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Information-Motivation-Behavioral Skills Barriers Associated with Intentional versus Unintentional ARV Non-adherence Behavior among HIV-Positive Patients in Clinical Care

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Abstract

Since the arrival of antiretroviral (ARV) therapy, HIV has become better characterized as a chronic disease rather than a terminal illness, depending in part on one's ability to maintain relatively high levels of adherence. Despite research concerning barriers and facilitators of ARV adherence behavior, relatively little is known about specific challenges faced by HIV-positive persons who report "taking a break" from their ARV medications. The present study employed the Information-Motivation-Behavioral Skills Model of ARV Adherence as a framework for understanding adherence-related barriers that may differentiate between non-adherent patients who report "taking a break" versus those who do not report "taking a break" from their ARV medications. A sample of 327 HIV-positive patients who reported less than 100% adherence at study baseline provided data for this research. Participants who reported "taking a break" from their HIV medications without first talking to their healthcare provider were classified as intentionally non-adherent, while those who did not report "taking a break" without first talking with their healthcare provider were classified as unintentionally non-adherent. Analyses examined differences between intentionally versus unintentionally non-adherent patients with respect to demographic characteristics and responses to the adherence-related information, motivation, and behavioral skills questionnaire items. Few differences were observed between the groups on

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demographics, adherence-related information or adherence-related motivation; however, significant differences were observed on about half of the adherence-related behavioral skills items. Implications for future research, as well as the design of specific intervention components to reduce intentionally non-adherent behavior, are discussed.

Keywords

ARV; ART; adherence; HIV; HIV-positive; intentional

INTRODUCTION

Since the introduction of antiretroviral (ARV) therapy, HIV has been transformed from a terminal illness to a manageable chronic disease (Quinn, 2008; Simon, Ho, & Abdool Karim, 2006), contingent upon maintenance of relatively high levels of adherence (Chen, Hoy, & Lewin, 2007; Conway, 2007). Correlates of optimal ARV adherence have been described among various HIV-positive populations (Halkitis, Shrem, & Zade, 2005; Remien, Hirky, Johnson, Weinhardt, Whittier, & Minh Le, 2003; Simoni, Amico, Pearson, & Malow, 2008a,b), and this work has been essential for the development of interventions to help patients overcome adherence-related barriers, increase medication-taking behavior, and improve overall health status (Amico, Harman, & Johnson, 2006; Fisher, Amico, Fisher, Cornman, Shuper, Trayling, et al., 2010; Mannheimer, Morse, Matts, Andrews, Child, Schmetter, et al., 2006; Simoni, Amico, Smith, & Nelson, 2010; Simoni, Pearson, Pantalone, Marks, & Crepaz, 2006).

Despite research concerning correlates of ARV adherence, however, relatively little is known about the specific adherence-related barriers faced by HIV-positive patients who are non-adherent and report “taking a break” from their ARV medication regimen. Although definitions of intentionally versus unintentionally non-adherent behavior vary across health domains, *intentional* non-adherence is generally characterized as the patient’s conscious awareness of and decision *not* to adhere to one’s regimen as prescribed, which may include periods of altering one’s dose requirements or discontinuing one’s medication altogether (Heath, Singer, O’Shaughnessy, Montaner, & Hogg, 2002; Mo & Mak, 2009; Wilson, Laws, Lee, Safren, Skolnik, & Rogers, 2009). *Unintentional* non-adherence is generally characterized as missing doses or pills ‘by mistake,’ or for reasons that are *not* consciously executed decisions (Heath et al., 2002; Mo & Mak, 2009; Wilson et al., 2009). The conceptual distinction between intentional and unintentional non-adherence to medications has been examined in other literatures (e.g., hypertension, bipolar disorder, cancer; Atkins & Fallowfield, 2006; Clatworthy, Bowskill, Rank, Parham, & Horne, 2007; Lehane & McCarthy, 2007), but has received relatively less attention within the ARV adherence domain (Mo & Mak, 2009).

Differentiation between intentional and unintentional non-adherence—and a better understanding of the potentially unique issues associated with each type of non-adherence—is important in that it may offer critical insights to inform the design of interventions aimed at reducing such behavior. There is evidence to suggest that intentional versus unintentional

non-adherent HIV-positive patients may struggle with different adherence-related barriers (e.g., cost of ARVs, managing side effects; Heath et al., 2002; Kumarasamy, Safren, Raminani, Pickard, James, Krishnan, Solomon, & Mayer, 2005; Roberts & Mann, 2003; Wroe & Thomas, 2003). However, little research has examined the particular psychosocial barriers that may distinguish intentional versus unintentional non-adherent HIV-positive patients. A noteworthy exception is a recent study conducted in Hong Kong by Mo and Mak (2009), who found that intentional non-adherent HIV-positive patients reported greater use of avoidant coping strategies than unintentional non-adherent patients. Whether or not these findings may be replicated in a U.S. population, and examination of an array of psychosocial barriers that may differentiate intentional versus unintentional non-adherers, however, has yet to occur.

The current research applied the Information-Motivation-Behavioral Skills (IMB) Model of ARV Adherence (Fisher, Amico, Fisher, & Harman, 2008; Fisher, Fisher, Amico, & Harman, 2006) as a framework for understanding adherence-related barriers that may differentiate intentional and unintentional non-adherent HIV-positive patients. Briefly, the IMB model of ARV adherence posits that sub-optimal adherence results from deficits in adherence-related information, motivation, and behavioral skills. Adherence-related *information* includes factual knowledge about one's medications (e.g., understanding the potential drug interactions and side effects of one's medications; Fisher et al., 2006, 2008), as well as misinformation and heuristics that would deter medication adherence (e.g., belief that ARVs are a government conspiracy to make people ill; Kalichman, 2009). Adherence-related *motivation* encompasses personal motivation (e.g., attitudes toward taking one's medications; Fisher et al., 2006, 2008) and social motivation (e.g., social support for taking one's medications; Fisher et al., 2006, 2008) for adhering to one's ARV regimen. Adherence-related *behavioral skills* consist of an individual's objective ability and perceived self-efficacy to engage in adherence-related behavior (e.g., ability to take one's medications when one's daily routine changes; Fisher et al., 2006, 2008).

The IMB model of ARV adherence is a mediational model, in which adherence-related information and motivation are seen to trigger the development and application of adherence-related behavioral skills to influence adherence behavior over time. Individuals who possess sufficient information and sufficient motivation—but who lack necessary behavioral skills—will be less likely to adhere effectively to their ARV regimen. Empirical support for the IMB model of adherence and the relationships among the specified constructs is available from correlational model-testing and experimental intervention research (e.g., Amico, Barta, Konkle-Parker, Fisher, Cornman, Shuper, et al., 2009; Amico, Fisher, Cornman, Shuper, Trayling, Ferrer, et al., 2009; Amico, Toro-Alfonso, & Fisher, 2005; Fisher et al., 2006, 2008, 2010; Starace, Massa, Amico, & Fisher, 2006). The current study examined the shared and unique adherence-related information, motivation, and behavioral skills barriers reported by intentionally (i.e., “taking a break”) versus unintentionally (i.e., not “taking a break”) non-adherent HIV-positive patients in clinical care settings.

METHODS

Participants

The current study examined baseline data collected as part of a larger, randomized controlled intervention trial (Amico et al., 2009; Fisher et al., 2010) testing the efficacy of an IMB model-based ARV adherence support program for HIV-positive patients in clinical care. Participants were eligible for the study if they were HIV-positive, currently prescribed ARV medications, 18 years of age or older, and able to complete study requirements (i.e., free from substantial cognitive impairment or disability). Analyses for the present study were restricted to 327 HIV-positive participants (i.e., 54.7% of the 597 total participants enrolled at study baseline) who reported less than 100% adherence to their ARV medications on a modified Visual Analog Scale (VAS; Amico, Fisher, Cornman, Shuper, Redding, Konkle-Parker, et al., 2006; Giordano, Guzman, Clark, Charlebois, Bangsberg, 2004). The research was approved by the Institutional Review Boards at the University of Connecticut and at each of the respective clinic study sites.

Procedure

Participants completed an assisted computer-administered self-interview (ACASI) with audio in English in a private area within one of five clinical care sites in Connecticut. The current study examined responses to the demographic items and to an IMB model-based ARV adherence barriers questionnaire, which were collected as part of the baseline assessment.

Measures

Demographic items—Demographic items included self-reports of age, gender, race/ethnicity, sexual orientation, years since HIV-positive diagnosis, history of injection drug use, employment status (e.g., unemployed, retired, employed part-time, employed full-time), and housing status (e.g., stable vs. unstable housing). Appropriate categorical and continuous response options were provided. These items were selected based on previous ARV-adherence studies (e.g., Amico et al., 2009).

LifeWindows Information-Motivation-Behavioral Skills Adherence

Assessment Questionnaire (LW-IMB-AAQ)—Psychosocial barriers to adherence-related behavior were assessed by the LW-IMB-AAQ (LifeWindows Project Team, 2006), a 33-item measure assessing participants' adherence-related information, motivation, and behavioral-skills. Each of the items on the LW-IMB-AAQ can be found in Tables II, III, and IV. Adherence-related *information* was assessed with nine items measured on a 5-point Likert-type scale (*1 = Strongly disagree, 5 = Strongly agree*); adherence-related *motivation* was assessed with ten items measured on a 5-point Likert-type scale (*1 = Strongly disagree, 5 = Strongly agree*); and adherence-related *behavioral skills* were assessed by 14 items on a 5-point Likert-type scale (*1 = Very hard, 5 = Very easy*). Because we were interested in *specific* adherence-related barriers characterizing intentional (i.e., “taking a break”) and unintentional (i.e., not “taking a break”) non-adherent patients, we examined each item-level barrier rather than summing or averaging items into aggregated scales.

ARV Adherence—Patients' ARV medication adherence was assessed as part of the broader ACASI-delivered baseline questionnaire. Participants completed a 3–4 week VAS assessment (Amico et al., 2006; Giordano et al., 2004), which was presented as a line ranging from 0%–100%. Participants were asked to select a point along the continuum (which appeared in intervals of 10%) that reflected their average level of adherence during the past 3–4 weeks for each prescribed medication (Amico et al., 2006). An overall adherence score, representing the average level of adherence across each patient's medication(s), was used to characterize adherence rates among participants in the current study. For the current analysis, we opted to use participants' self-reports on the VAS rather than the modified 3-day ACTG adherence measure (Chesney, Ickovicks, Chambers, Gifford, Neidig, Zqickl, & Wu, 2000) in order to assess adherence rates over a longer period of time.

Intentional versus Unintentional Non-adherence—A single item, “Are you currently taking a break from your HIV medications without first talking with your healthcare provider?” was developed for the present study and used to classify participants as intentional or unintentional non-adherers. Although the item did not specify a particular timeframe during which patients may have been “taking a break,” it did convey a sense of conscious awareness and volitional decision-making on behalf of the patient to deliberately alter or stop taking one's ARV regimen, which is consistent with previous classifications of intentional versus unintentional non-adherence behavior (e.g., Health et al., 2002; Mo & Mak, 2009). Thus, participants who responded “Yes” to the “taking a break” item and who reported less than 100% adherence at study baseline (i.e., non-adherers) were classified as *intentional non-adherers*. Participants who responded “No” to the “taking a break” item and who reported less than 100% adherence at study baseline (i.e., non-adherers) were classified as *unintentional non-adherers*. Note that patients who were on a *physician-initiated* or *prescribed* discontinuation of ARVs were *not* included in the current analysis.

Data Analysis

A series of one-way ANOVAs and Chi-square analyses examined differences between participants classified as intentional (i.e., “taking a break”) versus unintentional (i.e., not “taking a break”) non-adherers with respect to demographic variables and IMB model-based ARV adherence barriers. In order to control for a familywise Type I error that may result from multiple comparisons, statistical significance was set to $p < .01$ (Bland & Altman, 1995; Holland & Copenhaver, 1988). All analyses were conducted with PASW v. 17 (PASW Inc., 2009).

RESULTS

Patient Characteristics

Of 327 HIV-positive patients with less than 100% adherence at baseline, 29 (8.9%) reported currently “taking a break” from their HIV medications without first talking with their healthcare provider. Thus, these 29 participants were classified as intentional non-adherers while 298 participants were classified as unintentional non-adherers. Table 1 summarizes basic demographic characteristics of the overall sample and within each non-adherence category. Chi-square analyses revealed only marginally significant differences between the

groups with respect to race/ethnicity ($p = .06$) and employment status ($p = .07$; such differences must be interpreted with caution, however, due to relatively small cell sizes). No significant differences were observed between intentional versus unintentional non-adherent patients on other demographic variables.

Adherence-related Information—A series of one-way ANOVAs corrected for familywise error examined differences with respect to adherence-related information between intentional versus unintentional non-adherers ($I = Strongly disagree, 5 = Strongly agree$). As illustrated in Table II, only one difference was observed between the groups: intentional non-adherers were more likely to endorse the statement, “As long as I am feeling healthy, missing my HIV medications from time to time is OK,” ($M = 2.20, SD = 1.56$) compared to unintentional non-adherers ($M = 1.61, SD = 1.14$), $F_{(1, 325)} = 6.64, p = .01$. No other differences on information items were observed between the two groups.

Adherence-related Motivation—A series of one-way ANOVAs corrected for familywise error examined differences between intentional versus unintentional non-adherers on each of 10 adherence-related motivation items ($I = Strongly disagree, 5 = Strongly agree$). As illustrated in Table III, only one item was significantly different between the groups: intentional non-adherers were more likely to endorse the statement, “I get frustrated taking my HIV medications because I have to plan my life around them,” ($M = 3.75, SD = 1.61$) compared to unintentional non-adherers ($M = 2.92, SD = 1.57$), $F_{(1, 325)} = 7.31, p = .007$. Although not significant at the $p = .01$ -level, differences were observed at $p = .02$ before the correction on two additional items: intentional (versus unintentional) non-adherers reported greater difficulty taking medications because they remind them of their HIV-positive status, and intentional (versus unintentional) non-adherers reported greater frustration knowing that they have to take their HIV medications every day for the rest of their life.

Adherence-related Behavioral Skills—A series of one-way ANOVAs corrected for familywise error examined differences between intentional versus unintentional non-adherers on each of the 14 adherence-related behavioral skills items ($I = Very hard, 5 = Very easy$). As illustrated in Table IV, significant differences in adherence-related behavioral skills were observed between the groups on several items. Intentional (versus unintentional) non-adherers reported greater difficulty managing their medication side effects ($M = 2.86$ vs. $M = 3.36, F_{(1, 322)} = 6.06, p = .01$); taking their medications because the pills are hard to swallow or taste bad ($M = 3.00$ vs. $M = 3.53, F_{(1, 324)} = 6.94, p = .009$); incorporating their medications into their daily life ($M = 3.10$ vs. $M = 3.70, F_{(1, 325)} = 9.27, p = .003$); taking their medications when they do *not* feel well emotionally ($M = 2.41$ vs. $M = 3.00, F_{(1, 325)} = 6.97, p = .009$); taking their medications when they feel well physically ($M = 3.37$ vs. $M = 3.86, F_{(1, 325)} = 6.59, p = .01$); taking their medications when they do *not* feel well physically ($M = 2.58$ vs. $M = 3.23, F_{(1, 325)} = 9.99, p = .002$); and taking to their healthcare provider about their medications ($M = 3.58$ vs. $M = 4.15, F_{(1, 325)} = 9.36, p = .002$). Thus, in comparison to responses on the adherence-related information or motivation items, differences between intentional versus unintentional non-adherers were more widespread on the adherence-related behavioral skills items.

ARV Adherence—Significant differences were observed on self-reported adherence behavior between intentional versus unintentional non-adherers. The average adherence rate on the 3–4 week VAS measure was 40.94% ($SD = 33.66$) among intentional non-adherent patients compared to 81.40% ($SD = 18.99$) among unintentional non-adherent patients.

DISCUSSION

In the current sample of 327 HIV-positive patients who reported less than 100% adherence to their ARV medications during the past 3–4 weeks, 8.9% ($n = 29$) reported currently “taking a break” from their HIV medication(s) without first talking with their healthcare provider. Few differences were observed between participants classified as intentional (i.e., “taking a break”) versus unintentional (i.e., not “taking a break”) non-adherers on basic demographic variables, adherence-related information, or motivation. However, numerous differences were observed between groups on adherence-related behavioral skills. These preliminary findings highlight the potential utility of targeting such behavioral skills limitations in interventions directed at improving ARV adherence behavior among intentional non-adherent HIV-positive patients.

Results from the present study provide initial identification of the potentially unique psychosocial adherence-related barriers that may prevent intentional non-adherent HIV-positive patients from consistently adhering to their ARV medications. Interestingly, intentional versus unintentional non-adherent HIV-positive patients reported relatively similar levels of adherence-related information and motivation barriers, and differed with respect to only a few individual items. Among the adherence-related behavioral skills items, however, intentional non-adherent patients reporting greater levels of difficulty on approximately half of the behavioral skills items. This is consistent with the theoretical predictions of the IMB model of ARV adherence (Fisher et al., 2006, 2008), which specifies that deficits in behavioral skills constructs may thwart adherence even in the context of appropriate levels of adherence-related information and motivation. For some individuals, it appears that greater deficits in medication-taking behavioral skills may be associated with intentional non-adherent behavior.

Several limitations of the current study should be noted. First, patients’ self-report on the ARV adherence questionnaire and “taking a break” behavior item may be subject to response bias. Procedural safeguards were implemented specifically to mitigate this effect (e.g., assessment of psychosocial adherence-barriers and medication-taking behavior via ACASI software in a semi-private setting). Moreover, there is ample evidence to suggest that self-reported adherence is a reliable measure of actual adherence behavior (Oyugi, Byakikia-Tusiime, Pharm, Charlebois, Kityo, Mugerwa et al., 2004; Simoni, Kurth, Pearson, Pantalone, Merrill, & Frick, 2006; Walsh, Mandalia, & Gazzard, 2002). A second limitation of the present study is that causal inferences between “taking a break” behavior and behavioral skills barriers cannot be inferred due to the cross-sectional nature of the data. Results cannot speak to whether intentional non-adherence limits one’s practical exposure to the behavior and produces deficits in skills secondary to lack of experience or exposure, or if deficiencies in behavioral skills causes adherence to be so arduous that individuals stop taking their dose. Longitudinal research is needed to examine temporal relations or to

suggest some pattern of causality between behavioral skills deficits and “taking a break,” non-adherent behavior. Finally, the present study relied on a single-item response to classify patients as intentional or unintentional non-adherent. Although the percentage of patients classified as intentional non-adherers in the present study (i.e., 8.9%) is comparable to reports in other ARV adherence studies (i.e., 11%, Heath et al., 2002), the single, self-report item may misclassify some patients as intentional or unintentional non-adherers, to the extent that patients may employ cognitive techniques to justify their behavior or fail to accurately acknowledge the source of their behavior, and thus incorrectly respond (and hence classify) themselves on the “taking a break” item. Future work is needed to explore this item as a valid measure of intentional versus unintentional non-adherent behavior, and may benefit from qualitative research that seeks to more fully understand HIV-positive patients’ conceptualization, perception, and awareness of intentional versus unintentional non-adherent behavior.

Despite these limitations, the current results point to the need for adherence-promotion programs to include skills-building and self-efficacy enhancing intervention modules in order to address “taking a break” behavior that could occur in about 10% of a clinic sample. Patient decision-making in the volitional modification of prescribed regimens should be recognized more clearly in the literature and in practice. At minimum, some attention must be given at the intervention and clinical care level to foster open, collaborative discussions with patients about plans to modify or experiences with intentionally altering one’s prescribed ARV regimen, since patients in the present study reported “taking a break” without first discussing it with their healthcare provider. Based on the present findings, patient-provider discussions should also include an exploration of how limitations in behavioral skills may be influencing HIV-positive patients’ conscious awareness of and decision to “take a break” from ARV medications.

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References

- Amico KR, Barta W, Konkle-Parker DJ, Fisher JD, Cornman DH, Shuper PA, Fisher WA. The Information-Motivation-Behavioral Skills model of ART adherence in a Deep South HIV+ clinic sample. *AIDS and Behavior*. 2009; 13(1):66–75. [PubMed: 17876697]
- Amico KR, Fisher WA, Cornman DH, Shuper PA, Redding CG, Konkle-Parker DJ, Barta W, Fisher JD. Visual analog scale of ART adherence: Association with 3-day self-report and adherence barriers. *Journal of Acquired Immune Deficiency Syndrome*. 2006; 42(4):455–459.
- Amico, KR.; Fisher, WA.; Cornman, DH.; Shuper, PA.; Trayling, CA.; Ferrer, RA.; Redding, C.; Norton, W.; Fisher, JD. the LifeWindows Project Team. Impact of an IMB model based adherence promotion software intervention on adherence over time: Outcomes of the LifeWindows Project.

Presentation at the 4th Annual HIV Treatment Adherence Conference of the International Association of Providers in AIDS Care; April 6th, 2009; Miami, FL.

- Amico KR, Harman JJ, Johnson BT. Efficacy of antiretroviral therapy adherence interventions: A research synthesis of trials, 1996 to 2004. *Journal of Acquired Immune Deficiency Syndrome*. 2006; 41(3):285–297.
- Amico KR, Konkle-Parker DJ, Cornman DH, Barta WD, Ferrer R, Norton WE, Trayling C, Shuper P, Fisher JD, Fisher WA. Reasons for ART non-adherence in the Deep South: Adherence needs of a sample of HIV-positive patients in Mississippi. *AIDS Care*. 2007; 19(10):1210–1218. [PubMed: 18071964]
- Amico KR, Toro-Alfonso J, Fisher JD. An empirical test of the Information, Motivation, Behavioral Skills model of antiretroviral therapy adherence. *AIDS Care*. 2005; 17(6):661–673. [PubMed: 16036253]
- Atkins L, Fallowfield L. Intentional and non-intentional non-adherence to medication amongst breast cancer patients. *European Journal of Cancer*. 2006; 42(14):2271–2276. [PubMed: 16644208]
- Bland JM, Altman DG. Multiple significance tests: The Bonferroni method. *British Medical Journal*. 1995; 310:170. [PubMed: 7833759]
- Chen LF, Hoy J, Lewin SR. Ten years of highly active antiretroviral therapy for HIV infection. *The Medical Journal of Australia*. 2007; 186:146–151. [PubMed: 17309405]
- Chesney MA, Ickovics JR, Chambers DB, Gifford AL, Neidig J, Zqickl B, Wu AW. Patient Care Committee & Adherence Working Group of the Outcomes Committee of the Adult AIDS Clinical Trials Group (AACTG). Self-reported adherence to antiretroviral medications among participants in HIV clinical trials: The AACTG Adherence Instruments. *AIDS Care*. 2000; 12(3):255–266. [PubMed: 10928201]
- Clatworthy J, Bowskill R, Rank T, Parham R, Horne R. Adherence to medication in bipolar disorder: A qualitative study exploring the role of patients' beliefs about the condition and its treatment. *Bipolar Disorder*. 2007; 9(6):656–664.
- Fisher, JD. The LifeWindows Project: Changing ART Adherence Behavior. National Institute of Mental Health; 2003. 5R01MH066684
- Fisher, JD.; Amico, KR.; Fisher, WA.; Cornman, DH.; Shuper, PA.; Trayling, C.; Redding, C.; Barta, W.; Lemieux, A.; Altice, F.; Dieckhaus, K.; Friedland, G. for the LifeWindows Team. Computer-based intervention in clinical care setting improves antiretroviral adherence: The LifeWindows Project. 2010. Manuscript submitted for publication (copy on file with author)
- Fisher JD, Amico KR, Fisher WA, Harman JJ. The information-motivation- behavioral skills model of antiretroviral adherence and its applications. *Current HIV/AIDS Reports*. 2008; 5(4):193–203. [PubMed: 18838059]
- Fisher JD, Fisher WA, Amico KR, Harman JJ. An Information-Motivation- Behavioral Skills Model of adherence to antiretroviral therapy. *Health Psychology*. 2006; 25(4):462–473. [PubMed: 16846321]
- Giordano TP, Guzman D, Clark R, Charlebois ED, Bangsberg DR. Measuring adherence to antiretroviral therapy in a diverse population using a visual analog scale. *HIV Clinical Trials*. 2004; 5(2):74–79. [PubMed: 15116282]
- Halkitis PN, Shrem MT, Zade DD, Wilton L. The physical, emotional, and interpersonal impact of HAART: Exploring the realities of HIV seropositive individuals on combination therapy. *Journal of Health Psychology*. 2005; 10(3):345–358. [PubMed: 15857867]
- Holland BS, Copenhaver MD. Improved Bonferroni-type multiple testing procedures. *Psychological Bulletin*. 1988; 104(1):145–149.
- Kalichman, SC. *Denying AIDS: Conspiracy theories, pseudoscience, and human tragedy*. Springer Science + Business Media, LLC; New York, NY: 2009. p. 1-203.
- Lehane E, McCarthy G. An examination of the intentional and unintentional aspects of medication non-adherence in patients diagnosed with hypertension. *Journal of Clinical Nursing*. 2007; 16(4): 698–706. [PubMed: 17402951]
- LifeWindows Project Team. The LifeWindows Information-Motivation-Behavioral Skills ART Adherence Questionnaire (LW-IMB-AAQ). Center for Health, Intervention, and Prevention. University of Connecticut; 2006.

- Mo PKH, Mak WWS. Intentionality of medication non-adherence among individuals living with HIV/AIDS in Hong Kong. *AIDS Care*. 2009; 21(6):785–795. [PubMed: 19806492]
- Oyugi JH, Byakikia-Tsuime J, Charlebois ED, Kityo C, Mugerwa R, Mugenyi P, Bangsberg DR. Multiple validated measures of adherence indicate high levels of adherence to generic HIV antiretroviral therapy in a resource-limited setting. *Journal of Acquired Immune Deficiency Syndrome*. 2004; 36(5):1100–1102.
- Remien RH, Hirky AE, Johnson MO, Weinhardt LS, Whittier D, Minh Le G. Adherence to medication treatment: A qualitative study of facilitators and barriers among a diverse sample of HIV+ men and women in four U.S. cities. *AIDS & Behavior*. 2003; 7(1):61–72. [PubMed: 14534391]
- Roberts KJ, Mann T. Adherence to antiretroviral medications in HIV/AIDS care: A narrative exploration of one woman's foray into intentional nonadherence. *Health Care Women International*. 2003; 24(6):552–564.
- Simon V, Ho DD, Abdool Karim Q. HIV/AIDS epidemiology, pathogenesis, prevention, and treatment. *Lancet*. 2006; 368:489–504. [PubMed: 16890836]
- Simoni JS, Amico KR, Pearson CR, Malow RM. Strategies for promoting adherence to antiretroviral therapy: A review of the literature. *Current Infectious Disease Reports*. 2008a; 10:515–521. [PubMed: 18945394]
- Simoni, J.; Amico, KR.; Pearson, C.; Malow, R. Overview of Adherence to Antiretroviral Therapies. In: Pope, C.; White, RT.; Malow, R., editors. *Global Frontiers in Prevention/Intervention*. New York, NY: Taylor & Francis Publications; 2008b. p. 191-200.
- Simoni JM, Amico KR, Smith L, Nelson K. Antiretroviral adherence interventions: Translating research findings to the real world clinic. *Current HIV/AIDS Reports*. 2010; 7(1):44–51. [PubMed: 20425057]
- Simoni JM, Kurth AE, Pearson CR, Pantalone DW, Merrill JO, Frick PA. Self-report measures of antiretroviral therapy adherence: A review with recommendations for HIV research and clinical management. *AIDS & Behavior*. 2006; 10(3):227–245. [PubMed: 16783535]
- Simoni JM, Pearson CR, Pantalone DW, Marks G, Crepaz N. Efficacy of interventions in improving highly active antiretroviral therapy adherence and HIV-1 RNA viral load: A meta-analytic review of randomized controlled trials. *Journal of Acquired Immune Deficiency Syndrome*. 2006; 43(Suppl1):S23–S35.
- Starace F, Massa A, Amico KR, Fisher JD. Adherence to antiretroviral therapy: An empirical test of the information-motivation-behavioral skills model. *Health Psychology*. 2006; 25(2):153–162. [PubMed: 16569106]
- Walsh JC, Mandalia S, Gazzard BG. Responses to a 1 month self-report on adherence to antiretroviral therapy are consistent with electronic data and virologic treatment outcome. *AIDS*. 2002; 16(2): 269–277. [PubMed: 11807312]
- Wilson, IB.; Laws, MB.; Lee, Y.; Safran, S.; Skolnik, P.; Rogers, W. Patients report multiple intentional and non-intentional barriers to adherence with HIV antiretroviral medications. 4th International Conference on HIV Treatment Adherence (IAPAC); 2009.
- Wroe AL, Thomas MG. Intentional and unintentional nonadherence in patients prescribed HAART treatment regimens. *Psychology, Health, & Medicine*. 2003; 8(4):453–463.

TABLE 1

Demographic Characteristics of *Unintentional* (n = 298) vs. *Intentional* (n = 29) Non-adherent HIV-positive Patients (N = 327)

Variable	Response Options	<i>Unintentional Non-adherers</i> n (%) or M (SD)	<i>Intentional Non-adherers</i> n (%) or M (SD)	Test Statistic (F, <i>p</i> -value)
Gender	Male	174 (58.6%)	13 (44.8%)	F (1, 326) = 2.04, <i>p</i> = .15
	Female	123 (41.4%)	16 (55.2%)	
Race/Ethnicity ¹	African-American	148 (53.6%)	14 (50%)	F (1, 304) = 5.52, <i>p</i> = .06
	Latino	60 (21.7%)	11 (39.3%)	
	White	68 (24.6%)	3 (10.7%)	
Sexual Orientation ²	Heterosexual	225 (82.4%)	25 (89.3%)	F (1, 301) = .85, <i>p</i> = .35
	Homosexual	48 (17.6%)	3 (10.7%)	
Age	Open-response	46.67 (7.95)	44.62 (7.52)	F (1, 322) = 1.76, <i>p</i> = .18
Years HIV-Positive	Open-response	13.42 (6.43)	13.00 (4.59)	F (1, 325) = .11, <i>p</i> = .73
Active IDU ³	No	272 (92.8%)	26 (89.7%)	F (1, 322) = .38, <i>p</i> = .53
	Yes	21 (7.2%)	3 (10.3%)	
Employed ⁴	No	193 (64.8%)	14 (48.3%)	F (1, 327) = 3.09, <i>p</i> = .07
	Yes	105 (35.2%)	15 (51.7%)	
Stable Housing ⁵	No	25 (8.4%)	1 (3.4%)	F (1, 327) = .88, <i>p</i> = .34
	Yes	273 (91.6%)	28 (96.6%)	

¹Categories for Chi-square analyses were restricted to African-American, Latino, and White due to small cell sizes. Other responses included Native-American (*n* = 3), Multiple (*n* = 10), and Other (*n* = 7).

²Categories for Chi-square analyses were restricted to homosexual and heterosexual due to small cell sizes. Additional responses included bisexual (*n* = 20), unsure (*n* = 3), or refuse to answer (*n* = 3).

³Active IDU defined as having engaged in at least one injection use event within the past month.

⁴Employed defined as working part- or full-time, compared to being unemployed, on disability or sick leave, or retired.

⁵Stable housing defined as living in a friend/family's place or residence or in own residence compared to living on the street, in a homeless shelter, or in a halfway house.

TABLE 2

Differences between *Unintentional* (n = 298) vs. *Intentional* (n = 29) Non-adherent HIV-positive Patients (N = 327) on Adherence-related Information

Item	<i>Unintentional Non-adherers</i> M (SD)	<i>Intentional Non-adherers</i> M (SD)	Test Statistic
I know how each of my current HIV medications is supposed to be taken.	4.06 (1.27)	3.89 (1.17)	F (1, 325) = .46, p = .49
I know what to do if I miss a dose of any of my HIV medications.	4.08 (1.28)	4.17 (1.03)	F (1, 325) = .12, p = .72
Skipping a few of my HIV medications from time to time would not really hurt my health.	2.18 (1.46)	2.20 (1.54)	F (1, 324) = .006, p = .94
I know what the possible side effects of each of my HIV medications are.	3.64 (1.40)	3.75 (1.32)	F (1, 325) = .16, p = .68
As long as I am feeling healthy, missing my HIV medications from time to time is OK.*	1.61 (1.14)	2.20 (1.56)	F (1, 325) = 6.64, p = .01*
I understand how each of my HIV medications works in my body to fight HIV.	3.68 (1.39)	3.79 (1.34)	F (1, 324) = .15, p = .69
If I don't take my HIV medications as prescribed, these kinds of medications may not work for me in the future.	4.28 (1.22)	4.13 (1.32)	F (1, 325) = .37, p = .54
I believe that if I take my HIV medications as prescribed, I will live longer.	4.52 (1.09)	4.51 (.82)	F (1, 325) = .000, p = .98
I know how my HIV medications interact with alcohol and street drugs.	4.11 (1.36)	4.31 (1.16)	F (1, 323) = .57, p = .44

1 = Strongly Disagree, 5 = Strongly Agree.

* Significant at the p .01 level after correction.

TABLE 3

Differences between *Unintentional* (n = 298) vs. *Intentional* (n = 29) Non-adherent HIV-positive Patients (N = 327) on Adherence-related Motivation

Item	<i>Unintentional Non-adherers</i> M (SD)	<i>Intentional Non-adherers</i> M (SD)	Test Statistic
I am worried that other people might realize that I am HIV+ if they see me taking my HIV medications.	3.26 (1.59)	3.55 (1.50)	F (1, 325) = .88, p = .34
I get frustrated taking my HIV medications because I have to plan my life around them. **	2.92 (1.57)	3.75 (1.61)	F (1, 325) = 7.31, p = .007 **
I don't like taking my HIV medications because they remind me that I am HIV+.	2.60 (1.59)	3.31 (1.56)	F (1, 325) = 5.16, p = .02
I feel that my healthcare provider takes my needs into account when making recommendations about which HIV medications to take.	4.31 (1.17)	4.24 (1.32)	F (1, 324) = .10, p = .74
Most people who are important to me who know I'm HIV positive support me in taking my HIV medications.	4.25 (1.35)	4.03 (1.45)	F (1, 318) = .65, p = .42
My healthcare provider doesn't give me enough support when it comes to taking my medications as prescribed.	1.76 (1.30)	1.93 (1.46)	F (1, 325) = .41, p = .52
It frustrates me to think that I will have to take these HIV medications every day for the rest of my life.	3.10 (1.64)	3.82 (1.48)	F (1, 325) = 5.21, p = .02
I am worried that the HIV medications I have been prescribed will hurt my health.	2.34 (1.40)	2.58 (1.45)	F (1, 325) = .79, p = .37
It upsets me that the HIV medications I have been prescribed can affect the way I look.	2.34 (1.40)	2.58 (1.45)	F (1, 325) = 2.36, p = .12
It upsets me that the HIV medications I have been prescribed can cause side effects.	2.71 (1.54)	3.17 (1.48)	F (1, 325) = .25, p = .61

1 = Strongly Disagree, 5 = Strongly Agree.

* Significant at the p .01 level after correction.

** Significant at the p .001 level after correction.

TABLE 4

Differences between *Unintentional* (n = 298) vs. *Intentional* (n = 29) Non-adherent HIV-positive Patients (N = 327) on Adherence-related Behavioral Skills

Item	<i>Unintentional Non-adherers</i> M (SD)	<i>Intentional Non-adherers</i> M (SD)	Test Statistic
There are times when it is hard for me to take my HIV medications when I drink alcohol or use street drugs ¹ .	3.03 (1.71)	3.43 (1.71)	F (1, 200) = .82, p = .36
How hard or easy is it for you to stay informed about HIV treatment?	3.74 (1.07)	3.72 (1.09)	F (1, 325) = .007, p = .93
How hard or easy is it for you to get the support you need from others for taking your HIV medications?	3.88 (1.09)	3.93 (.88)	F (1, 325) = .04, p = .84
How hard or easy is it for you to get your HIV medication refills on time?	4.13 (.86)	3.86 (1.18)	F (1, 325) = 2.42, p = .12
How hard or easy is it for you to take your HIV medications when you are wrapped up in what you are doing?	3.48 (1.01)	3.41 (1.18)	F (1, 325) = .13, p = .71
How hard or easy is it for you to manage the side effects of your HIV medications?*	3.36 (1.03)	2.86 (1.24)	F (1, 322) = 6.06, p = .01*
How hard or easy is it for you to remember to take your HIV medications?	3.65 (.98)	3.37 (1.11)	F (1, 325) = 2.00, p = .15
How hard or easy is it for you to take your HIV medications because the pills are hard to swallow, taste bad, or make you sick to your stomach?***	3.53 (1.05)	3.00 (1.03)	F (1, 324) = 6.94, p = .009**
How hard or easy is it for you to make your HIV medications part of your daily life?***	3.70 (.99)	3.10 (1.11)	F (1, 325) = 9.27, p = .003**
How hard or easy is it for you to take your HIV medications when your usual routine changes?	3.26 (1.08)	2.89 (1.01)	F (1, 324) = 3.06, p = .08
How hard or easy is it for you to take your HIV medications when you do not well good emotionally?***	3.00 (1.16)	2.41 (1.05)	F (1, 325) = 6.97, p = .009**
How hard or easy is it for you to take your HIV medications when you feel well physically and don't have any symptoms of your HIV disease?*	3.86 (.97)	3.37 (1.01)	F (1, 325) = 6.59, p = .01*
How hard or easy is it for you to take your HIV medications when you do NOT feel well physically?*	3.23 (1.05)	2.58 (.94)	F (1, 325) = 9.99, p = .002*
How hard or easy is it for you to talk to your healthcare provider about your HIV medications?*	4.15 (.92)	3.58 (1.21)	F (1, 325) = 9.36, p = .002*

1 = Very Hard, 5 = Very Easy.

¹ Excludes participants who reported that they do not drink alcohol or use street drugs (n = 122). Note that the response option for this item was 1 = Strongly Disagree, 5 = Strongly Agree.

* Significant at the p .01 level after Bonferroni correction.

** Significant at the p .001 level after correction.