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Validation of theoretical pathway between discrimination, diabetes self-care and glycemic control

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ABSTRACT

Aims: This study examined the mechanisms through which discrimination influences diabetes self-care and glycemic control in patients with diabetes by using structured equation modeling.
Methods: 615 patients were recruited from two adult primary care clinics in the southeastern United States. Measures were based on a theoretical model and included perceived discrimination, social support, social cohesion, and perceived stress. Structured equation modeling examined the relationship with diabetes self-care and glycemic control.
Results: The final model (chi2(211) = 328.82, $p < 0.0001$, $R^2 = 0.99$, RMSEA = 0.03 and CFI = 0.98) shows that higher stress is directly significantly related to a decreased self-care ($r = -0.59$, $p < 0.001$) and increased HbA1c ($r = 0.27$, $p < 0.05$). There was no significant direct association between discrimination, social support or social cohesion, and glycemic control or self-care. There was, however, a direct significant association between increased discrimination ($r = 0.46$, $p < 0.001$), decreased social support ($r = -0.34$, $p < 0.001$), increased social cohesion ($r = 0.14$, $p < 0.05$) and increased stress.
Conclusions: These results support the hypothesized pathway of discrimination on health outcomes, showing both a direct and indirect influence through stress on HbA1c in adults with diabetes. Understanding the pathways through which discrimination influences diabetes outcomes is important for providing more comprehensive and effective care. These results suggest future interventions targeting patients with diabetes should take discrimination-induced stress into account.

1. Introduction

Diabetes is the 7th leading cause of death in the United States, affecting 29.1 million people, or 9.3% of the population (Centers for Disease Control and Prevention: National Diabetes Statistics Report, 2014). Individuals with diabetes are at an increased risk of blindness, kidney failure, heart disease, stroke, and amputation, as well as, at a 50% higher risk of death than those without diabetes (Centers for Disease Control and Prevention: National Diabetes Statistics Report, 2014). In addition, medical expenditures of those with diabetes are 2.3 times higher than those without diabetes, and totaled $245 billion in the United States in 2012 (Centers for Disease Control and Prevention: National Diabetes Statistics Report, 2014).

Research indicates discrimination is an important possible risk factor for health outcomes, including trajectory for chronic diseases such as diabetes (Pascoe & Richman, 2009; Williams & Mohammed, 2009; Williams, Neighbors, & Jackson, 2003). Discrimination refers to differential treatment of certain members of a society by either individuals or social institutions (Williams & Mohammed, 2009). Those experiencing discrimination are aware of the discriminatory behavior, and their perception of this discrimination can generate stress (Clark, Anderson, Clark, & Williams, 1999; Williams & Mohammed, 2009). While discrimination research often focuses on racial/ethnic discrimination, studies have found perceptions of non-race based discrimination similarly influences health; and in a study of patients with diabetes, discrimination based on education level was shown most significant (Reynolds, Walker, Campbell, & Egede, 2015; Williams & Mohammed, 2009). The stress literature suggests the ability to manage new stressors is reduced by existing stressors (Cohen, Janicki-Deverts, & Miller, 2007). Therefore, given the high psychological and behavioral burden of diabetes, it is important to understand how perceived discrimination relates to other stressors and/or combines with them to influence outcomes in diabetes (Pascoe & Richman, 2009; Williams & Mohammed, 2009).

Conflict of Interest: The authors report no potential conflicts of interest relevant to this article.

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Studies show a consistent inverse relationship between perceived discrimination and health, including self-rated health, physical functioning, and hemoglobin A1c (Gonzales, Lambert, Fu, Jacob, & Harding, 2014; Krieger, 1999; Paradies, 2006; Pascoe & Richman, 2009; Piette, Bibbins-Domingo, & Schillinger, 2006; Wagner, Tennen, Feinn, & Osborn, 2015; Williams & Mohammed, 2009; Williams et al., 2003). It has been hypothesized that potential pathways for this relationship include psychological and physiological stress responses, and health behaviors (Clark et al., 1999; Cuevas et al., 2013; Pascoe & Richman, 2009; Williams et al., 2003). For example, Chen and Yang found that an indirect association between discrimination and health status existed through health behaviors (physical activity, sleep quality, fruit and vegetable intake, and smoking intensity) and the presence of chronic disease (Chen & Yang, 2014). In patients with diabetes, it has been suggested that discrimination leads to unhealthy behaviors, such as increased screen time, cigarette smoking, alcohol use, drug use, and lack of seeking preventative services such as A1c testing or eye exams for diabetes (Dawson, Walker, Campbell, & Egede, 2015; McNeill, Kreuter, & Subramanian, 2006; Pascoe & Richman, 2009; Trivedi & Ayanian, 2006; Williams & Mohammed, 2009; Womack et al., 2014). My physiologically based hypothesis suggest that stress can accelerate cellular aging, and the experience of chronic stress can lead to dysregulation in multiple biological systems, creating premature illness and increasing risk of mortality (Pascoe & Richman, 2009; Seeman et al., 2004; Williams & Mohammed, 2009). In addition, acute experiences of stress can lead to cardiovascular reactivity, as seen by increased in blood pressure, and increased stress hormones are related to blood glucose levels (Surwit & Schneider, 1993; Williams & Mohammed, 2009).

Little research has been done to fully understand the pathway through which discrimination influences outcomes in adults with type 2 diabetes. While theoretical pathways exist, these mechanisms have not been extensively tested through either cross-sectional or interventional work. The aim of this paper is to understand the mechanisms through which discrimination influences diabetes self-care and glycemic control in patients with diabetes by using structured equation modeling to test theoretical pathways.

2. Methods

2.1. Sample

Following institutional review board approval, 615 patients were recruited from two adult primary care clinics in the southeastern United States. Eligibility included ages 18 years or older, diagnosis of type 2 diabetes in their medical record, and ability to communicate in English. Patients were ineligible if through interaction or chart documentation they were determined to be cognitively impaired as a result of significant dementia or active psychosis. Patients who expressed interest after receiving letters of invitation or being approached in the clinic waiting room were provided a detailed explanation of the study and consented. Participants completed validated questionnaires that captured social determinants of health factors along with demographic and self-care information. Most recent HbA1c was abstracted from the medical record to serve as diabetes outcome measure. Validated questionnaires were included based on a modified version of the conceptual framework by Brown et al. relating social determinant of health factors to diabetes processes and outcomes (Brown et al., 2004).

Measures included in this analysis were based on the theoretical model described by Pascoe and Richman for the pathways by which perceived discrimination influence health outcomes (Pascoe & Richman, 2009). As hypothesized based on a meta-analysis of available research on discrimination influences on health outcomes, Pascoe and Richman suggested a direct pathway connecting perceived discrimination with mental and physical health, as well as indirect pathways through both stress, and health behaviors (Pascoe & Richman, 2009). They further hypothesized that positive influences such as social support, stigma identification, and coping style could influence these indirect pathways (Pascoe & Richman, 2009).

2.2. Demographic information

Previously validated items from the 2002 National Health Interview Survey were used to capture age, race, gender, marital status, number of hours worked, household income, years of education and employment status (National Center for Health Statistics, 2002–2004).

2.3. Perceived discrimination

Perceived discrimination was measured using questions from the Diabetes Study of Northern California (DISTANCE) survey: a 4-question measure where patients reported how often in the past 12 months they were made to feel inferior because of their race/ethnicity, education level, gender, and language (Moffet et al., 2009). Response options were never, sometimes, usually, and often.

2.4. Social support

Social Support was measured with the Medical Outcomes Study (MOS) Social Support Survey: a 19-item scale measuring tangible support, affection, positive social interaction, and emotional or informational support (Sherbourne & Stewart, 1991). The total scale ($\alpha = 0.97$) has high internal consistency, good criterion and discriminant validity, and one-year test-retest reliability (0.72-0.76) (Sherbourne & Stewart, 1991).

2.5. Social cohesion

Social Cohesion was measured using the 5-item Sampson Scale. The scale measures the patient's ability to trust and relate to individuals in their neighborhood. Answer choices range from 1 – strongly agree to 5- strongly disagree (Sampson et al., 1997).

2.6. Perceived stress

Stress was measured with the Perceived Stress Scale (PSS); a 4-item scale that assesses the frequency with which the patient finds situations stressful during the previous month (Cohen & Williamson, 1988). The Cronbach alpha value is 0.69 and scores are highly correlated with stress, depression and anxiety (Andreou et al., 2011).

2.7. Diabetes self-care

Medication Adherence was measured with the Morisky Medication Adherence Scale (MMAS); an 8-item scale with higher values signifying greater adherence (Morisky, Green, & Levine, 1986).

Diabetes behavior was measured with the Summary of Diabetes Self-Care Activities (SDSCA) scale; an 11-item scale measuring frequency of self-care activity in the last 7 days for general diet (followed a healthy diet), specific diet (ate fruits/vegetables), exercise, blood glucose testing, and foot care (Toobert, Hampson, & Glasgow, 2000).

2.8. Glycemic control

Glycemic control was measured by extracting Hemoglobin A1C (HbA1c) from patients' medical records. The most recent HbA1C value within the past six months was used.

2.9. Statistical analysis

The sample size of 615 adults provides the recommended 20:1 ratio of subjects to variables needed to maintain 80% power, given the number of variables included in the model (Costello & Osborned, 2005; Schumacker & Lomax Richard, 2010). With a sample size of 615, parameter estimates