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Adherence

Time perspective and medication adherence among individuals with hypertension or diabetes mellitus☆

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ABSTRACT

Objective: The study determined if time perspective was associated with medication adherence among people with hypertension and diabetes.
Methods: Using the Health Beliefs Model, we used path analysis to test direct and indirect effects of time perspective and health beliefs on adherence among 178 people who participated in a community-based survey near Washington, D.C. We measured three time perspectives (future, present fatalistic, and present hedonistic) with the Zimbardo Time Perspective Inventory and medication adherence by self-report.
Results: The total model demonstrated a good fit (RMSEA = 0.17, 90% CI [0.10, 0.28], $p = 0.003$; comparative fit index = 0.91). Future time perspective and age showed direct effects on increased medication adherence; an increase by a single unit in future time perspective was associated with a 0.32 standard deviation increase in reported adherence. There were no significant indirect effects of time perspective with reported medication adherence through health beliefs.
Conclusion: The findings provide the first evidence that time perspective plays an under-recognized role as a psychological motivator in medication adherence.
Practice implications: Patient counseling for medication adherence may be enhanced if clinicians incorporate consideration of the patient's time perspective.

1. Introduction

The 100 million U.S. residents with hypertension or diabetes often struggle with medication adherence [1]. On average, 65% of individuals report being non-adherent in some way [2]. Their nonadherence contributes to many preventable consequences, including $100 billion in medical expenses [3], 33% of hospital or nursing home admissions, and 124,000 deaths annually [4]. Furthermore, the high prevalence of nonadherence among people with chronic diseases complicates attempts to ascertain the real benefits of medical care [5], and it increases risk of stroke and other adverse cardiovascular events [1]. Interventions improving medication adherence would help mitigate medical risks and reduce costs of chronic disease management.

Converting discoveries about risk factors into knowledge about individual motivation remains a central issue in adherence research. For example, some studies associate better adherence with older age [6] or having less education [7], where others report increased nonadherence among people using more medicines or more frequent dosing [4]. Time since diagnosis can be another predictor of lower adherence [4,8,9]. In one study, the percentage of individuals reporting nonadherence rose from 6 to 66% three years after diagnosis [9]. In all, demographic and biomedical variables are largely external factors that individuals can neither determine nor modify.

1.1. Role of psychological factors in understanding medication adherence

1.1.1. Health beliefs

Psychological frameworks may offer useful insights into factors that influence medication adherence beyond demographic and biomedical influences [7]. They flexibly provide explanatory concepts or change theories to decipher how health habits develop over a lifetime, allowing clinicians to prescribe more holistic strategies for patient-centered chronic disease management [1,10–12]. As Brown and Segal write, there is a broad understanding that "the decision to comply with medical regimens ultimately lies with the patient within the context of [his or her] beliefs and

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values" (p. 903) [13–15]. Individuals who have chronic diseases, like hypertension and diabetes, can make a series of trade-offs after receiving new medical information along six distinct dimensions: (1) perceived severity or interference with physical and mental functioning, (2) perceived potential threat from a medical condition, (3) perceived barriers to behavior change, (4) perceived benefits of behavior change, (5) behavioral cues, and (6) modifying factors [13].

Early publications primarily reference the first four perceptions [13,16]. The perceived severity dimension depicts feelings about a chronic condition's seriousness and evaluations of consequences for changes in health status. The perceived susceptibility domain reflects how vulnerable a person believes he or she is to secondary complications. Perceived benefits describe the degree to which an individual believes specific treatments will be successful for curing or managing a condition. Finally, the perceived barriers domain represents the awareness of challenges that impede individuals from taking necessary actions to improve their health [13].

Several studies largely attribute the motivation surrounding adherence to two health beliefs- an individual's subjective perception of risk of complications related to chronic diseases (susceptibility) and the risk of interference with physical or mental functioning (disease severity) [1,13,14]. Investigators apply these concepts in studies involving prevention or asymptomatic conditions, including initial hypertension or cardiovascular disease screening, if they expect internal motivators match or exceed overt symptoms' influence on medical outcomes [12,17]. A recent meta-analysis of 27 investigations offers that people who believe diabetes is more dangerous are more compliant with drug regimens, but those who do not describe diabetes as severe are on average 22% less likely to be adherent [10]. There is similar information on perceived susceptibility and medication-taking behaviors. Notably, findings show that individuals with higher adherence have elevated awareness of susceptibility to medical complications in the future.[14] Inaccurate or biased perceptions of disease severity or of one's susceptibility to health consequences of the disease may lead to unhealthy decisions.

1.1.2. Time perspective

There is potential that time perspective, working as a backdrop for health beliefs, influences the strength and direction of associations with several health behaviors and motivates medication adherence. Time perspective characterizes whether an individual has an orientation toward the present or future [18]. This motivator represents a person's subconscious way of making sense of experiences from the past, prioritizing actions in the present, and setting goals for the future [18]. Among supporting evidence, adults with elevated future time perspectives have reported better exercise habits [19,20], regular condom use for HIV prevention [20], less substance abuse [20], better psychological well-being, effective behavioral coping, and higher sense of control [21]. On the other hand, individuals whose prominent time perspective emphasizes the present, and particularly those whose decision-making process can be motivated by immediate gratification or a strict belief in predetermined fate, more often endorse more substance abuse, risky sexual practices [20], problem gambling [22], less sense of control, more negative affect, and use of angry or maladaptive coping [21]. In effect, a person with a dominant future outlook may invest energies toward anticipated long-term consequences and healthier outcomes, whereas those with predominantly present time perspectives may not prioritize behaviors according to similar uncertain or delayed outcomes.

Time perspective may further add context to how we understand motivations underlying medication-taking behaviors. For example, individuals with a dominant present-hedonistic outlook may be less adherent because they make immediate gratification and avoiding discomfort their priorities; nonadherence may minimize inconvenience, undesired lifestyle changes or side effects. Similarly, people with present-fatalistic outlooks, denoted by a strong belief in predetermined fate, may have little faith that efforts at better adherence will improve their current or future health. Lastly, those with more future-oriented time perspectives may invest their daily energies toward lifestyle changes that can improve health status over time.

1.2. Research questions

In this study, we tested associations between measures of time perspective, health beliefs, and medication adherence. We hypothesized that health beliefs regarding disease severity and susceptibility would be proximate determinants of medication adherence, and that time perspective would in turn influence beliefs regarding disease severity and susceptibility. We sought to answer two questions with mediation analyses: Is time perspective directly associated with medication adherence among participants with hypertension or diabetes? Is time perspective indirectly associated with medication adherence through beliefs about disease severity and susceptibility to complications?

2. Methods

We conducted our study in three cities near Washington, D.C. – Silver Spring, Maryland; Hagerstown, Maryland; and Martinsburg, West Virginia. To recruit multicultural community samples, we surveyed patrons of beauty shops and barbershops in ethnically-diverse neighborhoods, including those that were working-class and more affluent. We chose to collect data in community settings rather than clinical settings to reduce the possible incentive to exaggerate reports of adherence in efforts to appease care providers. We met with patrons to explain the study, determine eligibility, and obtain verbal informed consent. The inclusion criteria were being 18-years-old or older, being literate in English, and being able to provide informed verbal consent. Study protocol and informed consent procedures were approved by our Office of Human Subjects Research.

Participants completed a 6-page written questionnaire on demographic characteristics and three subscales of the Zimbardo Time Perspective Inventory (ZTPI).[18] We asked people who reported having either hypertension or diabetes to complete additional questions on health beliefs, use of medications, and the Morisky Medication Adherence Scale (MMAS).[23] Of 791 participants, 268 reported that a physician had diagnosed them with hypertension or diabetes, of whom 178 individuals reported taking medications for either or both conditions at the time of the survey.

2.1. Measures

2.1.1. Medication adherence

The MMAS has four items to assess the degree of medication adherence. The questions ask, "Do you ever forget to take your medicine? Are you careless at times about taking your medicine? When you feel better do you sometimes stop taking your medicine? Sometimes if you feel worse when you take the medicine, do you stop taking it?" Participants respond either "yes" or "no" for items, providing a total score up to 4. Responses are then reverse coded to produce five categorical levels (0 = *completely nonadherent*, 1 = *slightly adherent*, 2 = *adherent on average*, 3 = *mostly adherent*, 4 = *completely adherent*). The four-item MMAS possesses admittedly marginal internal reliability with Cronbach's alpha ratings of 0.60 among hypertension responses and 0.48 among diabetes responses. However, the scale has been a mainstay in clinical research, and has demonstrated construct and predictive