Relationships among Distress, Appraisal, Self-Management Behaviors, and Psychosocial

Factors in a Sample of Rural Appalachian Adults with Type 2 Diabetes

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Abstract

Background: Diabetes contributes to the development of multiple chronic conditions including cardiovascular disease, stroke, blindness, kidney disease, and lower-limb amputations. Currently, it is known that the Appalachian Region is an area of significant disparity in the occurrence of Diabetes. Persons with Diabetes can develop high levels of cognitive stress related to the experience of living with Diabetes.

Method: This paper presents the results of a descriptive study guided by the Transactional Model of Stress and Coping (TMSC), aiming to enhance understanding of the relationships among diabetes-related distress, appraisal, and self-management in a sample of 102 adults who were living rurally in Appalachia.

Findings: The majority of the study sample were low-income, obese, and had mean A1C levels above the goal for adequate diabetes control. Over one-third of the sample had a high likelihood or possibility of limited health literacy. Participants reported adhering to medication on over 6 days of the week but adhering to diet and exercise on fewer days per week. Overall, the sample had a lower level of distress related to the diagnosis of diabetes. Participants perceived diabetes as more of a challenge than a threat, harm, or benign stressor. Diabetes related distress was inversely correlated to challenge appraisals and benign appraisals, but positively correlated to threat and harm appraisals. Anxiety and depression were significantly positively related to diabetes related distress, threat appraisals, and harm appraisals and significantly negatively correlated with challenge and benign appraisals.

Conclusions: Recommendations for future research include the development and testing of targeted interventions that address the study findings including health literacy level, challenge appraisals, and the interrelationships of psychological and physical health variables. Knowing that diabetes is appraised as a challenge enhances the likelihood that it may be amenable to intervention. The interrelatedness of anxiety and depression to self-management further informs future intervention design.

Keywords: Psychosocial Factors, Rural, Diabetes, Adults, Self -Management, Cognitive appraisal, Distress

Relationships among Distress, Appraisal, Self-Management Behaviors, and Psychosocial Factors in a Sample of Rural Appalachian Adults with Type 2 Diabetes

Diabetes mellitus is one of the major causes of disease morbidity and mortality in the United States (US) and throughout the world. It is estimated that 29.1 million people in the United States have diabetes (9.3% of the U.S. population), with 1.7 million new cases diagnosed in people 20 years or older in 2012 (Centers for Disease Control and Prevention [CDC], 2014). Diabetes is the leading cause of cardiovascular disease, stroke, blindness, kidney disease, and lower-limb amputations, and has been estimated to cost the Unites States $176 billion in direct medical care costs and $69 billion in indirect costs from disability, productivity loss, and premature death (CDC, 2014).

The burden of diabetes is especially heavy in rural Appalachia. For this study, the rural population was conceptualized as people residing in rural Appalachia. Appalachia is a 13 state region of the Eastern United States and West Virginia is entirely within Appalachia. West Virginia ranks 48th in the nation for lowest number of citizens with the highest underinsured population, low high school graduation rates, highest incidence of infectious disease, highest prevalence of low birth-weight infants, and low availability of primary care providers (United Health Foundation, 2012). Of West Virginia's 55 counties, 49 counties contain areas that are designated as medically underserved (West Virginia Vital Statistics, n.d.). Chronic illnesses such as diabetes are more prevalent in Appalachia than other more urban regions of the United States (Barker, Kirtlans, Gregg, Geiss, & Thompson, 2011; Howard et al. 2011).

National data indicate that prevalence of diabetes is higher in rural areas, the Southeast, and Appalachia (CDC, 2011; Krishna, Gillespie, & McBride, 2010). Appalachians are 1.4 times as likely to have diabetes as non-Appalachians (Serrano, Leiferman, & Dauber, 2007). For many

Appalachians with diabetes, the distress associated with diabetes is constant and significantly affects daily life. As an area recognized for health disparity, Appalachia is characterized by high poverty, an aging population, and low educational attainment (Smith & Tessaro, 2005), adding to the complexity of managing diabetes.

Significance/Literature Review

High levels of diabetes-related distress have been described in the literature (Karlsen, Oftedal, & Bru, 2012). The distress can be linked to the complexity of integrating treatment regimens into daily life and can leave people feeling overwhelmed, frustrated, and discouraged (Polonsky et al., 2005). Thus, diabetes related distress can lead to reduced well-being, anxiety, and depression, (Fisher, Glasgow, & Strycker, 2010; Papelbaum et al., 2010). A vast amount of research suggests that diabetes-related distress affects self-management of diabetes (Glasgow, Toobert, & Gillette, 2001; Nozaki et al., 2009; Ogbera & Adeyemi-Doro, 2011), and indicates that distressed individuals may have difficulty maintaining self-management regimens (Landel-Graham, Yount, & Rudnicki, 2003; Morris, Moore, & Morris, 2011). Both the objective and subjective experiences shape the intensity of the distress an individual experiences in living with diabetes. For many adults with type 2 diabetes, the associated distress is constant and significantly affects daily life. Patient responses to diabetes-related distress may include decreased self-management activities and may be dependent on how they appraise their diagnosis of diabetes.

Appraisal refers to the process of how people constantly evaluate what is happening to them from the standpoint of its significance for their well-being. Research has demonstrated that appraisal is a modifiable psycho-social determinant of health and can change after a psychological intervention (Bargiel-Matusciewics, Trzcieniecka-Green, & Kozlowska, 2011). In

the literature, diabetes can be appraised in multiple ways including threatening, harmful, or challenging. Findings suggest that in persons with diabetes, appraising the illness as challenging, instead of threatening or harmful, has been linked to improved self-management behaviors (Carpenter, 2012). Despite this, the relationship between diabetes appraisal and self-management has not been well-studied. Most work on diabetes focuses on emotional outcomes (e.g., well-being, anxiety, distress) following diagnosis, and less on how individuals appraise their illness and self-manage their diabetes (Thoolen, De Ridder, Bensing, Gorter, & Rutten 2008).

Diabetes self-management is an ongoing struggle for people with Type 2 diabetes (Morris et al., 2011). Most research on diabetes has found that a significant proportion of patients fail to engage in adequate self-management (Peyrot et al., 2005; Thoolen, et al., 2006). Only a scant amount of research describes the self-management of diabetes in Appalachia. Most studies are qualitative, describing the impact of cultural, socio-economic, and knowledge deficits about diabetes. Once diagnosed, Appalachians report receiving little information from health care providers about diabetes and, consequently, develop personalized approaches to self-management. These approaches are usually affordable modifications of medical recommendations and are often based on cultural beliefs, socio-economic environments, and lack of knowledge about diabetes (Smith & Tessaro, 2005).

It is generally accepted that interventions targeting appraisal and self-management will be effective for some persons with diabetes under certain circumstances, however, the results of research on distress-reduction interventions remain inconclusive (Morris et al., 2011). To increase our understanding of an individual's appraisal of diabetes and its impact on self-management, and ultimately to develop more successful distress-reduction intervention

programs, research needs to focus on an individual's appraisal of their disease. To address this gap in the literature, researchers need to look beyond emotional outcomes to consider how patients' appraisal of diabetes influences their self-management activities.

The purpose of this study was to describe relationships among diabetes-related distress, appraisal, self-management, and psychosocial factors in rural Appalachians with Type 2 diabetes. This study had the following two research questions: 1. How is diabetes-related distress, diabetes appraisal, and self-management described by rural Appalachians with Type 2 diabetes? 2. What are the relationships between diabetes-related distress, diabetes appraisal, and self-management?

Theoretical Framework

This study was guided by the Transactional Model of Stress and Coping (TMSC), as described by Lazarus and Folkman (1984). Through the process of appraisal, a stressor is evaluated from the standpoint of its significance to the individual's well-being. This appraisal and the concomitant coping behaviors contribute to outcomes (Lazarus & Folkman, 1987). When a stressor is encountered, it is appraised in terms of relevance to the individual's well-being. The model posits two forms of appraisal: (a) primary appraisal, and (b) secondary appraisal. In primary appraisal, stressors are appraised as irrelevant (no significance to well-being), benign-positive (does not tax or exceed personal resources and signals only positive consequences), or stressful. Stressful appraisals include harms, threats, and challenges. Primary appraisal is shaped by an array of personal and situational factors, such as personal beliefs and commitments. A challenge appraisal is a judgment that the demands associated with a stressor can be met or overcome, whereas a harm appraisal cites damage that has already occurred, and a

threat appraisal reports anticipated harm from a stressor. Secondary appraisal involves the evaluation of coping resources and options.

For persons living in Appalachia, cultural beliefs, such as traditionalism, individualism, and religious fundamentalism, have been implicated as influencing the adoption of preventive health behaviors (Gobble, 2009; Weller, 1965). These values influence health beliefs and practices of the people from this region, and have been interpreted as evidence of fatalism about health (Behringer & Friedell, 2006; Deskins et al., 2006). Such beliefs may put Appalachians at risk for poor self-management behaviors required for successful diabetes management. However, qualitative evidence describes people from Appalachian culture as possessing qualities of self-determination and self-reliance (Smith & Tessaro, 2005).

Primary and secondary appraisals and coping work together to predict immediate and long-term effects, as defined by Lazarus and Folkman (1984). However, the literature suggests that the appraisal of diabetes warrants individual attention (Thoolen et al, 2008). Understanding how an individual appraises their diabetes may provide more knowledge about self-management behaviors.

Method

This descriptive study used a correlational design with a convenience sample of adults with Type 2 diabetes. A letter of approval was obtained from the West Virginia University Institutional Review Board (protocol #1310118078) prior to beginning the study.

Four unique research sites located in north central West Virginia were used to capture the diversity of the potential participants from this rural geographic area, each site operating with a unique care delivery model: an academic medical center primary care family medicine clinic; a nurse-managed primary care site in the community; a free clinic that provides care to the

uninsured; and a human performance lab that provides exercise prescription for special populations with chronic medical conditions.

To be included in this study, the participant needed to be an adult between the ages of 20 and 75, read and speak English, and have had a diagnosis of Type 2 diabetes for at least one year. The diagnosis of at least one year was selected based on literature that supports that most people underestimate the seriousness and overrate their ability to control their diabetes when first diagnosed (Adriaanse, et al, 2003; Eboral, et al., 2007; Skinner et al, 2006; Thoolen et al, 2008).

Measures

Primary study variables. Diabetes-related distress was measured with the Problem Areas in Diabetes (PAID) scale (Polonsky et al. 1995). This is a 20-item measure of diabetes-specific emotional distress. Items are scored on a 5-point scale producing a total score between 0 and 100, with higher scores indicating greater emotional distress. Prior internal reliability analyses showed that all 20 items on the PAID scale correlated 0.30 or higher with the total score, and that Cronbach's alpha was 0.95 for the total scale. Concurrent and discriminant validity have also been demonstrated (Polonsky et al., 1995; Welch, Jacobson, & Polonsky, 1997).

Appraisal was measured with the Cognitive Appraisal of Health Scale (CAHS) (Kessler, 1998). The CAHS consists of 28 items that are scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Subjects are asked to respond to each item based on his/her appraisal of his/her current health condition. Higher scores on each item indicate greater agreement with that appraisal. This measure of appraisal was selected because it can be used to categorize primary appraisal of diabetes into four groups (threat, challenge, harm, and benign/irrelevant). It is important to note the inclusion of the benign/irrelevant category, which allows for an appropriate evaluation if diabetes is not perceived as distressing. For this study,

only the 23 items of the four primary appraisal subscales were used, and each item was rephrased to be specific to diabetes. Internal consistency estimates for subscales have been reported at .70 and greater (Kessler, 1998). Internal, construct, and concurrent validity have also been demonstrated (Ahmad, 2004; Kessler, 1998).

Self-management was measured with the Summary of Diabetes Self-Care Activities (SDSCA) (Toobert & Glasgow, 1994). The SDSCA is a brief self-report instrument measuring levels of self-management of seven parts of a diabetes regimen. The tool measures each component rather than providing a cumulative score due to the multidimensional nature of self-management. Its use in adults with Type 2 diabetes is well-established. Average inter-factor correlations ranged from .16 to .21, and average inter-item correlations within each subscale exceeded .50. Initial validity testing with principal component factor analysis to evaluate factor patterns showed that all items loaded highly on their intended underlying factor (Toobert, Hampson, & Glasgow, 2000). For this study, the subscales for diet, exercise, and medication-taking were used. For each of these subscales, the subject is asked about these specific diabetes self-management activities over the past seven days. The number of days per week is recorded on a scale of 0 to 7.

Secondary study variables. The following secondary variables were collected to describe the sample: health literacy, anxiety, depression, comorbidities, diabetes-related complications, hemoglobin A1c, height, weight, body mass index (BMI), age, gender, ethnicity, duration of illness, marital status, number of people living in the home, education, income, employment status, and distance from clinic.

Health literacy was measured with the Newest Vital Sign (NVS) tool. The NVS is a measure of health literacy based on a nutrition label from an ice cream container. Participants are

given the label and asked to refer to it in answering six questions asked orally by a healthcare provider or researcher. The number of correct responses corresponds to the participant's health literacy level. Scoring is as follows: 0-1 suggests high likelihood (50% or more) of limited literacy; 2-3 indicates the possibility of limited literacy; 4-6 almost always indicates adequate literacy. Cronbach's $\alpha > 0.76$ has been reported in a reliability analysis and validity has also been established (Weiss, et al., 2005).

Anxiety and depression were measured with the Patient Health Questionnaire for Depression and Anxiety (PHQ-4). The PHQ-4 is a brief screening scale for anxiety and depression. Cronbach's alpha has been reported to be 0.85 for the scale. Construct and factorial validity have also been established (Kroenke, Spitzer, Williams, & Lowe, 2009).

The following data was obtained from the medical record: most recent hemoglobin A1c; most recent height, weight, and BMI; the comorbidities of obesity, hypertension, dyslipidemia, obstructive sleep apnea, fatty liver disease, cancer, fractures, cognitive impairment, hearing impairment, and periodontal disease; and the diabetes-related complications of vision loss, kidney failure, peripheral neuropathy, and amputations of legs or feet.

Demographic data was collected with a self-report demographic data form and included age in years, gender, ethnicity, duration of illness, marital status, number of people living in the home, education level, income, employment status, and distance from clinic.

Procedure

Sampling and data collection. Staff at all recruitment sites were educated about the study and worked with the research team to recruit participants. The research team maintained a table in the waiting areas of research sites for recruitment, along with posting flyers describing the study in the waiting areas and throughout the research sites.

Upon obtaining informed consent, participants were assigned a study ID number and administered the surveys by a member of the research team in a private space. Approximate time to administer the surveys was 25 minutes. Upon completion of the questionnaires, the researcher accessed the participant's medical record to obtain health data. In addition, participants received a $20 gift card for their participation. All data were de-identified to protect the confidentiality of participants. Participation was voluntary, and the participant could withdraw from the study at any time.

Data analysis. Data were analyzed with SPSS 21.0. Descriptive statistics of the demographic variables, variables obtained from the medical record, health literacy, anxiety, and depression were reported to describe the sample. Means, medians, and standard deviations were calculated for the continuous variables of age, duration of illness, number of people living in the home, distance to the clinic, hemoglobin A1c, height, weight, BMI, number of comorbidities and complications, health literacy score, anxiety score, and depression score. Frequency tables were generated for the categorical variables of gender, marital status, education level, income, and employment. Independent samples t-tests were used to compare mean differences by gender on each of these study variables.

For research question one, descriptive statistics were used to describe the study variables of distress, appraisal, and self-management. Independent samples t-tests were used to compare mean differences by gender on each of these study variables. For research question two, bivariate Pearson correlations were run between appraisal, distress, and self-management variables. Significance level was set at alpha of .05. Diabetes-related distress was measured as a continuous variable on a scale of 0 to 100. Measures of central tendency and variation were reported. Appraisal of diabetes was measured on 4 subscales: threat, harm, challenge, and

benign/irrelevant. A weighted score was reported for each subscale based on the number of subscale questions. Frequencies for each category of appraisal were reported. To describe self-management, the subscales for diet, exercise, and medication-taking from the SDSCA were used. For each of these subscales, the subject was asked about these specific diabetes self-management activities over the past seven days. The diet subscale has two questions corresponding to general diet and two questions corresponding to specific diet. The exercise and medication subscales each have two questions. For each of these subscales, the average number of days per week the participant followed the recommended self-management activity were reported.

Results

A convenience sample of 102 adults was enrolled in this study (men = 32.4%, 82.4% white, mean age = 54.03 years (SD 10.89, range 20-75,). Table 1 includes additional sample descriptors including number of people living in the home, marital status, highest education completed, household income, and employment status. Table 2 includes chronic illness descriptors of the sample by gender including duration of diabetes, A1c, BMI, anxiety, depression, total number of comorbidities, total number of diabetes complications, and health literacy. These descriptors indicate that the majority of the study sample were of low income, obese, and had mean A1c levels above the goal for adequate diabetes control.

Table 1

Sociodemographic Sample Descriptors Compared by Gender (N = 102)

Variable	Female (N = 69) Mean (SD)	Men (N = 33) Mean (SD)	Difference statistic	Sig (*p*)
Age	54.46 (11.08)	53.12 (10.24)	*t = 0.59*	*.559*
Number of people living in home	1.36 (0.75)	1.50 (0.80)	*t = 1.29*	*.199*
Marital Status			χ2 = 6.36	.276
Single	10	10		
Married	32	14		
Separated	3	2		
Divorced	14	4		
Widowed	8	1		
Significant Other	2	2		
Highest Education Completed			χ2 = 6.39	.381
Less than high school	10	3		
High School/GED	23	12		
Some College	16	9		
2 year college degree	8	2		
4 year college degree	5	4		
Graduate Degree	7	3		
Household Income ($/year)			χ2 = 2.32	.509
Less than $20,000	39	19		
$20,001 - $34,999	15	5		
$35,000 – $49,999	8	3		
$50,000 and higher	6	6		
Employment Status			χ2 =1.99	.574
Employed	23	15		
Not Employed	15	5		
Retired	13	4		
Unable to work	18	9		

Note. Equal variances assumed.
Note. * means p value was ≤ .05, ** means p value was ≤ .01.

Table 2

Chronic Illness Sample Descriptors Compared by Gender

Variable	Female (N = 69) Mean (SD)	Men (N = 33) Mean (SD)	t	Sig (p)
Duration of Diabetes (years)	10.62 (7.15)	10.87 (8.45)	0.16	.875
A1c	8.23 (1.99)	8.46 (1.85)	0.53	.596
BMI	38.74 (8.81)	33.39 (6.18)	3.09	.003**
Anxiety Score (PHQ4)	2.82 (2.28)	2.00 (2.28)	1.70	.091
Depression Score (PHQ4)	2.37 (2.20)	1.48 (1.95)	1.98	.050*
Number of Comorbidities	2.89 (1.31)	2.87 (1.45)	0.08	.936
Number of Diabetes Complications	0.38 (0.62)	0.44 (0.62)	0.46	.648
Health Literacy	3.84 (1.73)	3.88 (2.07)	0.09	.922

Note. * = p < .05, ** = p < .01.

Research question one: How is diabetes-related distress, diabetes appraisal, and self-management described by rural Appalachians with Type 2 diabetes?

The means comparisons by gender for diabetes-related distress, appraisal subscales, self-management, anxiety, and depression are in Table 3. Overall, the entire sample had a mean of 32.14 (SD 23.59) on diabetes related distress indicating a lower level of distress related to having diabetes, and there were no significant differences by gender. When evaluating the subscales on appraisal of diabetes as an illness, study participants had a higher mean score on the challenge subscale compared to the other three subscales of threat, harm, and benign. Overall, participants reported adhering to medication on over 6 days of the week but adhering to diet and exercise on fewer days per week on average. There was no difference by gender in diabetes-related distress, diabetes appraisal and general self-management. Significant differences by gender were found on specific diet and depression, such that women reported better adherence to specific diet on more days of the week, and reported more depressive symptoms than men.

Table 3

Mean Gender Comparisons for Diabetes-Related Distress, Appraisal Subscales, and Self-Management

Outcome	*Group*	*Baseline*		*t*	*p*
		Mean	*SD*		
Diabetes-related distress	Female	33.55	23.91	0.87	0.39
	Male	29.20	22.98		
Challenge Score	Female	3.80	0.74	-0.39	0.70
	Male	3.86	0.68		
Threat Score	Female	2.82	1.01	-0.90	0.37
	Male	3.01	1.01		
Harm Score	Female	2.30	0.90	-1.43	0.16
	Male	2.59	1.01		
Benign Score	Female	2.55	0.89	-0.40	0.69
	Male	2.63	0.84		
General Diet	Female	4.46	1.96	1.32	0.19
	Male	3.89	2.16		
Specific Diet	Female	3.93	1.45	2.76	0.01**
	Male	3.00	1.82		
Exercise	Female	2.58	2.40	-0.76	0.45
	Male	2.95	2.23		
Anxiety	Female	1.41	1.14	1.70	0.09
	Male	1.00	1.14		
Depression	Female	1.19	1.10	1.98	0.05*
	Male	0.74	0.98		

Note. * = *p* < .05, ** = *p* < .01.

What are the relationships between diabetes-related distress, diabetes appraisal,

and self-management?

Table 4 describes the correlations among diabetes-related distress, diabetes appraisal, self-management, anxiety, depression, and health literacy. Multiple significant correlations are reported. Diabetes related distress was inversely correlated to challenge appraisals and benign appraisals, but positively correlated to threat and harm appraisals. Diabetes related distress was inversely correlated to all self-management variables but this relationship was not statistically significant for medication adherence and exercise. There is a significant positive correlation between higher appraisals of challenge and days taking medicine. There is a significant negative correlation between threat appraisal and general diet and specific diet. There were significant

negative correlations between harm appraisal and both general and specific diet. There was a significant positive correlation between benign appraisals and general diet. Anxiety and depression were significantly positively related to diabetes related distress, threat appraisals, and harm appraisals and significantly negatively correlated with challenge and benign appraisals. Depressive symptoms were significantly inversely related to adherence to general diet. Health literacy had a significant inverse relationship with diabetes-related distress and depression, but a significant positive correlation with challenge appraisal scores. Though relationships among appraisal type and individual self-management variables differed and some were significant on correlations, none were predictive of these specific self-management behaviors.

Table 4

Correlation Coefficients for Distress, Appraisal, and Self-Management (N = 102).

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. PAID total (distress)	1											
2. Challenge appraisal	-.578**	1										
3. Threat appraisal	.671**	-.490**	1									
4. Harm appraisal	.688**	-.545**	.769**	1								
5. Benign appraisal	-.494**	.347**	-.657**	-.505**	1							
6. General diet	-.240*	.189	-.307**	-.315**	.261**	1						
7. Specific diet	-.268**	.189	-.377**	-.322**	.190	.514**	1					
8. Medication	-.131	.209*	-.035	-.081	-.077	.161	.113	1				
9. Exercise	-.099	.194	.089	-.191	.167	.165	.099	-.301**	1			
10. Anxiety	.477**	-.229*	.429**	.396**	-.360**	-.151	-.110	.030	-.046	1		
11. Depression	.486**	-.346**	.362**	.385**	-.338**	-.20*	-.167	-.015	-.132	.720**	1	
12. Health Literacy	-.373**	.256**	.259	.048	-.004	.162	.190	-.115	-.039	-.139	-.227*	1

Note. $* = p < .05$, $** = p < .01$.

Discussion

The findings from this study were surprising and in contrast to what has been reported in historical literature about distress and diabetes. It has been documented in the health and social science literature that the experience of diabetes is related to high distress (Barnard, et al., 2016; Karlsen et al.,2012; Pandit et al., 2014; Polonsky et al., 2005). Since the sample had relatively high mean A1c scores but reported relatively low distress scores related to their diabetes, understanding the complexity of factors that influence appraisal of diabetes in this population of disparity should be a priority.

Two prior qualitative studies conducted in rural Appalachia with underserved persons with diabetes have described distress associated with living with diabetes. The first study described diabetes as a distressing health challenge, calling out related thoughts and experiences which included knowledge of life circumstances, daily struggles, life choices, and feelings of inability to move forward from the present (Carpenter, 2014). The second study described living with the stress of diabetes as involving living with pain, fear of future unknowns, worry over family health and needs, and managing health behaviors (Carpenter, 2015). Both studies reaffirm that diabetes in this population is a distressing illness, and that the experience of diabetes is accompanied by prominent physical and psychological health difficulties.

Nurses who are caring for persons with diabetes in rural Appalachia should consider assessing for the distressing nature of diabetes. Recognizing the distress associated with the diagnosis of diabetes could lead to additional care planning. This planning could include a comprehensive approach and incorporate an emphasis on mind-body interactions that occur with chronic conditions. Knowing that distressing situations can impact physical health (McCain,

Gray, Walter, & Robins, 2005) makes it important that nurses in rural areas be knowledgeable about interventions that could diminish distress.

It was interesting, given the current literature and qualitative work, that study participants predominantly appraised living with diabetes as a challenging experience rather than a threatening, or harmful experience. In this study, perceiving diabetes as more of a challenge, than a threat or harm, was associated with increased adherence to diet recommendations. This is consistent with a separate study of persons with diabetes in Appalachia (Carpenter, 2012). From a theoretical perspective, challenge appraisal implies that the demands of diabetes can be met or overcome. This finding is in contrast to commonly held beliefs about Appalachian culture as being fatalistic. In fact, appraising diabetes as a challenge means that behaviors may be amenable to change with selected interventions. Motivational interviewing is one intervention that has demonstrated success for improving self-management behaviors and A1C levels at 6 months post intervention (Song, Xu, & Sun, 2014). Nurses who are caring for persons with diabetes in rural Appalachia may influence outcomes of diabetes by incorporating motivational interviewing techniques into their interactions with this population. A systematic review of problem-solving therapy in persons with diabetes also indicates that there is potential benefit for decreased A1C levels when using this technique. (Hill-Briggs & Gemmell, 2007)

Participants in this study did relatively well with medication adherence, but only moderately well with diet, and less with exercise. These findings are similar to the self-management adherence rates of other patient populations managing Type 2 diabetes (Delamater, 2006; Murata et al., 2004; Nelson, McFarland, & Reiber, 2007). Diet has been identified as a major stressor in persons with Type 2 diabetes (Peyrot et al., 2005: Vijan et al., 2005). In addition, qualitative data suggests that diet is a major challenge for person with type 2 diabetes

(Carpenter, 2015). It is important for nurses to note that in spite of being part of a group who suffer from worse health than many other sub-populations (Halverson, 2004), the adherence rates to behaviors of rural persons from Appalachia are similar to other patient populations. This similarity could be attributed to the exposure to known behavioral and social determinants of health (CDC, n.d.) in rural Appalachia, rather than to the geographic region. Thus, it can be logically concluded that nursing interventions that have demonstrated effectiveness for enhancing adherence in other populations known to experience these determinants of health may have potential to be helpful to persons with diabetes in rural Appalachia.

It was not surprising that anxiety and depression related significantly to distress, appraisals, and self-management. These psychological problems are well-documented in the literature as influential factors to how people think about illness and engage in health behaviors (Duke, 2016; Katon et al., 2004). Given the high prevalence of anxiety and depressive symptoms in this study sample and the positive relationships between appraisals of threat and harm with anxiety and depression, it is important to know current status of anxiety, depression, distress, and appraisal of illness prior to planning care. These results support adhering to current national guidelines for screening for all adults for anxiety and depression (U.S. Preventive Services Task Force [USPSTF), n.d.).

The relationships among study variables is complicated by the findings regarding health literacy. It is very problematic that 37.2% of the sample had a high likelihood or possibility of limited literacy. Low health literacy has been identified as problematic in Appalachian regions (O'Brien & Talbot, 2011). Literature does support the association between health literacy and health outcomes. In addition to poorer health and more advanced disease when first seen by a health care provider, patients with low or limited health literacy skills are more likely to report

less knowledge of their chronic disease and self-management (Rudd, Renzulli, Pererira, & Daltroy, 2005), low health knowledge, and less use of preventive services (Berkman et al, 2004; Berkman, Sheridan, Donahue, Halpem, & Crotty 2011). Specifically in persons with Type 2 diabetes, inadequate health literacy has been shown to be associated with worse glycemic control and higher rates of retinopathy (Schillenger et al, 2002). Assessing for health literacy level is important so that it can be incorporated into and potentially enhance nursing interventions. One tool that nurses could consider to use for assessment of health literacy in diabetes is the Newest Vital Sign (Weiss, et al., 2005) instrument that was used for this study.

The relationships among the appraisal variables in this study support the theoretical predictions of the transactional model of stress and coping, specifically the inverse relationship between challenge appraisals and threat and harm appraisals, and the positive relationship between threat and harm appraisals and distress. The transactional model served as a useful framework to guide the study, with concepts from the model serving as a basis for selecting and then operationalizing study variables.

Implications for Future Research

Recommendations for future research should include the development and testing of targeted interventions that address the study findings including health literacy level, challenge appraisals, and the interrelationships of psychological and physical health variables. First, any intervention designed for this study population should be developed with an appropriate health literacy level. Health literacy needs to be an integral component of intervention development because it is known to be influenced by multiple factors, including changes in life experience, education, and the presence of comorbid conditions such as functional status, mental illness, stress, or depression (Rudd et al., 2005). Second, focusing a novel intervention to facilitate an

increased challenge appraisal could lead to a positive impact on adherence to diet recommendations for person with Type 2 diabetes. Likewise, interventions to decrease perceptions of threat and harm of diabetes may have impact on diet adherence. Finally, future studies must include psychological assessments of anxiety and depression, given the known relationships of these variables to diabetes, appraisal, and diabetes outcomes.

Limitations

This study had several limitations including convenience sampling, homogeneous sample, self-reported data, and limited control of confounding variables. Participants volunteered for this study, thus the possibility exists that only the more adherent patients were willing to participate. This, paired with the homogenous nature of the sample leads to the conclusion that the study results could be applied to predominantly white, middle-aged females who have had diabetes for approximately ten years. It is possible that there was bias in the self-reported data.

Conclusions

This study enhances knowledge about appraisal of illness in persons with diabetes in Appalachia. This knowledge conveys the important message that diabetes is not perceived as distressing or as a threat by people in this study residing in Appalachia. Knowing that diabetes is appraised as a challenge enhances the likelihood that it may be amenable to intervention. The interrelatedness of anxiety and depression to self-management further informs future intervention design. The findings will be instrumental to future intervention success. Targeting the low literacy level of this population while working to enhance challenge appraisals while acknowledging psychological determinants of health could lead to positive health behaviors, and subsequently, positive diabetes-related health outcomes.

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