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Psychosocial Predictors of Medication Adherence among Persons Living with HIV

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Background: Since the introduction of highly active antiretroviral therapy (HAART), many have learned to live with HIV as a chronic illness. Adherence to medical regimens is extremely important for HIV patients. Purpose: To examine the extent to which medication adherence among HIV patients is related to social and psychological variables. Method: Data were gathered among 127 HIV patients (aged from 18–65 years) recruited at their quarterly consultation at Metz Hospital (France). Subjects completed a self-report adherence to medication scale, the Illness Perception Questionnaire (IPQ), the Beliefs about Medicine Questionnaire (BMQ), a French Value System Scale, a treatment satisfaction scale, and sociodemographic measures. Results: Analyses revealed significant associations between adherence and patients' beliefs about treatment, satisfaction with treatment, confidence in the physician, some values ("other people," "god and children"), and duration of treatment and illness. Conclusion: The data suggest that patients' beliefs about treatment are formed to a certain degree in the patients' relationship with the physician. Furthermore, adherence seems to be related to personal values.

Key words: medication adherence, HIV infection, values, believes, self regulatory model

The efficacy of highly active antiretroviral therapy (HAART) offers the possibility of dramatic clinical improvement and prolonged life for persons infected with the human immunodeficiency virus-, or HIV (Karon, Fleming, Steketee, & De Cock, 2001; Murphy et al., 2001). Of the many factors that influence treatment success (e.g., disease stage, antiretroviral treatment history, and presence of resistant strains of HIV), adherence to antiretroviral medications seems crucial in determining the success or failure of antiretroviral therapy (Chesney et al., 2000b; Perno et al., 2002; Van Vaerenbergh et al., 2002). Even occasional nonadherence to HAART may result in virologic failure and the emergence of drug-resistant strains. In one study that documented the high levels of adherence needed for effective HAART, Paterson et al. (2000) reported that virologic failure occurred in 72% of individuals with less than 95% adherence but in only 22% of individuals with 95% or greater adherence.

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Although it is widely recognized that adherence to HAART is vital to treatment success, adherence is often poor (Bangsberg et al., 2000; Lucas, Chaisson, & Moore, 1999; Liu et al., 2001; Nieuwkerk et al., 2001; Paterson et al., 2000). There are many potential reasons for poor adherence. The HAART regimen can be complex, often involving three or more medications, up to eight daily pills, and dietary restrictions. Many individuals experience immediate and long-term side effects including fatigue, nausea, diarrhea, insomnia, abnormal fat accumulation, taste alterations, and peripheral neuropathy (Ammassari et al., 2001; Chesney et al., 2000a). All these factors, combined with the long-term nature of the course of treatment, may result in poor adherence among seropositive individuals.

While there is growing consensus that multicomponent intervention approaches are more effective in enhancing adherence (Haynes, 2002; Roter et al., 1998; Wright, 2000), the mechanisms by which the interventions enhance adherence need clarification.

That situation led Reynolds (2003) to propose a model for antiretroviral (ARV) medication adherence, using Leventhal's self-regulation theory (Diefenbach & Leventhal, 1996; Leventhal et al., 1997) and supporting theoretical and empirical work (e.g., Alonzo & Reynolds, 1995; Reynolds & Alonzo, 2000). Leventhal's theory brings a patient-centered understanding to the dynamic factors involved in adherence.

This theory suggest that people seek to understand their illness by developing a working model or representation of what the illness is, its causes, its effects, how long it will last, and whether it can be cured or controlled. Representations are elaborated through the person's idiosyncratic symptom and illness episodes and information obtained through social and cultural channels. These representations do not necessarily conform to scientific views, but they have been found to guide health behaviors (Reynolds, 2003).

In this view, people are thought to be motivated to minimize their health-related risks and act to reduce health threats in ways consistent with their perceptions of them. This model suggests that adherence to ARV medications will be influenced by whether adherence makes sense to the patient, given his or her particular illness representation. It can be readily seen that several factors that have been identified as particularly important to ARV adherence (e.g., illness experiences, interactions with others, cognitive function) may involve the individual's HIV illness representation.

Illness representations are not the only representations that people form. They may also form representations of treatments. It has been suggested that decisions about taking medication are likely to be informed by beliefs about the medicines as well as beliefs about the illness they are intended to treat or prevent (Horne, 1997). This principle is recognized in a recent report from the Royal Pharmaceutical Society of Great Britain, which has identified the role of medication beliefs in treatment adherence as a priority for future research (Marinker, 1997; Royal Pharmaceutical Society of Great Britain, 1997). Moreover, necessity beliefs and concerns have been shown to relate to adherence in a range of chronic illness (Horne et al., 2004).

The patient-provider relationship has been identified as another important factor influencing adherence to treatment (Roberts, 2002). Aspects of the patient-provider relationship including trust, consistency, and continued interaction have been identified as being particularly important (Baken et al., 2000; Ickovics & Meisler, 1997; Singh et al., 1996). Further, patient adherence to medications has been enhanced when providers give clear explanations and provide full disclosure of potential adverse events, and when they offer encouragement, reassurance, and support (Davis et al., 1997). This pathway is the main subject of the study reported here. In this study, we want to test whether confidence in physician predicts medication adherence directly, and may also predict it indirectly, through patients' beliefs about treatment.

Another class of variable that appears relevant to the problem of adherence is values. Many authors have demonstrated the link between values and behaviors (Rokeach, 1973; Schwartz, 1992; Fischer & Tarquinio, 2002). Indeed, values are often considered as representing the underpinnings of behavior. In this view, people create a system of personal values from their experiences with their physical and social environment, their culture, and so on, and they then proceed to act from this system of values. To put it differently, people decide what is important for them and act accordingly. For instance, we wanted to show how values like "spirituality" influence medication adherence. Although the effect of spirituality on medication adherence per se is undocumented, persons diagnosed with life-threatening illness such as cancer and HIV/AIDS have reported high levels of spirituality (Connor, Wicker, & Germino, 1990; Jenkins, 1995; Zinnbauer et al., 1997), which have been highly correlated with psychological adaptation and good health outcomes (Kaczorowski, 1989; Simoni, Kerwin, & Martone, 2002).

Other recent authors focused on models of adherence with HAART. The most important factors seem to be social support and positive provider interactions (Simoni et al., 2006; Johnson et al., 2006b; Ironson et al., 2005) and also adherence information (regimen, side effects, beliefs about treatment; Starace et al., 2006; Johnson et al., 2006a).

In the present study, we examined how values, confidence in one's physician, and patients' beliefs about their treatment relate to medication adherence. We chose these factors from the self-regulatory model of antiretroviral adherence (Reynolds, 2003). We used structural equation modelling in a diverse sample of HIV-positive men and women to test whether confidence in one's physician was an important factor for patients' beliefs about treatment and for their medication adherence. Moreover, we wanted to analyse the contribution of some values (importance of others, spirituality) to medication adherence.

Method

Data for these analyses came from a cross-sectional study that investigated the relations of psychosocial variables to medication adherence among HIV-positive men and women. Data were collected during 2001.

Participants

HIV-positive adult men and women between the ages of 18 and 65 years who were currently prescribed HAART were eligible for inclusion in this study. No patient refused to participate in this study. Participants were recruited from the Regional Hospital Centre in Metz (France) during their quarterly consultation. Initially, 175 patients responded to recruitment efforts and were screened for the study. After a preliminary introduction to the study, 48 did not meet eligibility criteria. Patients were included if they had been prescribed some medicines for regular use in the treatment of their illness for at least two months prior to the study,

if they are at least 18 years, if they are not psychotic or demented, and if they could read and understand the questionnaire and felt well enough to complete it. The most common reasons for exclusion included participation in other clinical research trials, no current prescription for antiretroviral medication, inability to read or write French, or evidence of significant cognitive impairment. Data from 99 men and 28 women were used in the analyses. The characteristics of the main sample are shown in Table 1 and are described in more detail below.

The majority of the sample was White (84.3%), with 12.6% being Black/African. Thus, the sample is representative of people living with HIV/AIDS in France, with African women slightly underrepresented and White men and women slightly overrepresented (Organisation Mondiale de la Santé, 2002). A slight majority (59.1%) had a high school diploma or less education. The sample was fairly evenly divided between individuals who described their sexual orientation as exclusively heterosexual (56%) and all the others (44%). The average age of the sample was 40 years (SD = 9.20) and the mean time since HIV diagnosis was 96 months (SD = 53). Participants were prescribed an average of 8 (SD = 3.9) daily antiretroviral pills.

Table 1. *Sociodemographic and Medical Features of the Sample*

Variable	$N = 127$	% of Sample
Age (years)	M = 39.7	SD = 9.2
Gender		
Male	99	78
Female	28	22
Ethnicity		
White	107	84.3
Black/African	16	12.6
Other	4	3.1
Relationship		
status Single	60	47.2
Married	20	15.7
Divorced	14	11
Homosexual partnered	19	15
Heterosexual partnered	9	7.1
Widowed	5	3.9
Education		
< High school	27	21.3
High school	48	37.8
Some College	24	18.9
College graduate	28	22
HIV diagnosis		
1981–1990	29	23
1991–1996	48	38.1
1997–2002	49	38.9
HIV mode of transmission		
Homosexual intercourse	55	44
Heterosexual intercourse	30	24
Shared needles	15	12
Blood transfusion	4	3.2
Work accident	2	1.6
Unknown	19	15.2
Initiation of first HAART regimen		
<1996	24	20.7
1997–1999	51	44
2000–2002	41	35.3
Drug class		
Monotherapy	1	0.8
Bitherapy	8	6.7
Tritherapy	102	85.7
Quadritherapy	8	6.7
CD4 cell counts (cellules/mm^3)		
>500	33	43.4
200–500	27	35.5
<200	16	21.1
Viral load		
Detectable	65	51.6
Undetectable	61	48.4
Medication side effects		
Yes	93	73.2
No	34	26.8

Procedure

Informed consent was obtained from all participants prior to participation. Qualified participants completed a battery of psychosocial instruments via face-to-face structured interviews and self-report formats. Each patient was met individually in a hospital office. The investigator stressed that the study was being conducted by the University and was completely independent of the hospital, and that responses were anonymous and would not be seen by any of the staff involved in their care. It was hoped that this would decrease social desirability bias in responses (Abraham & Hampson, 1996).

Measures

Medication Adherence. A self-report adherence to medication scale was devised for this study. This scale was inspired by the medication adherence scale of Tarquinio, Fischer, and Grégoire (2000). Nonadherence was indicated by the tendency to forget to take medication and to deliberately adjust or alter the dose from that recommended by the physician. This scale comprises 16 adherence statements. Three items (e.g., "I sometimes forget to take my medicines" and "I sometimes alter the dose of my medication") are scored on a 6-point Likert scale with reverse scoring (where 1 = always and 6 = never). The remaining thirteen items (e.g., "I take the medicines prescribed by the physician" and "I respect the whole recommendations of my physician") are phrased as direct statements pertaining to the frequency of adjusting medication doses (scored on a 6-point scale where 1 = never and 6 = always). A total medication adherence score is obtained by summing responses to each of the sixteen items. Scores ranged from 16 to 96, with higher scores indicating greater reported adherence.

Values. A scale of reported values was also devised for this study. This scale derives from the work of Rokeach (1973) and Schwartz (1992). HIV patients

were asked to indicate the importance of each value to them, before and after their disease. Items are scored with a 9-point Likert scale (where 0 = not at all important and 9 = very important). Principal component analysis on these items (using the non-orthogonal method of rotation, as recommended by Kline, 1994, and Cattell, 1995) yielded four categories of values, explaining 47% of the variance: "other people" (11 items: respect, tolerance, being understanding with others), "success" (11 items: have a good job, be competitive, richness), "God and children" (5 items: found a family, see the children grow up, believe in god), and "sexuality" (5 items: continue to have sex, the pleasure, love). We have chosen to use these categories of values (used in other studies about AIDS and cancer, Fischer & Tarquinio, 2002) to see their relations to medication adherence.

Beliefs about Medicines Questionnaire (BMQ). The BMQ (Horne et al., 1999) assesses commonly held beliefs about medicines. The BMQ is an 18-item scale used to assess beliefs about the medications one has been prescribed (10 items) and the use of medication in general (8 items). There are four subscales: Specific-Necessity (e.g., "Without my HAART I would be very ill"), Specific-Concerns (e.g., "I sometimes worry about the long-term effects of my HAART"), General-Overuse (e.g., "Doctors use too many medicines"), and General-Harm (e.g., "All medicines are poisons"). Responses to each statement were scored on a 5-point Likert scale (where 1 = strongly disagree, 2 = disagree, 3 = uncertain, 4 = agree, and 5 = strongly agree).

Confidence in Physician. Participants were asked to indicate the level of their confidence in their physician ("how much are you confident in your physician"). The item was scored on a 5-point Likert scale (where 1 = strongly not confident and 5 = strongly confident). Most patients reported being very confident in their physician.

Statistical Analyses

First we calculated descriptive statistics, including means, standard deviations, ranges, and alpha reliabilities of all psychosocial and medication adherence.

Next, to identify potentially confounding variables that would need to be controlled in later analyses, we used bivariate analyses (i.e., Pearson correlations, *t*-tests, and chi-squares) to examine the association of each measure of adherence with sociodemographic factor (i.e., sex, ethnicity, age, education, sexual orientation, and relationship status) and medical-related variables (i.e., time since HIV diagnosis, time since initiation of first HAART regimen, drug class, number of medication in regimen, and viral load), as well as side effects.

Finally, structural equation modelling (SEM) was used to evaluate the proposed model. SEM examines the structural relationships between values, confidence in the physician, and patients' beliefs about treatment, and medication adherence.

SEM analysis was evaluated with the maximum-likelihood estimation and performed with STATISTICA software (version 6.1, Sepath model). Consistent with current recommendations, several goodness-of-fit indices were used in addition to the chi-square statistic that is sensitive to both the assumption of normality and sample size. Specifically, the overall model fit was assessed by examining the root-mean-square error of approximation (RMSEA) index, with values around .05 (the lower bound of the 90% CI under .05) indicating adequate fit (Bollen & Long, 1993; Browne & Cudeck, 1993); the standardized root-mean-square residual (SRMR)index, with values less than .09 as a criterion (Hu & Bentler, 1999); and the comparative fit index (CFI; Bentler, 1990), which indicates an adequate fit with values around .90 or greater (Newcomb, 1990, 1994).

Results

Descriptive Data

Means, standard deviations, ranges, and alpha reliabilities of all psychosocial measures are presented in Table 2. The table also includes means, standard deviations and alpha reliabilities for the level of adherence as assessed by the medication adherence scale.

Bivariate Analyses

In bivariate analyses, none of the adherence variables were related to any sociodemographic or medical-related variable or to side effects (see Table 3). Therefore, none of these variables were controlled in SEM. The only variables significantly related to

Table 2. *Descriptive Statistics for Study Variables among 127 HIV-Positive Individuals*

Factor and Indicators	Range	M	SD	Alpha Reliability
Values	0–9	7.68	1.08	.80
Other people	0–9	5.50	1.69	.78
Success	0–9	4.83	2.34	.69
God and children	0–9	7.53	1.53	.75
Sexuality	0–25	21.79	5.31	.72
BMQ				
Specific-Necessity	0–25	16.06	4.47	.68
Specific-Concerns	0–20	10.92	3.28	.64
General-Overuse	0–20	9.77	3.06	.70
General-Harm	0–5	4.59	0.63	—
Confidence with physician Adherence	0–96	81.37	9.61	.83

Note. BMQ = Beliefs about Medicine Questionnaire.

Table 3. *Determinants of Medication Adherence*

		Medication Adherence Score				
Variables	**Modalities**	N[1]	m	σ	t	p
Age	<39 yrs	60	5.02	0.7	−1.18	NS
	>39 yrs	62	5.15	0.4		
Educational experience	<College	72	5.06	0.6	−0.50	NS
	>College	50	5.11	0.5		
Gender	Male	95	5.03	0.60	−2.02	NS
	Female	27	5.29	0.5		
Relationship status	Single	57	5.10	0.5	−0.53	NS
	Partnered or married	20	5.17	0.4		
HIV mode of transmission	Sexual intercourse	82	5.45	0.7	−0.25	NS
	Blood transfusion	38	5.50	0.6		
Sexual orientation	Homosexual	53	5.40	0.6	−1.68	NS
	Heterosexual	29	5.53	0.7		
Drug class	Mono./Bitherapy	9	4.73	0.5	−2.04	NS
	Tri./Quadritherapy	110	5.13	0.6		
Side effect	Yes	89	5.04	0.6	−1.37	NS
	No	33	5.21	0.5		
Viral load	Detectable	63	5.37	0.7	−1.73	NS
	Undetectable	58	5.55	0.6		
Confidence in physician	Confident	41	5.24	0.7	−2.9	.004
	Very confident	81	5.58	0.6		
Confidence in therapy	Not at all/Not confident	29	5.08	0.8	−3.9	.000
	Confident/Very confident	93	5.58	0.5		
Confidence in medicine	Not at all/Not confident	34	5.14	0.8	−2.4	.018
	Confident/Very confident	88	5.59	0.5		
Beliefs in benefit of therapy	Yes	63	5.63	0.5	3.9	.000
	No	59	5.28	0.7		
Improvement of QoL with treatment	Yes	78	5.57	0.5	3.4	.001
	No	44	5.26	0.7		

[1]The variations observed in the size of the sample are due to missing data (subjects did not want to or could not answer to some questions).

adherence were confidence in physician and confidence with therapy.

We also developed a multivariate model on medication adherence (see Table 4). The variables significantly contributing to medication adherence were duration of treatment, duration of HIV infection (in years) and confidence in physician.

Table 4. *A Multivariate Model on Medication Adherence among 127 HIV-Positive Individuals*

	Medication Adherence		
Variables	**B**	**t**	**p**
Constant	74.39	1.09	.28
Initiation of first HAART regimen (in years)	−0.06	−0.59	.55
Duration of treatment	−0.25	−2.10	.04
Time since HIV diagnosis (in years)	0.29	2.47	.01
Number of prescribed medicines	−0.09	−0.80	.42
CD4 cells count	−0.10	−0.94	.34
Confidence in physician	0.30	2.40	.02
Quality of life	0.21	1.69	.09

Note: Model Characteristics R multiple = .60; R^2 adjusted = .36; $F(7,58) = 4{,}74$, $p = .000$.

Model Testing with SEM

We wanted to test the associations of values, confidence in physician, patients' beliefs about treatment, and medication adherence. We restricted our model to include only variables that correlated with medication adherence (see Table 5). We included three classes of values ("other people," "success," and "God and children"); confidence in one's physician; two of patients' beliefs about treatment (specific-concern and general-harm); and the score for total medication adherence as the end-point of the predictive path.

We tested whether confidence in physician would relate directly to medication adherence, and would relate indirectly, through patients' beliefs about treatment. We also tested the influence of values on medication adherence. Accordingly, we tested a model with three "categories" of predictors of medication adherence: values, confidence in physician, and patients' beliefs about treatment. This model also specified

Table 5. *Intercorrelations among Variables in the Study*

	BMQ Specific Necessity	BMQ Specific Concern	BMQ General Harm	BMQ General Overuse	Physician's Confidence	Values Other People	Values Sexuality	Values God and Children	Values Success
BMQ specific concern	-,06								
BMQ general harm	-,22*	,39**							
BMQ general overuse	-,18*	,25**	,54**						
Physician's confidence	,27**	-,15	-,26**	-,33**					
Values Other people	,17*	-,04	-,04	-,10	,17*				
Values Sexuality	-,00	,13	,13	,11	,02	,27**			
Values God and children	,11	,19*	,10	,04	,09	,45**	,18*		
Values Success	-,10	-,07	-,02	-,03	,24**	,31**	,41**	,06	
Adherence	,31**	-,04	-,25**	-,21*	,31**	,27**	,01	,17*	,20*

*$p < 0.05$; **$p < 0.01$.

physician's confidence as influencing patients' beliefs about treatment.

The overall model has an adequate fit to the data, $X^2(120, N = 127) = 23.16$, $p = .001$, CFI = .96, RMSEA = 0.05 (95% confidence interval = 0.03–0.06), SRMR = 0.07, and all factor loading and specified paths were significant (see Figure 1). In this model, the effect of physician's confidence on adherence is specified to be mediated in part by patients' beliefs about treatment. Greater confidence in the physician had a direct path to adherence. Confidence also had a positive path to stronger beliefs about the necessity of the antiretroviral treatment, which related to greater adherence, and a negative path to the belief that medicines are generally harmful, which related to lower adherence. There were also direct paths from two classes of values ("others" and "God and children") to greater medication adherence.

This, of course, is not the only model that one might specify. It might be argued, for example, that beliefs about medicine influence confidence in the physician, rather than vice versa. To determine how well such an alternative model would account for the relationships among the variables, we also tested a model in which the order of paths for confidence in physician and beliefs about treatment was reversed. This model has a

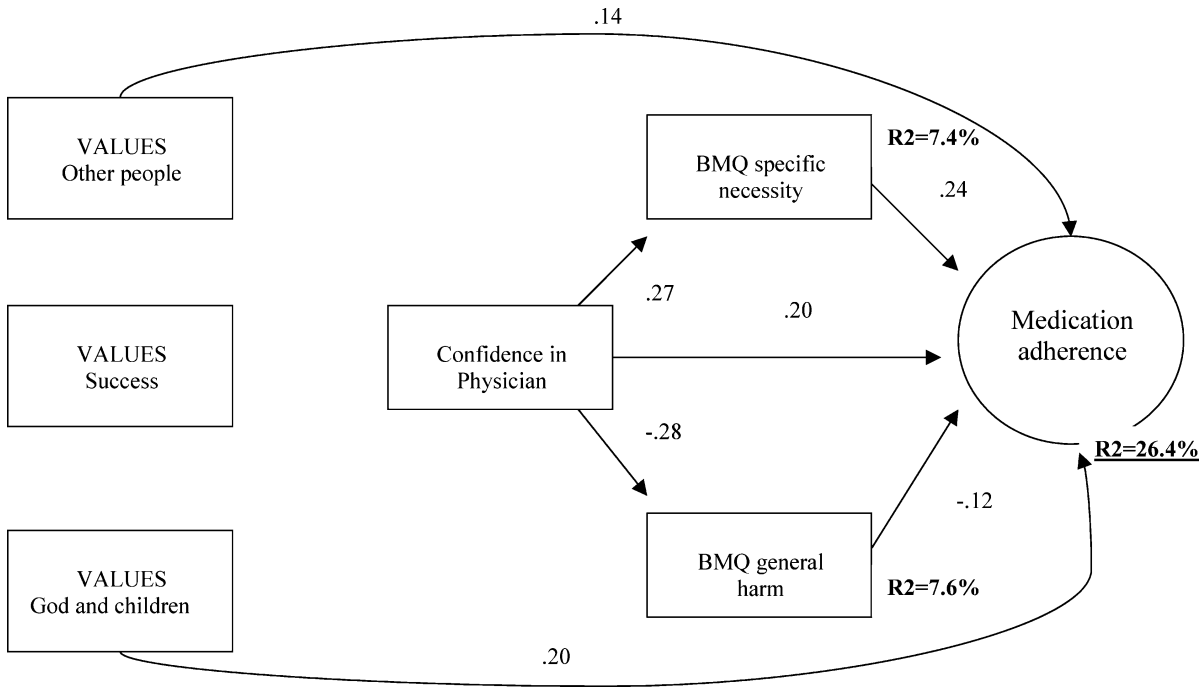

Figure 1. Structural equation model of psychosocial influences on medication adherence among persons living with HIV. All paths are significant ($p < .05$). Model fit statistics were as follows : $X^2(120, N = 127) = 23.16$, p = .001, comparative fit index = .96, root-mean-square error of approximation = 0.05 (95% confidence interval = 0.03–0.06), standardized root-mean-square residual = 0.07.

fit that was less optimal: $X^2(124, N = 127) = 14.84$, $p = .001$, CFI = .95, RMSEA = 0.09 (95% confidence interval = 0.07–0.1), SRMR = 0.08. The first model (shown in Figure 1) therefore was retained as the model that best accounted for the pattern of observed relationships among variables.

Discussion

The present study examines relationships among values, confidence in physician, patients' beliefs about treatment, and medication adherence in a diverse sample of men and women living with HIV. As hypothesized, greater confidence in one's physician was related to greater adherence. Moreover, we found that values and patients' beliefs about treatment also related to adherence. The effect of confidence in the physician was in part mediated by patients' beliefs about treatment. These results are consistent with the self-regulatory model for ARV adherence (Reynolds, 2003). This model suggests that the association between the patient-provider relationship and medication adherence is mediated by HIV illness/medication representation. In other words, the relationship between confidence in physician and adherence is in part positively mediated by patients' beliefs about the necessity of antiretroviral treatment and negatively mediated by patients' beliefs about the harmfulness of medication in general. The data are consistent with the position that patients' beliefs about treatment are formed in part from the patients' relation with the physician (the information that he or she gives about antiretroviral treatment, the side effects, the importance of taking medication regularly). This suggests that the patient-provider relationship is particularly important.

The present study improves on previous research by including all of the theorized variables in a comprehensive model and testing this against an alternative model. Does the relationship between confidence in physician and beliefs about treatment also work in the opposite direction? Although our data did not support this direction of effects clearly, it is possible for the relationship to be bidirectional. Individuals may have some personal beliefs about their treatment and, for that reason, become more or less confident in the physician. Longitudinal modelling of confidence in physician and patients' beliefs about treatment will be necessary to fully understand how this process unfolds over time.

Our results also lend support to the direct link between certain personal values and medication adherence. Valuing tolerance, respectfulness, and understanding toward others predicted greater adherence. Valuing family and beliefs in god also predicted greater adherence. These values ("other people" and "god and children") may be associated with social support, which is well known to be related to adherence (Paterson et al., 2000; Simoni et al., 2006; Weaver et al., 2005). On the other hand, valuing "success" and "sexuality" did not relate to adherence. These findings suggest that it may be useful to emphasize the relevance of certain values as a way of improving medication adherence.

In addition to theory building, our findings have implications for intervention development and clinical practice. They suggest that the social support (measured by valuing other people) received from an affirming other, an information-enhancing relationship, an empathic listener (measured by the confidence with physician), or a spiritual relationship is associated with improved medication adherence. Consequently, adherence may be increased through future efforts to improve individuals' access to social support, whether by encouraging them when safe and appropriate to confide in a partner or close friends or by facilitating their relationships with their medical care providers or with peers who are on similar medication regimens (Cohen et al., 2000; Uchino, 2004).

For spiritually inclined individuals, intervention focused on spiritual coping that could help to maintain a positive attitude and motivation toward health should be explored further. Such interventions could fill a culturally significant need for support (Jenkins & Pargament, 1995). Although we could not examine the effect of knowledge in our model (but we measured beliefs about treatment), prior research has suggested that it is at least a necessary, if not sufficient, factor in adherence and should be addressed. Information about specific medications, adherence strategies, the importance of adherence, and the management of side effects needs to be communicated throughout the course of treatment and not just at initiation. Medication adherence training may also enhance the effects of HAART (Antoni et al., 2006).

Interventions for HIV-positive persons on HAART are especially needed (Simoni et al., 2003). Given the lingering stigma surrounding HIV/AIDS, social support may be especially important for persons on HAART.

The current study has several limitations that should be noted. First, the stability of results from structural equation models depends in part on having a large sample size. This study would have benefited from a larger sample. Moreover, as previously noted, longitudinal modelling of the relationships between confidence in the physician and patients' beliefs about treatment is highly desirable to confirm the proposed relationships. In addition, because we recruited patients during their quarterly consultation and required our participants to be healthy enough to attend a number of assessment appointments, our results may not generalize to those individuals with serious co morbid medical conditions such as cancer or hepatitis, or advanced AIDS. Another limitation is the use of a single unvalidated item to

assess confidence in physician. Future research should use validated scales to assess multidimensional constructs related to patient/physician relationships. Finally, it is desirable that future studies use multiple methods of measuring adherence.

The application of statistical modelling techniques has great potential to advance our understanding of how psychosocial and behavioural factors jointly influence health. The results of the present study reveal that confidence in the physician, mediated partly through patients' beliefs about treatment, predict adherence to the medical regimen in men and women living with HIV. Future HIV medication adherence research should continue to focus on appropriate measurement of constructs (i.e., confidence with physician), the expansion of models to include additional constructs (i.e., social support may mediate the relation between values and adherence), and the application of findings to the development of interventions to enhance HAART adherence among men and women living with HIV.

Future research is needed also to validate this preliminary model, perhaps on larger and demographically different samples and with respect to different chronic illness regimens. Only with a sound theoretical model can the pervasive problem of medication adherence among individuals with chronic illness be understood and effective interventions then devised to assist them.

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