	Male	32	−.20 (.82)	24	−.18 (.84)	10	.05 (.63)	11	−.10 (1.13)	
	Female	19	−.35 (.64)	28	.02 (.93)	26	.13 (.94)	33	.43 (.87)	
Psychomotor speed	Male	32	.02 (.38)	24	.02 (.43)	10	.05 (.44)	11	−.40 (1.11)	
	Female	19	−.17 (.55)	28	.11 (.42)	26	−.02 (.67)	33	.04 (.79)	
Executive functioning	Male	32	−.13 (.77)	24	−.04 (.79)	10	.22 (.63)	11	.01 (.75)	
	Female	19	−.39 (.82)	28	−.05 (.74)	25	.08 (.61)	33	.22 (.80)	
Overall cognitive functioning	Male	32	−.39 (.48)	24	−.43 (.56)	10	−.12 (.35)	11	−.47 (.61)	M–BP =F–MD>M–SA=F–SZ
	Female	19	−.71 (.49)	28	−.31 (.61)	26	−.32 (.62)	33	−.04 (.56)	

[a]. SZ = Schizophrenia, SA = Schizoaffective Disorder, BP = Bipolar Disorder, MD = Major Depression, F = Female, M = Male.

[b]Factor scores based on 4-factor solution factor analysis of DKEFS.

Table 6

Correlations between neurocognitive functioning and social skill by diagnostic group.

	Neurocognitive measures				
Schizophrenia or Schizoaffective disorder (N = 103)	**Composite cognitive functioning**	**Memory**	**Psychomotor speed**	**Executive function**	**Verbal fluency**
SSPA					
Overall social skill:	.48**	.27**	.28**	.60**	.48**
Interest	.36**	.17	.35**	.47**	.37**
Fluency	.31**	.13	.28**	.44**	.40**
Clarity	.30**	.28**	.15	.34**	.42**
Focus	.40**	.40**	.28**	.38**	.34**
Affect	.31**	.18	.27**	.32**	.30**
Appropriateness	.07	.14	−.13	.04	.13
Major depression (N = 40)					
SSPA					
Overall social skill	.45**	.26	.23	.30	.43**
Interest	.45**	.16	.21	.34*	.36*
Fluency	.41*	.25	.16	.27	.26
Clarity	.23	.19	.15	.12	.31
Focus	.25	.11	−.04	.28	.32*
Affect	.17	.15	−.02	.17	−.08
Appropriateness	−.15	−.10	−.22	−.13	−.15
Bipolar Disorder (N = 33)					
SSPA					
Overall social skill	−.09	.07	−.37	−.12	.13
Interest	.04	.15	−.29	−.02	.03
Fluency	−.15	−.18	−.14	−.14	−.02
Focus	−.08	.16	−.50**	−.19	−.16
Affect	−.04	.14	−.17	−.16	−.03

Schizophrenia or Schizoaffective disorder (N = 103)					
	Neurocognitive measures				
	Composite cognitive functioning	Memory	Psychomotor speed	Executive function	Verbal fluency
Appropriateness	−.01	−.06	−.09	.02	.10

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

Table 7

Canonical variate-variable correlations for social skills and neurocognitive measures.[a]

	First Canonical Variate		
	Social Skill	**Neurocognitive**	
Affect	−.406	**−.867**	**Executive Functions**
Appropriateness	−.130	**−.828**	**Verbal Fluency**
Clarity	**−.703**	−.376	Psychomotor Speed
Fluency	**−.800**	−.472	Memory
Focus	**−.636**		
Interest	**−.816**		

[a] Variables with correlations over .5 are in bold.