# The Use of the Theory of Planned Behavior to Predict Medication Adherence in Schizophrenia

Alex Kopelowicz<sup>1</sup>, Charles J. Wallace<sup>1</sup>, Robert Paul Liberman<sup>1</sup>, Fabian Aguirre<sup>2</sup>, Roberto Zarate<sup>1</sup>, Jim Mintz<sup>3</sup>

# Abstract

**Objective:** Inadequate adherence to antipsychotic medication regimens is common among patients with schizophrenia. This study evaluated the psychometric properties of a new instrument designed to identify the factors associated with poor adherence to antipsychotic medications in this population. **Methods:** Spanish-speaking, Mexican-American adult patients with schizophrenia (N=155) were administered the newly developed Theory of Planned Behavior (TPB) Inventory, as well as the Rating of Medication Influences (ROMI) scale and the Treatment Compliance Interview (TCI). The latter two instruments are commonly used and well validated for the assessment of medication adherence among patients with schizophrenia. **Results:** The TPB Inventory demonstrated high internal consistency, excellent test-retest reliability and good concurrent validity with the ROMI. In addition, the TPB Inventory showed good predictive validity with patients' intentions to take medication as prescribed and actual adherence behavior. **Conclusions:** The TPB Inventory is a reliable and valid instrument that can be used to assess the factors associated with medication nonadherence. Better understanding of these factors can guide clinicians in their efforts to improve medication adherence among patients with schizophrenia.

## **Key Words:** Schizophrenia, Medication Adherence, Antipsychotic Medications, Hispanic, Theory of Planned Behavior

# Introduction

Upwards of 50% of individuals with schizophrenia do not adhere to their medication and psychosocial treatment regimens (1). This compliance failure often results in the utilization of disproportionately more costly services (i.e.,

<sup>1</sup>Department of Psychiatry & Biobehavioral Sciences, Geffen School of Medicine at UCLA <sup>2</sup>Department of Psychology, University of Texas, Austin <sup>3</sup>Department of Psychiatry, University of Texas Health Sciences Center at San Antonio

Address for correspondence: Alex Kopelowicz, MD, San Fernando Mental Health Center, 10605 Balboa Boulevard, Suite 100, Granada Hills, CA 91344 Phone: (818) 832-2400; Fax: (818) 832-2567; E-mail: akopel@ucla.edu

Submitted: July 12, 2007; Revised: September 11, 2007;

Accepted: September 15, 2007

inpatient treatment, emergency room visits, police involvement) and has a negative impact on the long-term outcome of the disorder (2-4). Moreover, there is little evidence that progress has been made in increasing adherence despite the introduction of the second-generation antipsychotic medications with less severe and disabling side effects (5).

Recent reviews converge in concluding that nonadherence to treatment is far better documented than understood in schizophrenia (6, 7). Attempts to understand the determinants of treatment adherence in schizophrenia have most often focused on identifying demographic and clinical characteristics that correlate with adherence. For instance, a number of studies have found no association between adherence and age, gender, ethnicity (African-origin versus Caucasian), level of education or income (8, 9). Nor have illness history variables, such as age at onset, duration of illness and number of hospitalizations been shown to correlate with adherence (10). Illness characteristics that have been consistently correlated with nonadherence include *comorbidity with substance abuse* (11-13), *more severe ratings of psychopathology* (14-16) and *lower levels of insight* (17-20).

Another approach used to understand adherence to treatment has been to focus on treatment variables. For example, *side effects* of antipsychotic medication, particularly dysphoria and akathisia, have been consistently associated with nonadherence (21, 22). However, the route and frequency (i.e., oral versus long-acting injections) of medication administration have not been powerful predictors of adherence (6). Other treatment characteristics, such as the *quality of the provider-patient relationship*, have been associated with treatment adherence among individuals with schizophrenia in general (23-25). For example, providing Mexican-Americans with ethnically matched therapists who incorporated their customs, values and beliefs into the treatment process increased the number of treatment sessions and decreased the rate of treatment dropout (24).

Several conceptual models for explaining treatment adherence in schizophrenia have been formulated, of which the Health Belief Model (HBM) has been researched most extensively. According to the HBM, people are more likely to adhere to treatment regimens if they: 1) perceive themselves to be potentially vulnerable to the illness (Susceptibility); 2) perceive the illness as severe (Severity); 3) are convinced of the efficacy of the proposed treatment regimen (Benefits); 4) see that there are few costs associated with adherence (Costs); and, 5) are exposed to stimuli that prompt adherence (Cues). The HBM recognizes that many diverse factors such as demographics and social variables influence health behavior, but these factors are thought to work through subjective perceptions and personal motivation for health (26, 27).

A limited number of studies have applied the HBM to medication adherence among patients with schizophrenia. For example, a study of 107 patients attending a VA outpatient clinic found that Susceptibility, Costs and Cues were significantly correlated with adherence and that 20% of the variance in adherence could be explained when all components of the HBM were examined together (28). In contrast, HBM was not useful in distinguishing the health beliefs of regular and irregular attenders at a depot neuroleptic clinic (16). More recent studies have attempted to tease apart the variables within the HBM that best predict medication adherence. One study of forty patients attending two depot neuroleptic clinics found that Susceptibility, Severity and Benefits all correlated with adherence, but Susceptibility alone accounted for the regression model's discriminative power (29). In contrast, another study of thirty-nine patients with serious mental illness (12 of whom were diagnosed with schizophrenia) found that Severity and Benefits explained 43% of the variance in adherence behavior, but that Susceptibility was not correlated with adherence (30).

The inconsistency of these findings may be a consequence of variations in sampling techniques and differences in the reliability and validity of the measures used to assess the HBM and adherence behaviors. Supporting this explanation is the fact that studies that used the Rating of Medication Influences scale (31), a validated and reliable instrument strongly tied to the HBM for use with patients with schizophrenia, have generally yielded the clearest results (30). However, an alternative explanation is that the HBM is an insufficient model for understanding medication adherence among individuals with schizophrenia. Some authors have questioned whether the HBM is applicable to schizophrenia because the disorder may disrupt illness perception and the capacity to plan and act (32, 33). Others suggest that consideration of the cognitive and motivational resources available to assess risk and formulate action may need to be added to an adherence model in schizophrenia (6, 7). Still others emphasize that adherence is influenced by the patient's social context and contend that it can be improved through identifying social constraints on adherence behavior (34, 35).

# The Theory of Planned Behavior

While recognizing the influence of the social environment, the HBM and the ROMI remain focused on the individual's perceptions about, and motivation toward, adhering to treatment. An alternative perspective holds that the social environment of the patient, including the level of participation of the family, should play a central part in any explanatory model of adherence behavior (36). For instance, a dozen cross-sectional studies have indicated that patients living with relatives who are supportive are more likely to maintain adherence to medications than those lacking such support (6). At the same time, patients whose families are ambivalent about antipsychotic medications, or refuse to become involved with treatment, are at increased risk of medication nonadherence after hospital discharge (37). Although the cross-sectional nature of these studies does not permit drawing causal conclusions, the inclusion of such family and cultural factors, which are given much less emphasis in the HBM and ROMI, led us to select the Theory of Planned Behavior (TPB) to study adherence to treatment in schizophrenia.

The TPB is an extension of the Theory of Reasoned Action (38, 39), which proposes that people engage in a *behavior* based on their *intention* to perform the behavior, which is a function of a person's *attitude toward the behavior* and *subjective norms*. The person's attitudes toward the behavior are composed of *beliefs* about the advantages and disadvantages of performing a particular behavior. Subjective norms are a function of a person's *beliefs* about what significant others think regarding the behavior, and his or her motivation to comply with the wishes of these others. In general, individuals will try to perform a behavior if they believe that the benefits of success outweigh the risks of failure, and if they feel that significant others, with whom they want to comply, believe that they should perform the behavior. the Theory of Reasoned Action was sufficient for predicting adherence with diet, smoking restrictions, physical activity and the avoidance of stress, but not for medication (43). Although the complete model was not supported for medication compliance, a direct relationship was found between attitude and compliance, and between motivation and compliance.

There have been three studies, each a PhD dissertation, that have used these theories to address medication adher-



According to the Theory of Reasoned Action, a person's beliefs determine his or her attitudes, which lead directly to intentions to perform a certain behavior. However, the theory is predicated on the notion that behavior is volitional and unobstructed; that is, once someone has an intention, the behavior follows naturally. To explain behaviors that go beyond volitional control, such as behaviors requiring specific abilities, Ajzen (40) expanded the theory by adding *perceived behavioral control*. Perceived behavioral control refers to the individual's belief that he or she has the resources and opportunities required to perform a particular behavior and can overcome the obstacles that stand in the way of doing it (41). The interrelationships among the key constructs of the model are depicted in Figure 1.

Studies examining the applicability of these theories to treatment adherence have found support for the model. For example, among patients with a myocardial infarction, attitudes toward regimen compliance and subjective norms predicted one-year compliance with all medical prescriptions including dietary restrictions, adherence to drug regimens, exercise activity, and smoking cessation (42). In a study of patients with hypertension, path analysis demonstrated that ence in schizophrenia (44-46). Jarvis (44) found that attitudes toward taking medications were more important than subjective norms for predicting medication adherence among Caucasian male noncompliers living at residential care homes in Los Angeles. Chiurazzi (45) compared compliers to noncompliers among Caucasian males living at residential care homes in Fresno, California. Compared to noncompliers, compliers believed positive consequences of taking medications were more likely to occur, were more motivated to comply with others' wishes, and were more likely to believe that others wanted them to take their medications. Radomsky (46) used TPB with twenty-six outpatients at a VA clinic and found that intention to take haloperidol was primarily due to motivation to do what prominent significant others wanted. Both the study by Chiurazzi and that of Radomsky supported the importance of subjective norms in predicting medication adherence; although the subjects in the former study most often mentioned members of the clergy as the important others while subjects in the latter study most often identified family members. The study by Jarvis was also supportive of the model, albeit indirectly, in that attitudes were more important than subjective norms because most of the subjects had little contact with family members or other caretakers and, thus, could not identify a referent whose opinion about medication adherence mattered to them.

In summary, the HBM is limited in its ability to explain the problem of treatment adherence among individuals with schizophrenia because it fails to sufficiently take into account the role of social and family factors. Consequently, we chose to use the TPB as the basis for the design of an intervention to improve medication adherence in a population of Spanish-speaking, Mexican-Americans with schizophrenia. The purpose of the present study was to systematically evaluate the psychometric properties of the TPB Inventory, the measure we created to assess the relationships between the three TPB factors - attitudes, subjective norms, and perceived behavioral control - and individuals' intention to take their antipsychotic medications and their actual medication adherence behavior for this specific study population. The study was conducted at two community mental health centers in Los Angeles that serve a predominantly Spanishspeaking, Mexican-American population.

# Methods

# **Subjects**

Data were collected from a sample of 155 respondents between the ages of 18 to 60 who were participating in a prospective study of medication adherence being conducted at three sites. All subjects were Spanish-speaking, Mexican-Americans who were receiving inpatient, outpatient or day treatment services at one of the sites and had been given a Diagnostic and Statistical Manual of Mental Disorders-4th Edition (DSM-IV) diagnosis of schizophrenia by a site psychiatrist. All measures were administered by a research assistant who had been trained by the UCLA Intervention Research Center for Schizophrenia and Psychiatric Rehabilitation (Robert Paul Liberman, Director) to a minimum interrater reliability of ICC=0.85 for each of the instruments used in this protocol. The study received Institutional Review Board approval, and all subjects provided written informed consent prior to completing any study procedures.

# Measures

## The Theory of Planned Behavior (TPB) Inventory

The TPB Inventory is the new measure that is the subject of this study. The following discussion describes the process of generation and validation of content and the scoring system.

*Generation and Validation of Content:* According to the developer of the TPB model, to assure that the beliefs assessed by a TPB measure are relevant to the specific

action described in the intention statement, the beliefs must be elicited from the respondents themselves or from a sample of respondents that is representative of the research population (41). Thus, to obtain a representative sample of target respondents, the Medical Directors of each of two community mental health centers that serve a combined total of 3,000 persons with serious and persistent mental illness were asked to select a panel of ten Mexican-Americans who were receiving services at that mental health center and had been diagnosed with DSM-IV schizophrenia by a center psychiatrist. The panel members met as a group with two facilitators who conducted the meeting in Spanish. The facilitators asked the panel members to identify each of their antipsychotic medications and to indicate their intention to take them exactly as prescribed by their psychiatrists. The panel members were then asked to review each behavioral belief of the Jarvis questionnaire, evaluate its relevance, and decide if it should be eliminated, revised, or retained as is. They were also given a list of the consequences (e.g., possible side effects, putative benefits) of the newer antipsychotic medications noted in the clinical and research literature and asked to indicate the relevance of each. Based on the answers of both panels, a list of 30 beliefs regarding behavioral consequences of taking antipsychotic medication was produced. An almost identical procedure was used to produce a final list of 36 important people in their lives (e.g., relatives, close friends, spiritual leader). The measure of perceived behavior control was developed by initially discussing with experienced clinicians from these community mental health centers the resources individuals need to take medications (e.g., prescription from a physician, valid identification card, insurance benefits), submitting a list of these resources to the two panels, and adding, eliminating, or modifying resources based on the panels members' suggestions to produce a final list of 20 resources. (See Appendix for an English-language version of the TPB Inventory.)

*Scoring the TPB Factors:* The TPB hypothesizes that an individual's action is a function of three factors – his/her attitude, subjective norms, and perceived behavioral control. In turn, each is the sum of the product of two judgments made by the individual: one primarily factual regarding the consequences of taking medication and the other evaluative. For example, the following item is one of thirty used to assess attitudes:



The evaluative dimension (good-bad, scored from +3 to -3) is multiplied by the behavioral belief dimension (likelyunlikely, scored from +3 to -3). A higher score indicates more positive attitudes. Using the example of weight gain, if a person believed that taking his/her medication every day was "extremely likely" (+3) to cause weight gain and felt that gaining weight would be "extremely bad" (-3), then that person would score a -9, indicating very negative attitudes toward taking medication vis-à-vis weight gain. Alternatively, if weight gain was deemed extremely bad (i.e., scored -3) and extremely unlikely (i.e., scored -3), the resulting score would be positive (in this case, +9) and, thus, indicate a very positive attitude toward taking medications vis-à-vis weight gain. To produce an overall attitude score requires adding the products of each of the 30 items (see Table 1 for a visual representation of these calculations).

Table 1	Ca	alculation o	of TPB Scores	
TPB Factor		Evaluative (bad – good)	Normative (unlikely-likely)	Attitude toward Medication (negative-positive
Attitude		-3 +3	-3 +3	-9 +9
Subjective Norms	2	-3 +3	-3 +3	-9 +9
Perceived Control		-3 +3	0 6	-18 +18

Note: The evaluative score is multiplied by the normative score to yield the attitude toward medication. Higher score reflects more positive attitude toward medication.

For subjective norms, the degree to which a respondent is motivated to comply with important people ("salient referents") in their lives (likely-unlikely, scored +3 to -3) is multiplied by the normative belief dimension (likely-unlikely, scored +3 to -3) and summed across the number of salient referents to produce a subjective norms score. For instance, if an individual is extremely motivated to comply with his mother's wishes (i.e., scored +3) and his mother is extremely likely to want him to take his medication (i.e., scored +3), then the subjective norm score for the mother would be +9 (+3 x + 3). Because each respondent differs in the number of salient referents in their lives, the total subjective norms score is divided by the number of referents identified by the respondent, yielding the valence of the referents on average. As in the attitude score, two negative responses (e.g., the referent very much wants the respondent not to take medication [-3] and the respondent generally wants to act against the referent's wishes [-1]) indicate a positive attitude (+3).

For perceived behavioral control, the perceived power or likelihood of having each of 20 resources (likely-unlikely, scored from +3 to -3) is multiplied by the belief in, or likelihood of, needing the resource to take medications as prescribed (unlikely-likely, scored 0 to 6) and summed across the 20 items to produce a perceived behavioral control score. This measure has been calibrated to account for the fact that if a respondent does not need a particular resource (scored 0), whether or not he/she has it is irrelevant because the product of the two items equals zero either way. Finally, the TPB Inventory includes a single item that asks the individual to rate his/her intention to adhere to medication treatment (likely-unlikely, +3 to -3).

# Other Measures Used in the Study

## The Rating of Medication Influences (ROMI) Scale

The Rating of Medication Influences (ROMI) scale (31) is a reliable and valid instrument to assess schizophrenia patients' subjective reasons for medication nonadherence. The conceptual framework for the ROMI is the Health Belief Model. This twenty-four-item measure is administered to respondents as a structured interview. The twenty-four items produce totals on four sources of influence: Medication Affinity (perceived benefit of medication); Denial/Dysphoria (denial of illness, belief that medication is unnecessary, and distressed by side effects); Logistical Problems (barriers to treatment access and financial obstacles); and, Influence of Others (family belief in medication and positive relationship with clinicians). The Spanish-language version was administered. The original authors have verified its equivalence with the English version through personal communication with Dr. Weiden.

## The Treatment Compliance Interview (TCI)

The Treatment Compliance Interview (TCI) (47) is a five-item measure that surveys different sources of information to assess an individual's adherence to his/her medication regimen. This instrument enables the assessor to quantify the extent to which the patient did or did not take the target medication, how much was taken and when since the previous assessment, and the degree to which supervision is needed to maintain adherence. The responses are used to quantify medication adherence on a scale of 0 to 100% with 25% increments (0%=not compliant at all; 100%=always compliant without the need for supervision). The patient, relative, and treatment provider versions were administered at study entry and any discrepancies amongst these sources of information were resolved by a consensus of the study investigators. A recent review of the literature has identified the TCI as one of the best validated subjective measures of medication adherence among patients with schizophrenia (48).

#### Analytic Approach

Internal consistency of the TPB instrument was examined using Cronbach's coefficient alpha and split-half reliability. Pearson correlations were conducted to examine the test-retest reliability of the TPB instrument and the convergent validity between the TPB instrument and the ROMI. Multiple regression analyses were used to determine the combined effects of the three TPB factors on intention and compliance. Finally, a covariance structure analysis was conducted to examine how well the data fit the TPB model.

## Results

The subjects included 97 males and 58 females. Their mean age was 34.1 (standard deviation [SD]=10.76), and the mean years of education was 9.33 (SD=3.16). No significant correlations were found between age, gender or years of education and scores on the TPB, ROMI or TCI. In terms of compliance, 46 of the 155 respondents (29.7%) were completely noncompliant (score of 0), 58 (37.4%) were 25% compliant (score of 1), 21 (13.5%) were 50% compliant (score of 3) and 17 (11%) were 100% compliant (score of 4).

#### Internal Consistency of the TPB Scales

Coefficients of internal consistency for the attitudes and perceived behavioral control factors of the TPB measure were calculated using Cronbach's coefficient alpha. The alphas were 0.91 and 0.88, respectively. Corrected item-total correlations, with the totals calculated excluding the item being considered, ranged from 0.84 to 0.93 for the attitude items and from 0.81 to 0.92 for the perceived behavior control.

On the subjective norms factor, the number of salient referents differ from respondent to respondent and, thus, the number of items to be totaled to obtain each respondent's score differ (range 3 to 23). In this case, coefficient alpha could not be calculated using Cronbach's generalized formula. An estimate of the split-half reliability (Cronbach's alpha is equivalent to the average of all possible split halves) was computed using a robust method. The item list for each subject was split in half randomly, arbitrarily calling one set "A" and the other "B." The average score was computed for the A and B items (a total would depend on the number of items) and these "halves" were correlated across subjects. The process was repeated 1,000 times, generating 1,000 estimated "split-half" correlations. The Spearman-Brown prophecy formula was then applied to each of these to estimate the reliability of the test if it were twice as long (i.e., the full test). These values were transformed using Fisher's normalizing ztransformation (the typical correlation between halves was high, so the distribution was negatively skewed). The mean of the Fisher's z values, back-transformed to an r, is reported here as the reliability. Using this method, the internal consistency reliability for the subjective norms component of the TPB questionnaire was 0.88.

#### Test-Retest Reliability

Twenty-five respondents were randomly selected and administered the TPB measure two weeks after the first administration. The test-retest coefficients were 0.88 for attitude, 0.91 for mean subjective norm, and 0.86 for perceived behavioral control.

#### **Concurrent Validity**

Table 2 presents the zero order correlations between the three TPB factors and the four sources of influence on medication adherence assessed by the ROMI. All three of the TPB factors were most highly and significantly correlated with their similarly labeled ROMI factor: Medication Affinity and Denial/Dysphoria (inversely) with the attitude factor, Influence of Others with subjective norms and Logistical Problems (inversely) with perceived behavioral control. In addition to the expected correlations, Denial/Dysphoria was significantly (inversely) correlated with perceived behavioral control.

Table 2 Co	onverge	ent Validit	ÿ						
	ROMI sources of influence on adherence								
TPB Factor	Med Affinity	Denial/ Dysphoria	Influence of Others	Logistic Problem					
Attitude	.30†	38 <sup>‡</sup>	.14	.17					
Subjective Norms	.22	19	.33†	12					
Perceived Control	.25	34 <sup>‡</sup>	.26*	31†					

\*p <.05, †p <.01, ‡p <.001

#### Compliance, Intent and the TPB Factors

Table 3 presents the zero order correlations among the three TPB factors, respondents' intentions to take their medications, and the compliance scores. The results are in accord with the TPB model. Performance of a behavior (i.e., compliance) was significantly correlated with intention to perform the behavior. All of the TPB factors were significantly correlated with intent, generally more so than they were correlated with one other.

Additional analyses were conducted to determine the effects of the TPB variables combined. First, a multiple regression was conducted to determine the overall effect of the three TPB factors on intention. The three TPB components together accounted for more than 60% of the variance (F=78.9; df=3, 148; p<.0001; r<sup>2</sup>=.608), with attitude being the most powerful predictor (t=10.8; p<.0001), followed by

perceived behavioral control (t=2.30; p=.023) and subjective norms being a poor single predictor (t=1.71; p=.089). Second, a multiple regression was conducted to determine the combined effect of the three TPB factors on compliance. The three TPB components together accounted for approximately 25% of the variance (F=18.01; df=3, 148; p<.0001;  $r^2$ =.253); subjective norms (t=2.64; p<.01) and perceived behavioral control (t=3.76; p<.0002) were significant predictors, but attitude was not (t=1.69; p=.094).

Table 3	Table 3 Correlations Between TPB Factors,   Intent, and Compliance Intent								
	Attitude	Subjective Norms	Perceived Control	Intent	Comply				
Attitude									
Subjective Norms	.53*								
Perceived Control	.35*	.37*							
Intent	.77*	.49*	.40*						
Comply	.37*	.41*	.42*	.39*					
N=155; *p <	.0001								

Finally, a covariance structure analysis was done (SAS CALIS) to determine if intention mediated the effect of the three factors on adherence behavior or if perceived behavioral control exerted a direct effect on the behavior apart

from its effect on intention as suggested by Ajzen (41) and represented in Figure 1. The results indicated that the Ajzen TPB model was not an entirely adequate "fit" for the observed data as the lack of fit chi square was statistically significant (p=.027).

Based on the results of the multiple regressions, an alternative model was evaluated that posits direct causal relationships between two of the TPB components (attitude and perceived behavioral control) and intention, and direct causal relationships between two of the TPB components (perceived behavioral control and subjective norms) and compliance. Standardized coefficients are reported in the model represented in Figure 2 because they are more directly comparable with each other than unstandardized coefficients. This model yielded a high goodness of fit index (.9917) and a nonsignificant lack of fit chi square ( $\chi^2$ =3.17; df=2, p=.205), indicating that the model is statistically plausible. The two degrees of freedom represent the two omitted paths: 1) from subjective norms to intention; and, 2) from attitude to medication compliance. The lack of a significant direct path from subjective norms to intention, and the presence of two direct paths from TPB components and compliance refute the hypothesis of complete mediation (i.e., that medication compliance is entirely accounted for by the effects of the TPB components on intention). Also, consistent with the results of the multiple regressions, the model suggests that attitude has a far stronger effect on intention than it does on compliance.



Note. Standardized path coefficients appear on single-headed straight arrows; t values corresponding with starred (\*) coefficients were greater than 2.50 (p<0.01);  $\chi^2$  = 3.17, df=2, p=.205, Goodness of Fit Index (GFI)=.992; and Adjusted GFI for degrees of freedom (AGFI)=.938.

#### Discussion

The Theory of Planned Behavior (TPB) was evaluated for its utility to explain antipsychotic medication adherence among Spanish-speaking, Mexican-American patients with schizophrenia. The TPB instrument demonstrated solid psychometric properties, including high internal consistency, excellent test-retest reliability and good concurrent validity with the ROMI, a well-tested measure of medication adherence in patients with schizophrenia. These findings suggest that the TPB instrument may serve as a reliable and valid measure of the factors associated with medication compliance/noncompliance.

Regarding the predictive validity of the TPB, that is, the extent to which ratings on the TPB Inventory predicted scores on the Treatment Compliance Interview, in general the results supported the Ajzen model (41): medication compliance was based upon the individual's intention to comply, whether significant others think the individual should take medication, and the individual's perception that complying with medication was within his/her control. Intention to comply with taking medication, in turn, was related to both positive attitudes and perceived behavioral control over complying.

Perceived social pressure to comply did not correlate with intention to comply but, nevertheless, did predict actual compliance behavior. The notion that people behave in ways they do not "intend" is not part of the Azjen theoretical model. However, this direct effect of social pressure on compliance behavior could be explained by a related concept; namely, social support. In other words, family members who recognized the importance of medication adherence may have provided instrumental support to their ill relative by helping with practical steps necessary to maintain medication usage such as obtaining, storing, retrieving and tracking medication usage.

Although the present investigation did not collect data on social support, two other studies of Mexican-Americans with schizophrenia did find support for this explanation. In one study, patients who received financial support from family members were more likely to take their medication than those who were self-supporting or just received federal assistance (49). In the other study, family instrumental support predicted higher medication usage even after adjusting for the impact of emotional support, family expressed emotion, and psychiatric symptoms (50). Taken together with the results of these studies, our findings suggest that adherence may be improved in individuals with schizophrenia if family caregivers provide tangible assistance to their ill relatives, rather than attempting to change their attitudes regarding the importance of medication or even their expressed intentions to take it.

tical assistance to facilitate medication compliance was the finding that perceived behavior control, the TPB factor that addresses the availability of tangible resources, was the only one of the three TPB factors that directly predicted compliance intention and behavior. Similar support for the role of perceived behavioral control on compliance derives from research that suggests that individuals with schizophrenia have diminished perceptions of control over their environment (51, 52) and teaching them the skills to effectively manage their own illness leads to greater knowledge about medication, improved skill utilization, and increased adherence to antipsychotic medication (53).

In interpreting the findings, we should note a number of limitations of the current study. The fact that all subjects were Mexican-Americans, and that the TPB Inventory was developed specifically for this group, limits the generalizability of the results to other cultural or ethnic groups. To test the validity and reliability of the TPB model in other cultural or ethnic groups would require future investigators to elicit the beliefs of their target population to create a TPB measure appropriate for that group. Second, most measures employed were self-report. Although self-reports of medication adherence are notoriously unreliable (54), the convergence of multiple sources of information can lead to more accurate assessments (55). Therefore, for the key measure of medication adherence, patient self-report was augmented with reports from a family member and a healthcare professional. Finally, any inferences regarding the relationship between the TPB variables on the one hand, and intention and compliance on the other, are limited by the cross-sectional design of the study, as all these measures were administered within a few days of each other.

The TPB Inventory (based on the Theory of Planned Behavior) is well suited to be the basis for designing an intervention to improve medication adherence in this population for several reasons. TPB is sensitive to the cultural context of the study population. Specifically, the centrality of the family for Mexican-Americans (56) suggests that subjective norms will play a key role in whether or not the patient adheres to treatment. Moreover, the tendency for unacculturated Mexican-Americans to report an external locus of control (57), coupled with their "real world" barriers to the utilization of professional mental health aftercare (58), points to the potential significance of behavioral control.

In addition, the TPB constructs can readily be operationalized and incorporated into a specific intervention program. Such an approach has been successful in reducing high-risk sexual behaviors among HIV-negative heterosexual males receiving treatment for sexually transmitted diseases (59).

Along these lines, in an ongoing study we are using the TPB instrument to gather individualized, culturally sensi-

Further evidence for the importance of providing prac-

tive information on barriers to medication adherence along the three TPB factors. For instance, a given patient may report a strong likelihood of refusing medications because an important relative discourages the use of traditional medicine in favor of "natural" methods such as herbal remedies. Within a multifamily group format, this patient and his/her relatives are provided with psychoeducation about the benefits of medication, as well as the side effects. Group members illustrate this material by reviewing their own histories of remission and relapses related to periods of compliance versus noncompliance with medication. Similarly, the target patient's history of remissions and relapses is reviewed. Additionally, problem-solving exercises are conducted in an attempt to achieve a positive change in the relative's attitudes about medication. Using psychoeducation, problemsolving and cognitive restructuring, attitudes, social/cultural norms and perceptions of lack of control over resources that interfere with medication adherence are systematically addressed.

# **Acknowledgments**

This research was funded by a grant from NIMH (R01 MH 064542) to Dr. Kopelowicz.

# References

- Weiden PJ, Olfson M, Essock S. Medication noncompliance in schizophrenia: Effects on mental health service policy. In: Blackwell B, editor. Treatment compliance and the therapeutic alliance. Amsterdam: Harwood Academic Publishers; 1997. p. 35-60.
- 2. Hoge SK, Appelbaum PS, Lawlor T, Beck JC, Litman R, Greer A, et al. A prospective, multicenter study of patients' refusal of antipsychotic medication. Arch Gen Psychiatry 1990;47(10):949-956.
- Weiden PJ, Olfson M. Cost of relapse in schizophrenia. Schizophr Bull 1995;21(3):419-429.
- 4. Knapp M, King D, Pugner K, Lapuerta P. Non-adherence to antipsychotic medication regimens: associations with resource use and costs. Br J Psychiatry 2004;184:509-516.
- 5. Awad AG, Voruganti LN. New antipsychotics, compliance, quality of life, and subjective tolerability--are patients better off? Can J Psychiatry 2004;49(5):297-302.
- 6. Fenton WS, Blyler CR, Heinssen RK. Determinants of medication compliance in schizophrenia: empirical and clinical findings. Schizophr Bull 1997;23(4):637-651.
- Zygmunt A, Olfson M, Boyer CA, Mechanic D. Interventions to improve medication adherence in schizophrenia. Am J Psychiatry 2002;159(10):1653-1664.
- 8. Sellwood W, Tarrier N. Demographic factors associated with extreme non-compliance in schizophrenia. Soc Psychiatry Psychiatr Epidemiol 1994;29(4):172-177.
- 9. Razali MS, Yahya H. Compliance with treatment in schizophrenia: a drug intervention program in a developing country. Acta Psychiatr Scand 1995;91(5):331-335.

- Buchanan A. A two-year prospective study of treatment compliance in patients with schizophrenia. Psychol Med 1992;22(3):787-797.
- Drake RE, Osher FC, Wallach MA. Alcohol use and abuse in schizophrenia. A prospective community study. J Nerv Ment Dis 1989;177(7):408-414.
- Kashner TM, Rader LE, Rodell DE, Beck CM, Rodell LR, Muller K. Family characteristics, substance abuse, and hospitalization patterns of patients with schizophrenia. Hosp Community Psychiatry 1991;42(2):195-196.
- Owen RR, Fischer EP, Booth BM, Cuffel BJ. Medication noncompliance and substance abuse among patients with schizophrenia. Psychiatr Serv 1996;47(8):853-858.
- 14. Van Putten T, Crumpton E, Yale C. Drug refusal in schizophrenia and the wish to be crazy. Arch Gen Psychiatry 1976;33(12):1443-1446.
- 15. Bartko G, Herczeg I, Zador G. Clinical symptomatology and drug compliance in schizophrenic patients. Acta Psychiatr Scand 1988;77(1):74-76.
- Pan PC, Tantam D. Clinical characteristics, health beliefs and compliance with maintenance treatment: a comparison between regular and irregular attenders at a depot clinic. Acta Psychiatr Scand 1989;79(6):564-570.
- 17. Marder SR, Mebane A, Chien CP, Winslade WJ, Swann E, Van Putten T. A comparison of patients who refuse and consent to neuroleptic treatment. Am J Psychiatry 1983;140(4):470-472.
- McEvoy JP, Apperson LJ, Appelbaum PS, Ortlip P, Brecosky J, Hammill K, et al. Insight in schizophrenia: its relationship to acute psychopathology. J Nerv Ment Dis 1989;177(1):43-47.
- 19. Amador XF, Strauss DH, Yale SA, Flaum MM, Endicott J, Gorman JM. Assessment of insight in psychosis. Am J Psychiatry 1993;150(6):873-879.
- 20. Smith CM, Barzman D, Pristach CA. Effect of patient and family insight on compliance of schizophrenic patients. J Clin Pharmacol 1997;37(2):147-154.
- 21. Van Putten T. Why do schizophrenic patients refuse to take their drugs? Arch Gen Psychiatry 1974;31(1):67-72.
- 22. Fleishhacker WW, Meise U, Gunther V, Kurz M. Compliance with antipsychotic drug treatment: influence of side effects. Acta Psychiatr Scand Suppl 1994;382:11-15.
- 23. Frank AF, Gunderson JG. The role of the therapeutic alliance in the treatment of schizophrenia. Relationship to course and outcome. Arch Gen Psychiatry 1990;47(3): 228-236.
- 24. Takeuchi DT, Sue S, Yeh M. Return rates and outcomes from ethnicity-specific mental health programs in Los Angeles. Am J Public Health 1995;85(5):638-643.
- 25. Day JC, Bentall RP, Roberts C, Randall F, Rogers A, Cattell D, et al. Attitudes toward antipsychotic medication: the impact of clinical variables and relationships with health professionals. Arch Gen Psychiatry 2005;62(7):717-724.
- 26. Becker MH. The health belief model and sick role behavior. Health Educ Monogr 1974;2:409-419.

- Clark NM, Becker MH. Theoretical models and strategies for improving adherence and disease management. In: Shumaker SA, Shron EB, Ocken JK, McBee WL, editors. The handbook of health behavior change. New York: Springer Publishing Company; 1988. p.5-32.
- Kelly GR, Mamon JA, Scott JE. Utility of the health belief model in examining medication compliance among psychiatric outpatients. Soc Sci Med 1987;25(11):1205-1211.
- 29. Budd RJ, Hughes IC, Smith JA. Health beliefs and compliance with antipsychotic medication. Br J Clin Psychol 1996;35(Pt 3):393-397.
- Adams J, Scott J. Predicting medication adherence in severe mental disorders. Acta Psychiatr Scand 2000;101(2):119-124.
- Weiden, P, Rapkin B, Mott T, Zygmunt A, Goldman D, Horvitz-Lennon M, et al. Rating of medication influences (ROMI) scale in schizophrenia. Schizophr Bull 1994;20(2):297-310.
- 32. Babiker IE. Noncompliance in schizophrenia. Psychiatr Dev 1986;4(4):329-337.
- Bebbington PE. The content and context of compliance. Int Clin Psychopharmacol 1995;9(Suppl 5):41-50.
- Erickson DH, Beiser M, Iacono WG. Social support predicts 5-year outcome in first episode schizophrenia. J Abnorm Psychol 1998;107(4):681-685.
- 35. Hudson TJ, Owen RR, Thrush CR, Han X, Pyne JM, Thapa P, et al. A pilot study of barriers to medication adherence in schizophrenia. J Clin Psychiatry 2004;65(2):211-216.
- 36. Blackwell B. Treatment adherence. Br J Psychiatry 1976;129:513-531.
- Olfson M, Mechanic D, Hansell S, Boyer CA, Walkup J, Weiden PJ. Predicting medication noncompliance after hospital discharge among patients with schizophrenia. Psychiatr Serv 2000;51(2):216-222.
- Fishbein M, Ajzen I. Belief, attitude, intention and behavior: an introduction to theory and research. Reading (MA): Addison-Wesley; 1975.
- Ajzen I, Fishbein M. Understanding attitudes and predicting social behavior. Englewood Cliffs (NJ): Prentice-Hall; 1980.
- 40. Ajzen I. Attitudes, personality, and behavior. Chicago: Dorsey Press; 1988.
- 41. Ajzen I. The theory of planned behavior. Organizational Behavior and Human Decision Processes 1991;50:179-211.
- 42. Miller P, Wikoff R, McMahon M, Garrett MJ, Ringel K, Collura D, et al. Personal adjustments and regimen compliance 1 year after myocardial infarction. Heart Lung 1989;18(4):339-346.
- 43. Miller P, Wikoff R, Hiatt A. Fishbein's model of reasoned action and compliance behavior of hypertensive patients. Nurs Res 1992;41(2):104-109.
- 44. Jarvis DA. The role of attitudes and social norms in the compliance of chronic schizophrenics with their antipsy-

chotic medications. Dissertation Abstracts International 1985;46:2065.

- 45. Chiurazzi JH. Schizophrenic patients' decision-making process in regard to medication treatment compliance. Dissertation Abstracts International 1987;48:258.
- 46. Radomsky ED. Measurement and assessment of compliance with an oral haloperidol regimen. Dissertation Abstracts International: Section B: The Sciences & Engineering 1995;56:3461.
- 47. Weiden PJ, Mott T, Curcio N. Recognition and management of neuroleptic noncompliance. In: Shriqui C, Nasrallah H, editors. Contemporary issues in the treatment of schizophrenia. New York: Raven Press; 1995. p.463-485.
- 48. Velligan DI, Lam YW, Glahn DC, Barrett JA, Maples NJ, Ereshefsky L, et al. Defining and assessing adherence to oral antipsychotics: a review of the literature. Schizophr Bull 2006;32(4):724-742.
- Hosch HM, Meyer LD, Barrientos GA, Fierro C, Ramirez JI, Moreno A, et al. Predicting adherence to medication by Hispanics with schizophrenia. Hispanic Journal of Behavioral Sciences 1995;17:320-333.
- Ramirez Garcia JI, Chang CL, Young JS, Lopez SR, Jenkins JH. Family support predicts psychiatric medication usage among Mexican American individuals with schizophrenia. Soc Psychiatry Psychiatr Epidemiol 2006;41(8):624-631.
- Varkey L, Sathyavathi K. Locus of control and other personality variables in psychotics. Psychological Studies 1984;29:83-87.
- 52. Hoffman H, Kupper Z, Kunz B. Hopelessness and its impact on rehabilitation outcome in schizophrenia – an exploratory study. Schizophr Res 2000;43:147-158.
- Eckman TA, Liberman RP, Phipps CC, Blair KE. Teaching medication management skills to schizophrenic patients. J Clin Psychopharmacol 1990;10(1):33-38.
- Byerly MJ, Thompson A, Carmody T, Bugno R, Erwin T, Kashner M, et al. Validity of electronically monitored medication adherence and conventional adherence measures in schizophrenia. Psychiatr Serv 2007;58(6):844-847.
- 55. Velligan DI, Wang M, Diamond P, Glahn DC, Castillo D, Bendle S, et al. Relationships among subjective and objective measures of adherence to oral antipsychotic medications. Psychiatr Serv 2007;58(9):1187-1192.
- Guarnaccia PJ, Parra P. Ethnicity, social status, and families' experiences of caring for a mentally ill family member. Community Ment Health J 1996;32(3):243-260.
- 57. Jenkins JH. Subjective experience of persistent schizophrenia and depression among U.S. Latinos and Euro-Americans. Br J Psychiatry 1997;171:20-28.
- Vega WA, Kolody B, Aguilar-Gaxiola S, Catalano R. Gaps in service utilization by Mexican Americans with mental health problems. Am J Psychiatry 1999;156(6):928-934.
- 59. Kamb ML, Fishbein M, Douglas JM, Rhodes F, Rogers J, Bolan G, et al. Efficacy of risk-reduction counseling to prevent human immunodeficiency virus and sexually transmitted diseases: a randomized controlled trial. JAMA 1998;280(13):1161-1167.

# Appendix

TPB Questionnaire								
	Subject	Name:				Date:		
	Intervie	wer:						
Good:	:		:	:	:	:	_::	Bad
	extremely 3	very 2	some 1	neither 0	some -1	very -2	extremely -3	
I. I feel that ha	aving my proble	ems be mo	re bearable i	is or would k	)e			
2. I feel that m	y functioning b	etter is or v	would be					
3. I feel that ge	etting treatmen	t for my ch	ronic illness	even if I hav	e no sympto	ms is or wo	ould be	
4. I feel that ha	aving to do som	ething un	necessary is	or would be				
5. I feel that m	y drooling is or	would be						
6. I feel that m	y having a bett	er outlook	on life is or v	would be				
7. I feel that ne	eding to reme	mber to tal	ke medicatio	on with me v	vhen I go pla	ces is or wo	ould be	
8. I feel that m	y having bizarro	e behavior	is or would	be				
9. I feel that m	y being like a zo	ombie is or	would be					
0. I feel that m	y doing someth	ning I don't	like to do is	or would be	į			
1. I feel that be	eing held back f	rom doing	things I wa	nt to do is or	would be			
2. I feel that m	y being numb i	s or would	be					
3. I feel that m	y having less er	nergy is or	would be					
4. I feel that m	y shaking is or v	would be						
5. I feel that m	y vomiting is or	would be						
6. I feel that m	y gaining weigl	nt is or wou	uld be					
7. I feel that m	y being sleepy	during the	day is or wo	ould be				
8. I feel that m	y being dizzy is	or would l	be					
9. I feel that m	y feeling better	is or would	d be					
0. I feel that m	y having less fe	ars of anot	her relapse i	is or would b	e			
1. I feel that m	y keeping my e	motions fr	om spurting	is or would	be			
2. I feel that m	y thinking more	e clearly is	or would be					
3. I feel that m	y having slowe	r reactions	is or would	be				
4. I feel that sp	eeding up my	recovery is	or would be	2				
5. I feel that de	ecreasing the ch	nances that	t I will be ho	spitalized ag	ain is or wou	ıld be		
6. I feel that ha	aving my anxiet	y be more	controllable	is or would	be			
7. I feel that m	y feeling differe	ent from ot	her people i	s or would b	e			
8. I feel that m	y keeping weig	ht off is or	would be					
9. I feel that m	y having less se	xual desire	e is or would	be				
) I fool that m								

Likely:	:		:	:	:	:	_::	Unlikely
	extremely 3	very 2	some 1	neither 0	some -1	very -2	extremely -3	
. Generally spe	aking, I want to	o do what	my brother	thinks I shou	ld do			
. Generally spe	aking, I want to	o do what	my other br	other thinks	should do			
. Generally spe	aking, I want to	o do what	my other br	other thinks	should do			
. Generally spe	aking, I want to	o do what	my boss thi	nks I should o	lo			
. Generally spe	aking, I want to	o do what	my therapis	t thinks I sho	uld do			
. Generally spe	aking, I want to	o do what	my mother	thinks I shou	d do			
. Generally spe	aking, I want to	o do what	my father th	ninks I should	do			
. Generally spe	aking, I want to	o do what	my sister th	inks I should	do			
. Generally spe	aking, I want to	o do what	my other sis	ster thinks I sl	nould do			
Generally spe	aking, I want te	o do what	my other sis	ster thinks I sl	nould do			
Generally spea	aking, I want te	o do what	my cousin t	hinks I should	do l			
Generally spea	aking, I want te	o do what	my other co	ousin thinks l	should do			
Generally spea	aking, I want te	o do what	my uncle th	inks I should	do			
Generally spea	aking, I want te	o do what	my other ur	ncle thinks I s	hould do			
. Generally spe	aking, I want te	o do what	my aunt thi	nks I should o	lo			
. Generally spea	aking, I want t	o do what	my other au	unt thinks I sh	ould do			
. Generally spea	aking, I want t	o do what	my stepfath	er thinks I sh	ould do			
. Generally spea	aking, I want t	o do what	my stepmo	ther thinks I s	hould do			
. Generally spea	aking, I want to	o do what	my friend th	ninks I should	do			
Generally spec	aking, I want te	o do what	my other fri	end thinks I s	hould do			
Generally spea	aking, I want te	o do what	my other fri	end thinks I s	hould do			
Generally spea	aking, I want to	o do what	my pastor t	hinks I should	l do			
Generally spea	aking, I want to	o do what	my psychiat	trist thinks I s	hould do			
Generally spe	aking, I want to	o do what	my other do	octor thinks I	should do			
Generally spe	aking, I want to	o do what	my case ma	nager thinks	I should do			
Generally spe	aking, I want to	o do what	my spouse	thinks I shoul	d do			
Generally spe	aking, I want to	o do what	my boy/girl	friend thinks	I should do			
Generally spea	aking, I want to	o do what	my son thin	ks I should d	C			
Generally spe	aking, I want to	o do what	my other so	on thinks I sho	ould do			
Generally spe	aking, I want to	o do what	my daughte	er thinks I sho	uld do			
Generally spe	aking, I want to	o do what	my other da	aughter think	s I should do			
Generally spe	aking, I want to	o do what	my grandm	other thinks	should do			
Generally spe	aking, I want to	o do what	my grandfa	ther thinks I s	hould do			
Generally spea	aking, I want to	o do what	my other gr	andmother t	hinks I should	d do		

Likely:									
	extremely 3	very 2	some 1	neither 0	some -1	very -2	extremely -3		
1will make n	ny problems m	ore bearal	ble						
2will help m	e function bet	er							
3will be nec	essary for my c	hronic illn	ess even if l	have no sym	otoms				
4will not be	necessary								
5will make r	ne drool								
6will give m	e a better outlo	ook on life							
7means I wil	ll have to reme	mber to ta	ike it with m	ne when I go j	olaces				
8will keep m	ne from having	bizarre be	havior						
9will make n	ne feel like a zo	ombie							
10is somethir	ng I won't like t	o do							
11will hold m	e back from do	oing things	s I want to d	0					
12will make n	ne numb								
3will cause r	ne to lose ener	gy							
14Will cause r	ne to shake								
15will make n	ne vomit								
16will make n	ne gain weight								
17will make n	ne sleepy durir	ig the day							
10will make n	ne uizzy								
9wiii maken	ine reer better	anothor ro	lanco						
20will help pi	event lears of a	m courtin	apse						
21will keep fi 22. will help m	e think more c	loarly	g						
23 will slow m	v reactions	learry							
24 will speed	up my recovery	,							
25 will decrea	se the chances	, that I will	he hospital	ized again					
26 will help m	ake my anxiety	be more	controllable	a a a gaint					
27will make r	ne feel differen	t from oth	er people						
28will help m	e keep weight	off	iei peopie						
29will cause r	ne to lose my s	exual desi	re						
30will stop m	e from hearing	voices of	people who	are not reall	y there				

Instructions: Fill in the referent's name on the right hand side of the question. If no such referent exists, write N/A on the right hand side of the question. Refer back to pages 4-6 if necessary. thinks I should take all my antipsychotic medication exactly as prescribed by my doctor every day during this next week. Likely: Unlikely \_\_:\_\_\_: \_\_:\_\_\_: \_:\_ neither very extremely very some some extremely 1 0 3 2 -1 -2 -3 1. My brother 2. My other brother 3. My other brother 4. My boss 5. My therapist 6. My mother 7. My father 8. My sister 9. My other sister 10. My other sister 11. My cousin 12. My other cousin 13. My uncle 14. My other uncle 15. My aunt 16. My other aunt 17. My stepfather 18. My stepmother 19. My friend 20. My other friend 21. My other friend 22. My pastor 23. My psychiatrist 24. My other doctor 25. My case manager 26. My spouse 27. My boy/girl friend 28. My son 29. My other son 30. My daughter 31. My other daughter 32. My grandmother 33. My grandfather 34. My other grandmother 35. My other grandfather 36. Anyone else? A-4

	Perceived Behavioral Control questions
	Likely::::::: Unlikely
	extremely very some neither some very extremely 3 2 1 0 -1 -2 -3
1.	In general, I have a car available to me – either mine, my family's or a friend's – that I can use to go anywhere.
2.	I can use my own money or other people's money to buy the things that I like such as snacks, CDs, or clothes.
3.	I have access to a phone to call whomever I want – my doctor, my family, my friends – whenever I want, and I know their phone numbers or how to obtain them.
4.	I have access to the bus or Metro to go wherever I want.
5.	I have access to my medicines when I want, and I can take them whenever I want.
6.	There are people who remind me when I have to take my medicines.
7.	I can speak with my doctor whenever I want to if I feel bad or if I am having problems with my medication, and he/she will listen and try to help me.
8.	I know the names of the medicines that I am taking.
9.	I know what the medicines I am taking look like.
10.	I know what time I have to take my medicines.
11.	I have a wristwatch or a clock on the wall of my house.
12.	I know how my medications help me.
13.	I have enough money and transportation – mine, my family's or my friends' – to get the medications every time I need to pick them up from the pharmacy.
14.	I have a prescription from my doctor that I can use to get my medications every time I run out of medications.
15.	I have Medi-Cal or other form of health insurance.
16.	I know where the pharmacy is, and I can get there when I need to.
17.	I can talk to the staff of the pharmacy when I feel bad or if I'm having problems with my medication, and they listen and try to help me.
18.	I know where the hospital is.
19.	I know who to call when my symptoms get severe.
20.	Lhave a bus pass.

## Medication Adherence in Schizophrenia

