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Subjective Reasons for Adherence to Psychotropic Medication and Associated Factors among Older Adults with Schizophrenia

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Abstract

Rationale—There are limited data examining subjective influences on medication adherence among older persons with schizophrenia. The subjective reasons for adherence to antipsychotic medication and associated clinical and psychosocial factors in this population are examined.

Methods—The sample consisted of 198 community dwelling persons aged ≥55 who developed schizophrenia before age 45. Using the Rating of Medication Influences Scale (ROMI), a principal component factor analysis with varimax rotation yielded three subscales: Medication Affinity and Prevention, Influence of Others, and Impact of Authority. These subscales were dichotomized into high and low based on a median split. We also created an ordinal High Adherence measure based on the summed scores of each person's three dichotomized ROMI subscales. A modified health belief model was used to examine the association between 18 predictor variables and the ROMI subscales and the adherence scale.

Results—The mean subscale rankings were Medication Affinity and Prevention> Impact of Authority> Influence of Others. In logistic regression, lower education, more side-effects, higher depression scores, and more mental health services were associated with higher scores on Influence of Others subscale. More side-effects and more entitlements were associated with higher scores on the Medication Affinity and Prevention subscale. The Impact of Authority subscale had no significant associations. More side effects and higher depression scores were associated with higher scores on High Adherence measure.

Conclusion—We identified a three-dimensional model for explaining the subjective reasons for medication adherence in older persons with schizophrenia. Our findings suggest that cognitive approaches and use of authority figures may be useful for promoting adherence in older adults. Independent variables associated with these subscales may provide guidance for improving adherence in this population.

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Keywords

Schizophrenia; Aging; Adherence; Subjective factors

1.0 Introduction

Multiple studies have shown that low adherence rates in schizophrenia are associated with worse physical and mental health outcomes (Marder 1998; Moore et al. 2000). Consequently, understanding the factors underlying adherence is important for treatment planning and relapse prevention. Risk factors for non-adherence have been conceptualized into three elements: patient-related, treatment-related, and environment-related (Lacro et al. 2002; Fleischhacker et al. 2003). These elements can be studied utilizing objective measurements as well as by using patients' subjective feelings about them. In this study, we focus on the latter perspective.

There is some evidence that problems with adherence may increase with age (Fleischhacker et al. 2003). Indeed, older adults may have special problems with medication adherence because they have narrow therapeutic windows that require more careful drug monitoring; they are likely to be on more complex medication regimens as a result of having multiple physical disorders; and they are more likely to have increased difficulties with cognition, vision, and manual dexterity (Ryan et al. 1999). Although medication adherence should be an important concern in the care of aging persons with schizophrenia, there has been a paucity of data concerning this issue. Over the next two decades this issue will become even more compelling with an anticipated doubling of the population of persons aged 55 and over with schizophrenia (Cohen et al. 2008).

In the younger population with schizophrenia, there have been a few studies that have explored the subjective factors that influence medication adherence. Weiden and coauthors (1994) and Vauth and colleagues (2004), using the Rating of Medication Influences (ROMI; Weiden et al. 1994) instrument, found three factors that patients believed had affected their medication adherence: "influence of others," "prevention," and "medication affinity" (i.e., perceived everyday benefits and absence of any perceived pressure). These factors constitute the 3 subscales of the ROMI. Studies using the ROMI (Loffler et al. 2003; Rosa et al. 2005) found that the perceived benefit from medication was the principal reason for patients' adherence. Another study by Kozuki and Schepp (2005) of inpatients and outpatients with psychosis spectrum disorders found a somewhat different alignment of the items comprising the ROMI. They identified three dimensions for adherence: perceived pressure, positive affinity for medications, and a positive relationship with clinicians.

In addition to examining subjective factors, several investigators explored the interplay of the subjective factors with other variables that were postulated to influence adherence (Vauth et al. 2004; Kozuki et al. 2005; Maeda et al. 2006). For example, lower verbal memory scores, fewer years of education, better vocational functioning, and lower cognitive flexibility were associated with the Influence of Others subscale (Vauth et al. 2004). Higher levels of education, better vocational functioning, selective attention, and more depression were associated with the Medication Affinity subscale (Vauth et al. 2004; Kozuki et al. 2005). More depression and greater age was associated with the Positive Relationship with Clinicians subscale (Kozuki et al. 2005). Better vocational functioning, selective attention, better recall, and older age were associated with the Prevention subscale (Vauth et al. 2004). Kozuki and Schepp (2005) found that the Thought Disorder Scale derived from the Positive and Negative Syndrome Scale (PANSS) (Kay 1991) was associated with the Positive Relationship with Clinicians subscale, whereas Vauth and colleagues (2004) found no associations between any of the adherence

measures and positive or negative symptoms. These preliminary findings also suggested several potential points of intervention to augment adherence motivation.

The earlier studies on subjective response to adherence have several limitations with respect to their applicability to older adults with schizophrenia living in urban settings. The samples were comprised primarily of young and middle-age subjects, most lacked racial diversity, and they examined only a limited number of variables associated with adherence.

Moreover, much of the earlier work on subjective reasons for medication adherence lacked a theoretical underpinning for examining the associated factors. One potentially useful perspective on adherence is the Health Belief Model. The Health Belief Model postulates that patients weigh the perceived benefits of the treatment against its costs, and that they will comply with treatment if they believe that the benefits will exceed the costs (Bebbington 1995). Originally developed to explain compliance with prevention treatments such as vaccines, the Health Belief Model has been modified for adherence in schizophrenia (Fenton et al. 1997), and emphasizes patients' attitudes, beliefs and understanding of illness and treatment options.

In this article, we address the limitations of earlier research by employing a large, mixed racial sample of community dwelling persons aged 55 and over with a diagnosis of schizophrenia. We consider the following three questions: (1) What are the principal dimensions comprising subjective reasons for adherence in older adults with schizophrenia? (2) What is their relative importance in this population? (3) Using the Health Beliefs Model as a theoretical underpinning, what variables are associated with each of these dimensions?

2.0 Methods

2.1 Sample

Methods for this study are described elsewhere (Diwan et al. 2007). Briefly, we recruited subjects aged 55 and over living in community who developed schizophrenia before the age of 45 using a stratified sampling method in which we attempted to interview approximately half the subjects from outpatient clinics and day programs and the other half from supported community residences in New York City. The supported community residences included sites with varying degrees of on-site supervision. Inclusion was based on a *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*, chart diagnosis of schizophrenia or schizoaffective disorder that was supplemented by a lifetime illness review adapted from Jeste and associates (Jeste et al 1997). Thus, respondents were required to have one or more of the following: 1) symptoms such as social withdrawal, loss of interest in school or work, deterioration in hygiene and grooming, unusual behaviors, or outbursts of anger before age 45; 2) evidence of hallucinations, delusions, or disorganized thinking or behavior before age 45; 3) hospitalization for schizophrenia before age 45; and/or 4) treatment for schizophrenia before age 45. Subjects were excluded if they had medical conditions or trauma, seizures, dementia, head injury with unconsciousness of 30 minutes, mental retardation, substance abuse, or evidence of bipolar illness that could better account for the subject's psychotic symptoms before age 45. Persons with cognitive impairment too severe to complete the questionnaire were excluded from the study, i.e., defined as scores of <5 on the Mental Status Questionnaire (Zarit et al, 1978).

Subjects were offered $75 for completing the 2½-hour interview. The rejection rate was 7 %. The sample consisted of 198 persons. Among these, 39% were living independently in the community and 61% in supported community residences. Forty-nine percent were women; 57% were Caucasians, 35% were African Americans, 7% were Latinos, and 2% were in other categories; and the mean age of the sample was 61.5 ± 5.6 years (range 55 to 82 years, median; 60.0 years).

2.2 Instruments

We used a modified version of the ROMI (Weiden et al. 1994) to assess subjective attitudinal and behavioral factors affecting adherence with antipsychotic medication. We examined the responses to Part I of the ROMI, which assesses the reasons for taking the medication. We did not include Part 2 of the ROMI in our analysis because most respondents did not feel that the items applied to them. Part 2 address the reasons why people might not take their medication. Part I of the ROMI has 11 items. Each item is answered on a 3-point scale, 3 (strongly important), 2 (somewhat important), and 1 (not important). A principal component factor analysis with Varimax rotation yielded three subscales: Medication Affinity and Prevention, Influence of Others, and Impact of Authority (Table 1). The Spearman Rho correlation coefficients among the subscales ranged from .00 to .30(see Table 2) and the internal reliabilities (Cronbach's alpha) of the subscales were all at acceptable levels of ≥.70(see Table 2).

In order to study the independent variables associated with higher subjective adherence, we dichotomized the scores of each ROMI subscale at its median value so as to rank each person as "high"(1) or "low"(0) on the subscale. It was necessary to dichotomize the scales because they were not normally distributed, i.e., the Kolmogorov-Smirnov test for each of the scales was statistically significant. We created an ordinal High Adherence measure based on the summed scores of each person's three dichotomized ROMI subscales (range: 0 to 3). The sample's four resultant groups ranged from those persons who did not attribute high importance to any of the above subscales to those who gave high importance to all three.

Although the primary focus of the paper is to examine the factors that account for medication adherence in an older sample, we were also interested in whether there were any variables that might influence adherence. In order to provide for the rational inclusion of these associated variables, used a modified version of the Health Belief Model (Fenton et al. 1997). The model consisted of three categories: patient related factors, medication related factors, and environment related factors. We operationalized the model using 18 predictor variables based on our literature review (Ryan et al. 1999; Lacro et al. 2002; Fleischhacker et al. 2003; Janssen et al. 2006) (see Table 4). These variables were derived from the following instruments: the Center for Epidemiological Depression Scale(CESD) (Radloff 1977), the "Physical Illness" score that represented the sum of 11 illness categories derived from the Multilevel Assessment Inventory and Physical Self-Maintenance Scale (Lawton et al. 1982) (higher scores indicate worse health); Instrumental Activities of Daily Living scale (IADL; Lawton et al. 1969) (lower scores indicate more impairment); PANSS (Kay 1991) from which we used the 7 items assessing positive symptoms, the 7 items assessing negative symptoms, and the Insight and Judgment Item of the PANSS (range 1–7, with higher scores indicating worse insight); the Dementia Rating Scale which assesses five areas of cognitive functioning (attention, initiation and perseveration, construction, conceptualization, and memory); higher scores indicate better functioning (Coblentz et al. 1973) ; the Medication Side Effects Scale that was based on the sum of 21 self-reported items: four items assessing extrapyramidal symptoms(dystonia, akinesia, tremor, akathisia), the 12 items of the Abnormal Involuntary Movement Scale (AIMS; Guy, 1976), and 5 items from the autonomic subscale of the UKU side effects rating scale (Lingjarde et al, 1987); the Network Analysis Profile (Sokolovsky et al. 1981) from which we derived the number of agency contacts and the proportion of network members considered confidantes; and the CAGE (Ewing 1984) score for alcohol abuse. Mental Health Service Utilization (pharmacotherapy or any psychotherapy) was divided into terciles (1=low; 2= medium, 3=high) based on their frequency of visits. We also included five sociodemographic variables: age, sex, race, education, and place of residence. We could not include the type of antipsychotic agents in the analysis because only 140 of 198 subjects had definitive data regarding their medication. Since information on medication was based on self-report, some

respondents were uncertain of the name of their medication or they were not on an antipsychotic agent at the time of the interview. Among the 135 persons on either a 1st or 2nd generation antipsychotic agent (5 persons were taking both types), there were no significant correlations (r=−.05 to .15) with any of dependent variables in the analyses (the factored scales and the summed high adherence measure).

The internal reliability (Cronbach's alpha) scores of the scales were: CES-D (0.88), PANSS positive scale (0.83), PANSS negative scale (0.78), IADL scale (0.77), Dementia Rating Scale (0.89), Medication Side Effects (0.89). All scales attained recommended alphas of 0.70 or higher (Nunally, 1978).

The project staff trained interviewers with the assistance of audio- and videotapes. Interviewers were generally matched to respondents from similar ethnic backgrounds. Interviewers were periodically monitored using audiotapes of their interviews. The intra-class correlations (ICC) ranged from 0.79 to 0.99 on the various scales. Raters had a mean of 99% and 94% agreement with expert ratings of one of the authors (CIC) on the physical illness and social network measures.

2.3 Data Analysis

Initial bivariate analysis compared independent (predictor) variables of the high and low groups for each subscale using t-tests and chi-square analyses for continuous and categorical variables, respectively. For t-tests, the unequal variance t-test was used when findings of the Levine test were significant. The associations between the independent variables and the High Adherence measure was initially assessed using Spearman rho. We used binary and ordinal logistic regression to examine the association between the 18 predictor variables and the dichotomized subscales and the High Adherence measure, respectively. There was no evidence of collinearity among the independent variables. Correlations among the variable ranged from .00 to .51 and the variance inflation factors (VIF) were all < 2.5, and 17 of the 18 variables had VIFs of <2.0.

3.0 Results

Ninety-eight percent persons were taking a psychotropic medication, among whom 94% reported that they "always or almost always" took their medications as prescribed, and another 4% said they took as prescribed about three-quarters of the time. The mean item scores were significantly higher in the Medication Affinity and Prevention Subscale versus the Influence of Others and Impact of Authority subscales, and the mean item score of the latter subscale was significantly higher than other subscale (Table 2). There were no differences in the relative strengths of these subscales among persons living in supported residences versus those who were in more independent settings.

In the initial bivariate examination of the dichotomized subscales (Table 3), 13 of the 18 independent variables were associated with one or more subscales. The Medication Affinity and Prevention subscale was associated significantly with four variables: number of entitlements, higher cognitive functioning, more side effects, and lower insight scores. The Influence of Others subscale was associated significantly with 7 variables: more physical illness, more depressive symptoms, more agency contacts, greater use of mental health services, less likely to live in supported residences, fewer positive symptoms, and smaller proportion of intimates in their social network. The Impact of Authority subscale was associated significantly with 7 variables: more positive symptoms, more negative symptoms, more side effects, living in supported residences, lower cognitive functioning, smaller proportion of intimates in their social network, and lower instrumental activities of daily living scores. However, in logistic regression, only six variables were found to be significantly and independently associated with the subscales (Table 4). The Influence of Others subscale had

the most significant predictor variables. Lower education, more medication side effects, more depressive symptoms, and more mental health services were associated with being in the high group of the Influence of Others subscale. Having more medication side effects and more entitlements were associated with being in the high group in the Medication Affinity and Prevention subscale. No variable was significantly associated with being in the high group of the Impact of Authority subscale.

On the High Adherence measure, the percentages of subjects in the sample being above the median on none, one, two, or all 3 of the ROMI subscales were 15%, 35%, 32%, and 18%, respectively. In the initial bivariate analysis, two variables were associated with higher scores on the High Adherence measure (Table 5). In ordinal logistic regression analysis, two variables-- more medication side effects and more depressive symptoms-- were associated with higher scores on this measure (Table 4).

4.0 Discussion

To our knowledge, this is the first study to focus on the subjective reasons why older schizophrenia patients are willing to take their medication. Several important findings emerged from this investigation. First, our study largely supported the framework of three components of subjective reasons of adherence developed by Weiden and associates (1994). That is, in older as well as younger persons, subjective adherence is a complex measure that involves at least three dimensions. Although there were some differences in the alignment of the items from earlier studies of younger schizophrenia populations, our three component subscales were similar to those of delineated by previous studies in younger persons (Kozuki et al. 2005). Importantly, all 11 items of Part 1 of the ROMI loaded into our three subscales, and the internal reliabilities of the three subscales were .70 and above.

A second important finding was the relative ranking of the three subscales in terms of their importance with respect to subjective adherence. Relative ranking of the subscales had not been done previously, although earlier studies had found that the ROMI item concerning perceived daily benefit from medications was the strongest predictor of adherence (Loffler et al. 2003; Rosa et al. 2005). Thus, our findings that the Medication Affinity and Prevention subscale, which contains the perceived benefit item and was the most commonly endorsed of the three subscales, is consistent with the earlier studies.

A somewhat surprising finding was that the Impact of Authority' subscale was more powerful than the Relations to Others subscale. By contrast, using a broad age range of subjects, Kozuki and Schepp (2005) and Vauth and coauthors (2004) found increased age to be significantly associated with the relations with clinicians and the prevention subscales, respectively, but not with the perceived pressure subscale. Our finding could not be explained by residential location (i.e., those in supported residences had the same hierarchy of subscale importance), and in logistic regression no variable was significantly associated with this subscale. Thus, older outpatient persons with schizophrenia may not have difficulties with authority or accepting a more passive role with respect to medication. Whether this reflects a change in attitude over the course of their illness or a cohort effect remains to be determined. Also, it should be noted that there were no within sample differences with respect to age. That is, being older within our aging sample was not associated with any changes in subjective reasons for adherence.

A third noteworthy finding was that the subscales were associated with only a few of the variables that had been previously found to affect adherence. This suggests that subjective adherence is largely an independent predictor of adherence, and it is not likely that the other variables will act indirectly through subjective factors on overall medication adherence. Our study also indicated that while 13 of the 18 variables that had been reported previously to be

associated with medication adherence in schizophrenia patients were significant in bivariate analysis, only five attained significance in logistic regression. Thus, many of the putative factors influencing subjective medication adherence are not independent of each other, and it is important to conduct multivariate analyses to determine their independent effects.

A fourth important finding was the distribution of persons who scored highly on one or more of the three subjective adherence subscales. Although two-thirds of the sample were in one or two of the above median groups, about one-sixth of the sample were below the median in all three subscales and another one-sixth were above the median in all three categories. Thus, about one-third of the sample is comprised of roughly two equal subgroups of older patients--those for whom subjective factors do not substantially influence their medication adherence and those for whom subjective factors are very important. Persons who had more high scores on the subjective adherence subscales were significantly more likely to have more medication side effects and have more depressive symptoms. Perhaps, these persons need an array of reasons –external pressure, support from others, and cognitive rationales—for continuing to use medication despite suffering from greater number of depressive symptoms and more side effects of from their medication.

Finally, our findings have potential clinical applications. The Medication Affinity and Prevention subscale, which contains more cognitive elements, was the most strongly endorsed of the three subscales. This suggests that psycho-educational approaches can be a valuable tool in the care of older persons with schizophrenia. On the other hand, despite recent efforts to make therapeutic relationships more collaborative, older patients seem more willing to take medication when pressured by others. Thus, clinicians and family members should not necessarily be chastised for such approaches, and research is needed to determine how to successfully adapt such methods with older adults in a therapeutically sensitive manner. Respondents rated positive relations with clinicians and family as having only marginal importance in affecting their willingness to take medication. It would seem that emotional bonds, albeit important in other therapeutic endeavors, may not be as critical in influencing medication adherence in older adults with schizophrenia.

Although only a few putative risk factors were associated with the adherence subscales, they still may provide guidance with respect to improving adherence. For example, because a higher level of medication side effects was associated with both the Medication Affinity and Influence of Others subscales, persons who experience more side effects from medication might benefit from approaches that focus on both psychoeducation and building therapeutic relationships. Likewise, depressive symptoms and lower education were associated with the Influence of Others subscale. Consequently, persons with higher levels of depressive symptoms and lower education may require more emphasis on therapeutic relationships rather than more cognitive or authoritarian approaches. The fact that our findings regarding the associations between Influence of Others subscale and more depressive symptoms and lower education had been reported previously in studies of younger populations by Kozuki and Schepp(2005) and Maeda and coauthors(2006), respectively, provides additional support for further exploration of this strategy.

This study has several strengths. It is the first study examining subjective reasons for adherence specifically focused on an older population; it has a large sample of older schizophrenia persons (n=198); we use only persons with schizophrenia rather than various psychotic disorders; it is a multiracial sample from a large urban area; we use a multivariate health belief model that provides for the rational inclusion of variables, our dependent variable is derived from an instrument that is multidimensional and has acceptable psychometric properties. Nevertheless, the findings must be interpreted cautiously because of the cross-sectional nature of the data; it is restricted to one geographic area; the schizophrenic respondents were not randomly selected

but represent a convenience sample, albeit derived from a variety of residential and clinical sites; and we do not know if willingness to take medication corresponds with any objective markers of medication adherence. Notably, the study population reported high levels of medication adherence; consequently, we do not know whether the findings would have differed if a less adherent population had been assessed. Also, because of the numerous comparisons, there is a possibility of one or more Type 1 errors. However, we opted to use a .05 significance level in the analyses because of the exploratory nature of this study and our concerns about making Type 2 errors. Finally, although the Health Belief Model provided a theoretical underpinning for our analysis of the relationship between the subjective dimensions of adherence and associated variables, the fact that only a few variables remained significant when analyzed in concert and the odds ratios of the significant variables were very modest suggests that this framework may require modification.

In summary, we have identified a hierarchical three dimensional model of subjective reasons for medication adherence in older persons with schizophrenia that appears to be largely independent of other putative factors influencing adherence. If replicated in other sites, this model may be useful in guiding strategies for enhancing medication adherence in this population.

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Table 1

Subscales of Rating of Medication Influences (ROMI) Determined by Factor Analysis

Medication Affinity and Prevention	Influence of Others	Impact of Authority
Perceived daily benefit(.77)	Positive relation with prescribing physician(.86)	Someone supervises(.81)
Relapse prevention(.81)	Positive relation with therapist (.87)	Family pressure(.69)
Fear of rehospitalization (.74)	Told to by doctor (.57)	Treatment system pressure/force(.78)
Fulfillment of life goals(.63)	Positive family belief about medication (.62)	

Note: Factor loadings in parentheses.

Percent variance explained by each factor: Medication Affinity and Prevention = 18.6%; Influence of Others = 30.1%; Impact of Authority =11.1%.

Table 2

Comparison of Mean Scores of ROMI Subscales

ROMI Subscale	Mean item score	Standard Deviation	Chronbach's alpha	Wilcoxan signed rank test	Spearman Rho
1. Medication Affinity and Prevention	2.51	0.55	.71	$z = -10.94$ (1 vs. 2)*; $z = -9.39$ (1 vs. 3)*	.23* (1 vs 2); .00 (1 vs 3)
2. Influence of Others	1.45	0.57	.77	$z = -7.92$ (2 vs. 3)*	.30* (2 vs 3)
3. Impact of Authority	1.90	0.60	.70		

Scale Scoring: 1=not important, 2=somewhat important, 3= strongly important

* p<.001

Table 3

Bivariate Analysis of Variables for Dichotomized Three ROMI subscales

Independent variables	Medication Affinity and Prevention Subscale					Influence of Others Subscale					Impact of Authority Subscale				
	Low Group N=92	High Group n=104	t value /χ^2	df	p	Low Group n=100	High Group n=96	t value /χ^2	df	p	Low Group n=95	High group n=101	t value /χ^2	df	p
Patient Related Factors															
Age (mean)	61.6 (5.8)	61.4 (5.3)	.27	191	.79	61.6 (5.4)	61.3 (5.8)	.31	191	.76	60.8 (5.0)	62.0 (6.0)	−1.49	191	.14
Female (%)	48	51	.19	1	.66	44	55	2.46	1	.12	45	53	1.32	1	.25
White (%)	57	56	.01	1	.92	58	54	.29	1	.59	49	62	3.31	1	.07
Education (mean)	12.2 (3.5)	13.5 (11.5)	−1.08	188	.28	14.0 (47)	11.7 (3.5)	1.70	188	.074	12.3 (3.4)	13.4 (11.7)	−.94	188	.35
PANSS Insight (mean)	2.4 (1.8)	1.8 (1.3)	2.59	166	**.01**	2.3 (1.8)	1.9 (1.4)	1.53	185	.13	1.9 (1.6)	2.3 (1.5)	−1.59	192	.11
PANSS Positive (mean)	12.5 (5.8)	12.5 (6.5)	.046	192	.96	13.4 (6.7)	11.6 (5.4)	2.09	188	**.04**	11.4 (5.9)	13.5 (6.3)	−2.46	192	**.02**
PANSS Negative (mean)	12.0 (5.8)	12.0 (6.2)	.085	194	.93	12.6 (6.7)	11.3 (5.3)	1.57	187	.12	10.6 (4.7)	13.3 (6.9)	−3.23	177	**.002**
Dementia Rating Scale (mean)	125.7 (13.9)	129.4 (12.2)	1.99	194	**.05**	126.9 (14.4)	128.4 (11.7)	−.77	189	.44	130..0 (11.6)	125..5 (14.2)	2.40	194	**.02**
CAGE score (mean)	.11 (.50)	.17 (.63)	−.78	194	.43	.14 (.59)	.15 (.56)	−.07	194	.94	.07 (.44)	.21 (.67)	−1.67	175	.09
Number of physical illnesses (mean)	1.3 (1.3)	1.4 (1.5	−.47	194	.64	1.1 (1.2)	1.5 (1.6)	−2.07	173	**.04**	1.4 (1.3)	1.3 (1.5)	.45	194	.65
Center for Epidemiological Study Depression Scale (mean)	11.4 (9.9)	13.7 (9.8)	−1.59	194	.11	10.8 (8.9)	14.5 (10.5)	−2.67	194	**.008**	11.9 (10.3)	13.2 (9.4)	−.89	194	.38
Instrumental Activities of Daily Living Scale (mean)	22.6 (3.5)	21.8 (4.2)	1.41	193	.16	22.1 (3.7)	22.3 (4.1)	−.363	194	.72	23.1 (2.9)	21.3 (4.4)	3.40	174	**.001**
Medication Related Factors															
Medication Side Effects Scale (mean)	5.8 (5.9)	9.1 (7.9)	−3.28	189	**.001**	7.1 (6.4)	8.0 (7.9)	.88	194	.38	6.1 (5.0)	8.9 (8.6)	−2.88	163	**.005**
Environment Related Factors															
Number of entitlements (mean)	3.1 (1.2)	3.8 (1.3)	−3.32	194	**.001**	3.5 (1.4)	3.4 (1.2)	.172	194	.86	3.5 (1.2)	3.4 (1.4)	.42	194	.68
Proportion of intimate contacts (mean)	.21 (.21)	.26 (.25)	−1.58	193	.12	.28 (.24)	.21 (.23)	2.07	194	**.04**	.29 (.25)	.19 (.21)	3.08	184	**.002**
Agency size (mean)	2.3 (1.7)	2.6 (1.8)	−1.13	194	.26	2.1 (1.6)	2.7 (1.9)	−2.48	194	**.014**	2.5 (1.7)	2.4 (1.9)	.38	194	.70
Supported residence (%)	64	57	1.12	1	.29	70	50	8.18	1	**.004**	47	72	12.68	1	**.000**
Mental health service utilization (mean)	1.9 (0.8)	2.0 (0.8)	−.58	194	.51	1.8 (0.7)	2.2 (0.8)	−3.89	194	**.000**	2.1 (0.8)	1.9 (0.8)	1.78	194	.08

Table 4

Binary Logistic and Ordinal Regression Analysis of Variables Predicting Different ROMI Subscales and High Adherence Measure, Respectively

Independent Variables	Medication affinity and prevention Subscale [#]		Influence of Others Subscale[#]		Impact of Authority Subscale [#]		High Adherence Measure[##]	
	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p	OR (95%CI)	p
Patient Related Factors								
Age	0.99(.93–1.06)	.81	1.02(.95–1.09)	.65	1.05(.99–1.12)	.18	0.98(.92–1.04)	.55
Female	1.12(.56–2.25)	.76	1.49(.74–2.99)	.27	1.36(.68–2.73)	.38	0.68(.37–1.26)	.22
White	.61(29–1.29)	.20	1.02(.47–2.21)	.96	1.80(.85–3.86)	.12	0.97(.49–1.93)	.93
Educational level	1.03(.98–1.08)	.21	0.87(.77–.96)	**.010**	1.03(.94–1.12)	.53	1.00(.98–1.02)	.70
PANSS Insight	0.76(.57–1.01)	.06	1.03(.78–1.35)	.84	1.00(.77–1.31)	.98	1.11(.89–1.38)	.35
PANSS Positive	1.00(.94–1.08)	.83	0.96(.90–1.04)	.38	1.01(.94–1.09)	.80	1.01(.95–1.06)	.85
PANSS Negative	1.02(.93– 1.12)	.64	1.01(.93–1.11)	.75	1.01(.92–1.10)	.91	0.98(.91–1.06)	.66
Dementia Rating Scale	1.01(.98–1.05)	.46	1.00(.97–1.04)	.91	0.98(.95–1.01)	.25	1.01(.98–1.03)	.49
CAGE score	1.09(.59–2.02)	.80	0.74(.42–1.33)	.32	1.96(.98–3.93)	.06	0.79(.38–1.66)	.53
Physical illnesses	0.91(.69–1.19)	.49	1.01(.76–1.33)	.96	0.96(.73–1.27)	.79	1.04(.82–1.31)	.76
Center for Epidemiological Study Depression Scale	1.01(.98–1.05)	.46	1.06(1.01–1.09)	**.008**	1.02(.98–1.06)	.26	0.96(.93–1.00)	**.030**
Instrumental Activities of Daily Living Scale	0.95 (.89–1.05)	.34	1.03(.92–1.14)	.64	0.92(.83–1.03)	.15	1.04(.94–1.14)	.45
Medication Related Factors								
Medication Side Effects Scale	1.08(1.02–1.15)	**.015**	1.07(1.01–1.13)	**.024**	1.03(.96–1.10)	.44	0.92(.86–.99)	**.022**
Environment Related Factors								
No. of Entitlements	1.49(1.12–1.98)	**.006**	0.85(.63–1.13)	.26	0.89(.67–1.17)	.41	0.96(.75–1.25)	.78
Proportion of intimate contacts	2.27(.37–13.8)	.37	2.33(.37–14.4)	.36	0.42(.07–2.05)	.36	0.57(.11–2.98)	.50
No. of agency contacts	1.07(.86–1.34)	.53	1.15(.91–1.45)	.24	1.13(.90–1.41)	.29	0.89(.74–1.06)	.18
Living in supported residence	0.75(.35–1.60)	.45	0.55(.25–1.20)	.132	2.05(.96–4.40)	.07	0.95(.49–1.85)	.87
Mental health services utilization	1.03(.63–1.68)	.91	1.73(1.06–2.83)	**.029**	0.92(.57–1.48)	.73	0.79(.49–1.27)	.33

[#]Bivariate Logistic Regression Analysis: ORs >1 indicate that the predictor variable is associated with higher scores on the ROMI scales; ORs <1 indicate that the predictor variable is associated with lower scores on the ROMI scales

[##]Ordinal Logistic regression Analysis: ORs>1 indicate that the predictor variables is associated with fewer high adherence items; ORs<1 indicate that the predictor variable is associated with more high adherence items.

Table 5

Bivariate Correlations (Spearman's rho) between High Adherence Measure and the Independent Variables.

Independent variables	Spearman's rho	p
Patient Related Factors		
Age	.01	.85
Female	.13	.08
White	.04	.54
Educational level	−.04	.57
PANSS Insight	.00	.96
PANSS Positive	.04	.59
PANSS Negative	.05	.50
Dementia Rating Scale	−.01	.85
CAGE score	.13	.08
Physical illnesses	.03	.72
Center for Epidemiological Study Depression Scale	.23	**.001**
Instrumental Activities of daily Living Scale	−.11	.14
Medication Related Factors		
Medication Side Effects Scale	.25	**.000**
Environment Related Factors		
Number of Entitlements	.09	.22
Proportion of intimate contacts	.01	.88
Number of agency contacts	.09	.19
Living in supported residence	.01	.91
Mental health services utilization	.09	.19