Feature

# *Motivation as a Mechanism for Daily Experiences' Effects on HIV Medication Adherence*

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*Medication adherence is a challenge for people living with HIV (PLWH), who may experience a gap between their intentions and everyday behaviors. We measured PLWH's (*n = *87) daily experiences and tested a model to explain the intention-behavior gap. Participants completed baseline questionnaires, then used a smartphone-based survey and an electronic pill bottle to provide daily data for the next 10 weeks. These PLWH, with generally well-controlled HIV, were nevertheless adherent on only 73% of study days. Multilevel analyses were used to test predicted relationships between variables (*n = *58). Four of five theory-based daily measures predicted motivation for antiretroviral therapy (betas = 0.06-0.10), and motivation, in turn, predicted adherence. Consistent with our theory, control beliefs, mood, and social support had indirect effects on adherence. However, stress and coping did not. Daily experiences affect adherence, even in PLWH with well-controlled HIV. Providers should ask about everyday changes in motivation.*

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Imagine a patient, Mr. S., who is prescribed antiretroviral therapy (ART) for HIV. His health care provider, Dr. T., counsels Mr. S. that persons living with HIV (PLWH) must use medication almost perfectly—at least 95% of doses taken—to gain the desired benefits of ART (Bangsberg et al., 2006; Paterson, Swindells, & Mohr, 2000). Because Dr. T. also knows that ART adherence tends to be low even for newer medications (Langness, Cook, Gill, Boggs, & Netsanet, 2014), he asks Mr. S. to complete the Morisky adherence scale (Morisky, Green, & Levine, 1986) at his next clinic visit. Mr. S. indicates on the measure that he "always or almost always" takes his medication as prescribed, and that he missed no more than two doses per month. Both Mr. S. and Dr. T. are, therefore, surprised to learn that Mr. S.'s HIV viral load (VL) remains high. Before suggesting a change in medication regimen, Dr. T. asks for a consult from a pharmacist co-located in the HIV

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clinic, who recommends further evaluation of adherence using an electronic pill-bottle monitoring device. When that device is read 1 month later, both Dr. T. and Mr. S. are surprised to learn that Mr. S. was less adherent than he thought: seven missed doses in the month, for an overall 75% adherence rate. Given that Mr. S. did not appear to have been deliberately deceiving Dr. T., what happened here?

## Literature Review

### Differences Between Retrospective and In-the-Moment Measures of Experience

As with most health behaviors, medication adherence actually occurs as a series of discrete events in patients' day-to-day lives. Health care providers might view taking medication as the single most important activity of a patient's day, but this is not the patient's perspective (Koop, 1985). As is the case for most people, Mr. S. experienced his life as a series of discrete psychological events or *momentary states*. These affected his actions, and his behavior also occurred as a series of discrete momentary activities (Reis, 2012; Shiffman, Stone, & Hufford, 2008). Even behaviors that are usually habitual, such as medication adherence, can be affected by day-to-day variability in mood, motivation, or other factors that serve as either barriers or facilitators to adherence behavior (Cook, Schmiege, Starr, Carrington, & Bradley-Springer, 2017). Unfortunately, models of behavior that have been developed based on retrospective measures of patients' experiences may not generalize to the prediction of moment-by-moment behavior (Riley et al., 2011) because aggregate retrospective questions (e.g., *On average, how adherent were you over the past week?* or *How did you feel on most days in the past week?*) tap into memory and language rather than into the immediacy of momentary events (Kahneman, 2011). This cognitive filtering of events (Schwartz, 2012) is what accounts for the discrepancy between Mr. S.'s actual medication-taking behavior in the moment, and his beliefs about his behavior as indicated on Dr. T.'s questionnaire. Mr. S. sees himself as an adherent person, and therefore, he unintentionally misremembers his actual behavior. In clinical practice, about 20% of PLWH who are prescribed ART have levels of adherence too low to achieve treatment goals (Langness et al., 2014; White House Office of National AIDS Policy, 2016), and we suggest that state-trait discrepancies between people's beliefs and behaviors explain at least part of this gap.

Because of cognitive biases in memory and language, measures of the same construct from the same person with respect to the same period of time can nevertheless show substantial and clinically important differences from retrospective reports when they are collected in real time (Ptacek, Pierce, & Thompson, 2006). New mobile technologies facilitate the collection of intensive longitudinal data from frequent measures of patient experiences close to the times when they occur. This research strategy, known as ecological momentary assessment, is illustrated in the clinical example above where the pharmacist used technology to monitor adherence in real time. When using this approach, a shorter duration between experience and its evaluation means that self-report measures are less affected by post hoc cognitive editing. Discrepancies between real-time and post hoc data collection have also been found in studies of PLWH (Mustanski, 2007).

Differences between momentary behaviors and retrospective measures of behavior may explain the relative weakness of current adherence interventions. Programs to improve ART adherence have low-to-moderate effect sizes (Finitsis, Pellowski, & Johnson, 2014; Simoni, Amico, Pearson, & Malow, 2008; Van Camp, Van Rompaey, & Elseviers, 2013), a finding in line with a Cochrane review that reported small-to-moderate effects for all current interventions to improve medication adherence (Nieuwlaat et al., 2014). Despite its importance in ART, treatment adherence is a problem that resists solutions despite good intentions and sincere efforts by both patients and health care providers. Rather than focusing on the question, *Which patients are non-adherent?*, a study of momentary state data can address the potentially more clinically useful question, *Under what circumstances are patients non-adherent?* (Dunbar-Jacob & Mortimer-Stephens, 2001). This might, in turn, lead to a better understanding of the barriers and facilitators of adherence behavior that are amenable to in-the-moment change.