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Health Beliefs, Attitudes, and Health-Related Quality of Life in Persons with Fibromyalgia:
Mediating Role of Treatment Adherence

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Abstract

Fibromyalgia is a chronic illness characterized by pain and fatigue. Persons with fibromyalgia experience increased risk for poor mental and physical health-related quality of life, which may be dependent on multiple factors, including health beliefs, such as confidence in physicians and the health care system, and health behaviors, such as treatment adherence. Respondents with fibromyalgia (n=409) were recruited nationally, via support organizations, and completed self-report measures: Multidimensional Health Profile – Health Functioning Index (MHP-H), Short-Form-36 Health Survey (SF-36v2), and Medical Outcomes Study (MOS) Measure of Patient Adherence - General Adherence Items. In mediation models, belief in the healthcare system and healthcare personnel, and health efficacy exerted an indirect effect through treatment adherence on mental and physical quality of life. Adaptive health beliefs and attitudes were related to greater treatment adherence and, in turn, to better quality of life. Maladaptive health beliefs and mistrusting attitudes about physician-level and systemic-level healthcare provision are negatively related to both treatment adherence and consequent physical and mental health-related quality of life in persons with fibromyalgia. Future randomized controlled trials are needed to determine if therapeutic strategies to alter health values might improve adherence and self-rated health.

Keywords: Health-Related Quality of Life, Treatment Adherence, Health Beliefs and Attitudes, Fibromyalgia

Health Beliefs and Attitudes and Health-Related Quality of Life in Persons with Fibromyalgia:
Mediating Role of Treatment Adherence

Fibromyalgia is a chronic illness, with physical symptoms of fatigue, sleep disruption, enuresis and encopresis, pain, and reduced motor control (Amutio et al., 2018; Clauw, 2014). Many persons with fibromyalgia also experience cognitive-emotional symptoms, including memory loss, and anxiety and depression (Carbonell-Baeza, Ruiz, Aparicio, Ortega, & Delgado-Fernández, 2013; Markkula et al., 2011). As such, persons with fibromyalgia typically report poorer mental and physical health-related quality of life (HRQL) (Lee et al., 2017; Ownby, Acevedo, Jacobs, Caballero, & Waldrop-Valverde, 2014). HRQL is dependent on numerous factors including environmental influences, such as engagement with healthcare providers and systems (Karoly, 1991), and attitudinal influences, including beliefs and values pertaining to wellness, health behaviors and treatment engagement, which strongly predict patient-centered health outcomes (Ownby et al., 2014). This is important for individuals with fibromyalgia, who make frequent contact with providers, report poor experiences with physicians and the healthcare system (Bennett, Little, Nair, & Watson, 2018), and have poorer treatment adherence than other disease groups (Chan et al., 2014). Such outcomes may be due, in part, to negative views toward healthcare systems and professionals (Ashe, Furness, Taylor, Haywood-Small, & Lawson, 2017).

Asking patients to self-report their physical and mental health, and functional ability, or HRQL, is an integral part of health surveillance and a valid measure of health care needs and intervention outcomes (Santos, de Matos, Simões, Leal, & do Céu Machado, 2017). HRQL holistically incorporates self-perception of mental, social and role functioning, and physical health, as well as ability to complete self-care, and social and vocational activities. Typically,

individuals with greater HRQL report less psychopathology and better physical vitality and life satisfaction, whereas poor HRQL is related to increased psychopathology, and greater impairment and mortality (Chan et al., 2014). Self-reported health is often a stronger predictor of morbidity and mortality, and health care costs and utilization, than objectively-measured health (Ownby et al., 2014), yet routine assessment of HRQL in fibromyalgia patients is uncommon.

Understanding patient health beliefs and attitudes is vital for planning effective intervention strategies to impact HRQL. Early identification of dysfunctional attitudes and health-compromising habits can facilitate cost-effective prevention programs and overall improvement of health care quality (Nsamenang & Hirsch, 2014; Pagès-Puigdemont et al., 2016). Further, patients' beliefs about their health and medical treatment significantly predict health behavior engagement (McCormack, Thomas, Lewis, & Rudd, 2017).

In our study, we examined health self-efficacy, vigilance and values, and belief in the health care system and personnel, factors predicated on self-regulation strategies important for health functioning (Dark-Freudeman & West, 2016). Health self-efficacy, or self-confidence in health management, including adherence, is a robust predictor of engagement in health-promoting behaviors, as is the importance one places on health (Ownby et al., 2014). Ability to monitor health-relevant goal attainment {i.e., vigilance}, is also closely related to adherence (Clark & Zimmerman, 2014). Institutionally, a patient's beliefs and attitudes about the health care system and personnel reflect degree of confidence in the relationship they share with their provider, and belief in a system's ability to meet health care needs (Halepian, Saleh, Hallit, & Khabbaz, 2018). Patients with little belief in providers, or who distrust the system, often

underutilize healthcare resources and experience resultant poor health (Timmerman, Stronks, Groeneweg, & Huygen, 2016).

These patient-provider and patient-system linkages are particularly salient for persons with fibromyalgia. For example, health care providers are less likely to accept these patients due to frustrations associated with symptom control, patients' emotional responses, and causal attribution of fibromyalgia to psychological factors (Homma, Ishikawa, & Kiuchi, 2016). Persons with fibromyalgia also experience greater distrust and skepticism from providers about illness validity, increasing risk for developing maladaptive views of healthcare providers and services (Mengshoel, Sim, Ahlsen, & Madden, 2018), and negatively affecting adherence and HRQL (Ownby et al., 2014).

Treatment adherence, or compliance with prescribed medical regimens may determine, in large part, treatment effectiveness for chronic illness and consequent HRQL (Kripalani, Yao, & Haynes, 2007; Ohn & Fitzgerald, 2018). Costs associated with noncompliance may be as high as \$300 billion annually, in the U.S., due to disease exacerbation, hospitalizations, medical testing, and death (DiMatteo, 2004). Regarding fibromyalgia, medication noncompliance rates are estimated between 40-90% (Ben-Ami Shor et al., 2017). Conversely, consistent treatment adherence in fibromyalgia patients is associated with lower nonprescription medication use, and better mental and physical HRQL (Dobkin et al., 2009; Haanstra et al., 2015).

Treatment adherence is impacted by a variety of social, individual, and system-level factors, including sex, socioeconomic status, psychopathology, ethnicity, and marital status (Jack, McLean, Moffett, & Gardiner, 2010; López-González et al., 2015). System-level factors that deleteriously affect adherence include poor patient-physician relationship, physician

burnout, and physician communication style (Iihara et al., 2014; Watanabe, Hasegawa, & Yoshinaga, 2005).

Although the independent contributions of health beliefs and treatment adherence to HRQL are well-established, their interrelations have not been examined, particularly in a fibromyalgia sample that may have negative views of the healthcare system and poor adherence (Bernard, Prince, & Edsall, 2000; Ownby et al., 2014). At the bivariate level, we hypothesized that adaptive health beliefs and attitudes would be positively related to adherence and mental and physical HRQL, and that adherence would be positively related to HRQL. At the multivariate level, we examined the relation between health beliefs/values and HRQL, and the mediating role of treatment adherence, hypothesizing that adaptive health beliefs and values would be related to better adherence and, in turn, to better HRQL.

Methods

Participants

Our sample of 409 fibromyalgia patients was primarily female ($n=387$; 94.6%; Males = 22; 5.4%), ranged in age from 18 to 73 years old (Mean Age = 47.79; SD = 13.18), and were largely of White ethnicity ($n=371$; 90.7%), followed by Black ($n=13$; 3.2%) and Multiracial ($n=9$; 2.2%) (See Table 1).

Participants in our Institutional Review Board-approved study were recruited nationally, via support organizations and social media, provided informed consent, and completed an online survey. Participants were provided with mental health resources upon study completion. Only participants reporting a physician diagnosis of fibromyalgia and a diagnostic date were included.

Measures

Participants provided demographic information including, among other variables, age, insurance coverage, and date of onset of symptoms.

Health beliefs and attitudes were measured using the Multidimensional Health Profile – Health Functioning Index (MHP-H), a 69-item self-report assessment of behaviors, perceptions, attitudes, and beliefs associated with health status and health care utilization. In our study, we utilized the 24-item health beliefs and attitudes subscale (e.g., “In general, I trust doctors”), which assesses five dimensions of health beliefs and attitudes (Williams, McDevitt-Murphy, Fields, Weathers, & Flood, 2011), and which has demonstrated acceptable to good internal consistency (Cronbach’s α): self-efficacy ($\alpha = .80$), health vigilance ($\alpha = .68$), health values ($\alpha = .74$), trust in health care personnel ($\alpha = .85$), and trust in health care system ($\alpha = .59$) (Karoily, Ruehlman, & Lanyon, 2005). In our sample, the MHP-H exhibited acceptable to good internal consistency, ranging from .70 to .80 for individual subscales, and .56 for trust in health care.

Treatment adherence was assessed using the Medical Outcomes Study (MOS) Measure of Patient Adherence, a 5-item measure, using a 6-point Likert scale ranging from 1 (*none of the time*) to 6 (*all of the time*) (Sherbourne, Hays, Ordway, DiMatteo, & Kravitz, 1992). An example of an item is “I found it easy to do the things my doctor suggested I do.” Internal consistency is good in chronic illness patients (Cronbach’s $\alpha = 0.81$) (Sherbourne et al., 1992), and in our sample ($\alpha = .87$).

Health-related quality of life was assessed using the second version of the Short-Form-36 Health Survey (SF-36v2) (Ware, 2008), a 36-item scale assessing eight dimensions of HRQL, including: physical functioning (HRQL-PF), role limitations due to physical functioning (HRQL-RP), bodily pain (HRQL-BP), social functioning (HRQL-SF), mental health (HRQL-MH), role limitations due to emotional health (HRQL-RE), vitality (HRQL-VT), and general health

(HRQL-GH), as well as two composite scores used in our study, Physical (HRQL-PCS) and Mental Component Summaries (HRQL-MCS). An example item for the HRQL-PCS is “How much bodily pain have you had during the past 4 weeks,” and for the HRQL-MCS is “How much of the time during the past 4 weeks have you felt downhearted and depressed?” In a primary care sample, the SF-36v2 exhibited acceptable internal consistency ($\alpha = .70$ to $.80$ for individual subscales), with excellent internal consistency ($\alpha=.90$) for both the HRQL-PCS and HRQL-MCS (Hann & Reeves, 2008). In our sample, internal consistency was acceptable for the MCS ($\alpha=.70$) and good for the PCS ($\alpha=.80$).

Statistical Analyses

Pearson’s product-moment correlations were conducted to examine the zero-order associations between health beliefs and attitudes, treatment adherence and mental and physical HRQL. Correlations between variables did not exceed $.80$, a recommended cutoff for independence (Nunnally & Bernstein, 1994).

Mediation analyses consistent with Preacher and Hayes (Preacher & Hayes, 2008) were conducted (10,000 iterations). A set of 95% bias-corrected and accelerated bootstrap confidence intervals (95CIs) of the indirect effect of each predictor on the outcome, through the mediator, were generated.

Mediation analyses, with adherence as the mediator, were conducted to assess for an indirect association between health beliefs and attitudes and HRQL. Separate models were developed for each independent variable (trust in the health care system and health care personnel, health values and self-efficacy, and health vigilance), and for each dependent variable (physical and mental HRQL). All models covaried age, insurance coverage, and time since onset

of symptoms, given previous linkages of these variables to poor health outcomes and to reduced quality of care and adherence (Jacobs, 2002; Nsamenang & Hirsch, 2014).

Results

In bivariate analyses, partially supporting hypotheses, health self-efficacy and trust in health care personnel were positively related to adherence, whereas health vigilance and health values, and belief in the health care system, were not. Health self-efficacy was positively related to physical HRQL, but health vigilance, health values, trust in health care personnel, and trust in the health care system were not. Health self-efficacy, health values and trust in the health care system were positively related to mental HRQL, but trust in health care personnel and health vigilance were not. Finally, adherence was positively associated with physical and mental HRQL, and there was no association between mental and physical HRQL (See Table 2).

In our first mediation model (only significant models are discussed), utilizing health self-efficacy (IV) and physical HRQL (DV), health self-efficacy was significantly, positively associated with physical HRQL. This effect was reduced, but remained significant, after accounting for adherence, indicating mediation. In other words, health self-efficacy was related to adherence and, in turn, to greater physical HRQL (See Table 3; Figure 1).

In models analyzing belief in the healthcare system, neither a total or direct effect existed in relation to physical HRQL; however, *ab* was significant, indicating an “indirect only” effect. That is, belief in the healthcare system was associated with physical HRQL, but only as a function of its relation to adherence (See Table 3).

Finally, for belief in health care personnel there was neither a total nor a direct effect in relation to physical HRQL. However, again, *ab* was significant, indicating an indirect only

effect. Additional models examining health values and health vigilance as independent predictors of physical HRQL failed to support hypotheses (See Table 3).

In models examining mental HRQL (DV), similar effects emerged. Health self-efficacy was significantly positively associated with mental HRQL, and the direct effect reduced but remained significant after accounting for adherence, indicating mediation (See Table 4; Figure 2). Belief in the health care system was significantly positively associated with mental HRQL, which reduced but remained significant after including adherence, indicating mediation (See Table 4). Finally, for belief in healthcare personnel there was neither a total nor a direct effect in relation to mental HRQL, but *ab* was significant, indicating an indirect only effect. Mediation hypotheses were not supported when health values and health vigilance were examined as independent predictors of mental HRQL (See Table 4).

Discussion

We examined the relation between health beliefs and attitudes and HRQL among persons with fibromyalgia, and the mediating role of treatment adherence. At the bivariate level, health self-efficacy and trust in health care personnel were positively related to adherence, and adherence was positively associated with physical and mental HRQL. Health self-efficacy, health values and trust in the health care system were also positively related to mental HRQL, and health self-efficacy was positively related to physical HRQL. In mediation analyses, health self-efficacy exerted an indirect effect through adherence on physical HRQL. Belief in health care personnel and belief in the health care system exerted an indirect-only effect through adherence on physical HRQL. In mediation analyses examining mental HRQL, health self-efficacy and belief in healthcare system exerted a significant indirect effect through adherence,

whereas belief in healthcare personnel exerted an indirect only effect through adherence on mental HRQL.

Our results are consistent with previous theory and research indicating the impact of health beliefs and attitudes on adherence in patients with chronic illness and, further, replicate past studies linking adherence to HRQL (Carbonell-Baeza et al., 2013; Richardson, Bergen, Martin, Roeger, & Allison, 2005; Soones et al., 2017). Our findings extend past research by providing an explanatory model, suggesting that beliefs/values are related to engagement in provider-recommended health behaviors and, in turn, to both mental and physical HRQL (Ownby et al., 2014; Thompson, Broadbent, Bertino, & Staiger, 2016).

Consistent with previous literature, adherence was correlated with health self-efficacy and mental and physical HRQL, and we extend these findings to include the explanatory role of treatment adherence. Conceptually, self-efficacy is the self-evaluation of one's ability to carry out contextually-specific behaviors and to access the cognitive-motivational resources necessary for behavior (Bachmann, Oesch, & Bachmann, 2018; Deci & Ryan, 2000). Persons with fibromyalgia who feel more efficacious and masterful in their ability to achieve health-related goals, and who have the self-perceived cognitive resources to do so may, in turn, feel more competent to adhere to treatment, thereby improving HRQL (López-Larrosa, 2013; McGuckin, Prentice, McLaughlin, & Harkin, 2012).

The relationships that patients have with healthcare providers and systems are robust contributors to health functioning (Ernstmann, Weissbach, Herden, Winter, & Ansmann, 2017; Ownby et al., 2014). We found that, although belief in healthcare personnel and systems were not directly related to physical HRQL, they were indirectly related via adherence. This pattern of findings suggests that although physical HRQL is not affected by a patient's interaction with a

provider or system, it is indirectly affected by poor treatment adherence emerging from such interactions, perhaps due to low trust and confidence.

Of note, there was a significant relation between belief in the healthcare system and mental HRQL, and an indirect association between belief in healthcare personnel and mental HRQL. Trust is theorized to be a patient's willing acceptance that a provider is acting in their best interest (Murray & McCrone, 2015), and the belief that treatment recommendations will improve one's health. Our findings suggest that anticipated or objective improvements in health may be impacted by the effect of health self-efficacy and provider/system-trust, on willingness and ability to adhere to treatment (Bauer et al., 2014).

Our lack of findings for models utilizing health vigilance and health values as predictors of mental and physical HRQL is counter-intuitive, given literature suggesting the importance of value-based health behaviors and self-monitoring for improved health (Bachmann et al., 2016; Hays & Morales, 2001). It is possible that persons with fibromyalgia, even with strong health values and vigilance, may be unable to maintain treatment recommendations due to functional inability or inadequate cognitive-motivational resources (Ben-Ami Shor et al., 2017; Carbonell-Baeza et al., 2013; Markkula et al., 2011). This is consistent with previous literature indicating that although it is important to have well-defined health values, or to be vigilant in health tracking, self-efficacy is the most significant predictor of health-related behaviors (Montanaro & Bryan, 2014; Sheeran et al., 2016).

We also found that mental and physical health-related quality of life were not significantly associated, in our sample of persons with fibromyalgia. Although such an outcome is predictable, given the orthogonality of these subscales in factor analytic and psychometric assessment (McHorney, Ware, & Raczek, 1993), there is also much evidence suggesting that

mental and physical HRQL are positively related (Matcham, Norton, Steer, & Hotopf, 2016). For persons with fibromyalgia, however, there is often a discordance between their self-reported HRQL and objective health status, which is dependent on mental health functioning (Estévez-López et al., 2016). Such patterns of association suggest a potential disconnect between perceptions of mental and physical health in persons with fibromyalgia and, given the high prevalence of psychopathology in this group, including vulnerability to anxiety, depression and post-traumatic stress disorder, warrants further examination of this complex relation (Bellomo et al., 2017; Garcia-Fontanals et al., 2017).

Our study limitations must be acknowledged, including a cross-sectional design that precludes examination of causal associations. Also, our sample was primarily White and female, limiting generalizability, although it is representative of the fibromyalgia population (Carbonell-Baeza et al., 2013). Regarding measures, our subscales assessing health beliefs and values were brief (3-5 items), resulting in internal consistency scores that are acceptable but less than ideal. Finally, our self-report measure of adherence is not ideal considering potential confounds such as impression management and recall bias (Huprich, Bornstein, & Schmitt, 2011). Future, longitudinal research with diverse individuals and illness groups is needed, with particular focus on use of comprehensive measures and objective assessment of adherence and health markers.

Despite limitations, our findings suggest that self-efficacy and belief in the health care system and personnel are salient factors related to treatment adherence and, in turn, to better HRQL. Our findings have important clinical implications for those with chronic illness, particularly fibromyalgia, for whom reports of poor mental and physical HRQL are frequent (Fitzcharles, Perrot, & Häuser, 2018; Macfarlane et al., 2017). For instance, therapeutic strategies emerging from Motivational Interviewing (MI) are applicable to healthcare settings

(Miller & Rose, 2015), and can be used to target barriers to adherence and to promote motivation to attain health goals. Utilization of Motivational Interviewing techniques to engage patients in ‘change talk’ and decisional balancing toward completion of health recommendations may promote greater efficacy and, in turn, greater goal-oriented treatment behaviors (Rollnick, Miller, Butler, & Aloia, 2008). Indeed, our suggested implications are well-suited to complement current best-practices for the treatment of fibromyalgia. For example, current European League Against Rheumatism (EULAR) guidelines indicate exercise as the primary recommended treatment for persons with fibromyalgia, an endeavor that requires both efficacy and motivation (Macfarlane et al., 2017; Scioli-Salter et al., 2017). In recent research, meditation, mindfulness and cognitive-behavioral strategies have proven effective in enhancing self-efficacy and exercise, and reducing pain and fatigue, in persons with fibromyalgia (Amutio et al., 2018; Kashikar-Zuck et al., 2016; Van Gordon, Shonin, Dunn, Garcia-Campayo, & Griffiths, 2017).

Our findings also have implications for systems-level treatment practices, suggesting that, in large part, the extent to which individuals with chronic illness trust their healthcare providers and service systems determines health behavior and wellbeing. This dynamic may be particularly important for persons with fibromyalgia, given that they often experience stigmatization, overt rejection and denial of symptoms from physicians (Colmenares-Roa et al., 2016). As well, given that a poor relationship and communication with one’s physician is a leading cause of medical error, patient harm, and patient dissatisfaction (Belasen & Belasen, 2018; Noordman, van der Weijden, & van Dulmen, 2012), interventions to improve these factors are necessary. Several communication-related behavior change techniques (BCTs), such as behavioral counseling and didactic presentations of patient-centered approaches to providers, have been used to improve system-patient and physician-patient communications (Adams, Flores, Coltri, Meltzer, & Arora,

2016; Noordman et al., 2012). Of note, current research suggests that a patient-centered, emotionally-supportive and empathetic approach is desired by patients with fibromyalgia and has the most beneficial impact on treatment outcomes, particularly when health messaging is tailored to each individual patient and their motivational readiness to change (Ullrich, Hauer, & Farin, 2014; Van Liew, Cvengros, & Christensen, 2018).

In closing, we examined a potential mechanism, treatment adherence, through which health beliefs and attitudes affect HRQL, finding that individuals with adaptive health beliefs and attitudes are better able to adhere to treatment and, in turn, experience better physical and mental HRQL. Knowledge of factors that impact HRQL, such as health belief and attitudes, and adherence, is essential for the development of effective and comprehensive healthcare. Given the impact that health beliefs and attitudes have on treatment adherence and HRQL, healthcare providers treating patients with fibromyalgia should incorporate assessment of such factors into daily practice, with the downstream goal of increasing patient HRQL.

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Table 1
Characteristics of Participants

Education	Percentage of participants
High school Diploma/GED	32.0%
Associate's Degree	20.5%
Bachelor's Degree	23.7%
Master's Degree	12.7%
Doctorate Degree	1.5%
Income	
\$0-9,999	7.1%
\$10,000-19,999	11.5%
\$20,000-29,999	9.3%
\$30,000-39,999	9.8%
\$40,000-49,999	10.0%
\$50,000-59,999	8.3%
\$60,000-69,999	5.9%
\$70,000-79,999	6.4%
\$80,000-89,999	5.6%
\$90,000-99,999	4.9%
\$100,000-200,000	9.3%
More than \$200,000	1.0%
No response	9.3%
Employment status	
Full-time	17.6%
Part-time	12.5%
Retired	11.5%
On disability	31.1%
Unemployed	13.0%
Marital status	
Single	19.6%
Married	56.7%
Divorced	16.1%
Widowed	2.9%
Insurance Coverage	
Yes	84.1%
No	13.7%
No Response	2.2%

Table 2
Bivariate Correlations of Study Variables

Variable	M	SD	1	2	3	4	5	6	7	8
1. Efficacy	13.87	3.10	-							
2. Values	14.74	2.19	.03	-						
3. Vigilance	19.22	3.17	.36**	.19**	-					
4. Trust in Personnel	11.44	3.24	.28**	.05	-.07	-				
5. Trust in System	10.11	1.89	.03	.15**	.16**	.11**	-			
6. Treatment Adherence	20.41	5.39	.27**	.02	.09	.27**	.10	-		
7. Physical HRQL	28.75	7.72	.18**	.07	.04	.05	.10	.19**	-	
8. Mental HRQL	34.12	11.83	.35**	.19**	.03	.10	.15*	.27**	-.08	-

Note: Efficacy, Values, Vigilance, Trust in Personnel, Trust in System = Multidimensional Health Profile – Health Functioning Index (MHP-H); Treatment Adherence = Medical Outcomes Study (MOS) Measure of Patient Adherence - General Adherence Items; Physical and Mental HRQL = Short-Form-36 Health Survey (SF-36v2). * $p < .05$, ** $p < .01$.

Table 3

Direct and Indirect Associations between Health Beliefs and Attitudes, Treatment Adherence, and Physical HRQL

Path	Estimate (SE)	Bias corrected and accelerated 95% Confidence Interval BCa CI
Physical HRQL		
<i>c</i> (Efficacy→ Physical HRQL)	.529 (.14)***	
<i>a</i> (Efficacy → Treatment Adherence)	.401 (.102)***	
<i>b</i> (Treatment Adherence → Physical HRQL)	.189 (.083)*	
<i>c'</i>	.452 (.144)**	
<i>ab</i>	.001 (.044)	 [.007, .183]
Physical HRQL		
<i>c</i> (Values→ Physical HRQL)	.312 (.198)	
<i>a</i> (Values → Treatment Adherence)	.142 (.144)	
<i>b</i> (Treatment Adherence → Physical HRQL)	.246 (.081)**	
<i>c'</i>	.347 (.196)	
<i>ab</i>	.034 (.083)	 [-.134, .023]
Physical HRQL		
<i>c</i> (Vigilance→ Physical HRQL)	.094 (.140)	
<i>a</i> (Vigilance → Treatment Adherence)	.112 (.099)	
<i>b</i> (Treatment Adherence → Physical HRQL)	.252 (.083)**	
<i>c'</i>	.066 (.138)	
<i>ab</i>	.028 (.028)	 [-.014, .103]
Physical HRQL		
<i>c</i> (Belief in System → Physical HRQL)	.387 (.243)	
<i>a</i> (Belief in System → Treatment Adherence)	.397 (.173)*	
<i>b</i> (Treatment Adherence → Physical HRQL)	.231 (.082)**	
<i>c'</i>	.296 (.243)	
<i>ab</i>	.092 (.055)	 [-.233, -.013]
Physical HRQL		
<i>c</i> (Belief in Personnel→ Physical HRQL)	.133 (.137)	
<i>a</i> (Belief in Personnel → Treatment Adherence)	.451 (.094)***	
<i>b</i> (Treatment Adherence → Physical HRQL)	.242 (.085)*	
<i>c'</i>	.024 (.141)	
<i>ab</i>	.108 (.046)	 [.036, .221]

Note: Efficacy, Values, Vigilance, Trust in System, Trust in Personnel = Multidimensional Health Profile – Health Functioning Index (MHP-H); Treatment Adherence = Medical Outcomes Study (MOS) Measure of Patient Adherence - General Adherence Items; Physical HRQL = Short-Form-36 Health Survey (SF-36v2).

Note. Bootstrap sample size = 10,000. BCa CI = Bias-corrected and accelerated confidence interval; 95CI values not containing 0 are considered significant and are bolded.

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 4

Direct and Indirect Associations between Health Beliefs and Attitudes, Treatment Adherence, and Mental HRQL

Path	Estimate (SE)	Bias corrected and accelerated 95% Confidence Interval BCa CI
Mental HRQL		
<i>c</i> (Efficacy→ Mental HRQL)	1.341 (.203)***	
<i>a</i> (Efficacy → Treatment Adherence)	.407 (.102)***	
<i>b</i> (Treatment Adherence → Mental HRQL)	.416 (.115)***	
<i>c'</i>	1.171 (.204)**	
ab	.173 (.072)	 [.056, .335]
Mental HRQL		
<i>c</i> (Values→ Mental HRQL)	1.234 (.287)***	
<i>a</i> (Values → Treatment Adherence)	.141 (.143)	
<i>b</i> (Treatment Adherence → Mental HRQL)	.535 (.115)***	
<i>c'</i>	1.158 (.277)***	
<i>ab</i>	.004 (.070)	[-.216, .069]
Mental HRQL		
<i>c</i> (Vigilance→ Mental HRQL)	.090 (.204)	
<i>a</i> (Vigilance → Treatment Adherence)	.112 (.099)	
<i>b</i> (Treatment Adherence → Mental HRQL)	.545 (.119)***	
<i>c'</i>	.029 (.198)	
<i>ab</i>	.072 (.074)	[-.236, .061]
Mental HRQL		
<i>c</i> (Belief in System → Mental HRQL)	.951 (.356)*	
<i>a</i> (Belief in System → Treatment Adherence)	.397 (.173)**	
<i>b</i> (Treatment Adherence → Mental HRQL)	.514 (.118)***	
<i>c'</i>	.746 (.348)*	
ab	.207 (.101)	 [-.449, -.042]
Mental HRQL		
<i>c</i> (Belief in Personnel→ Mental HRQL)	.341 (.202)	
<i>a</i> (Belief in Personnel → Treatment Adherence)	.451 (.095)*	
<i>b</i> (Treatment Adherence → Mental HRQL)	.551 (.122)***	
<i>c'</i>	.092 (.203)	
ab	.247 (.072)	 [.129, .419]

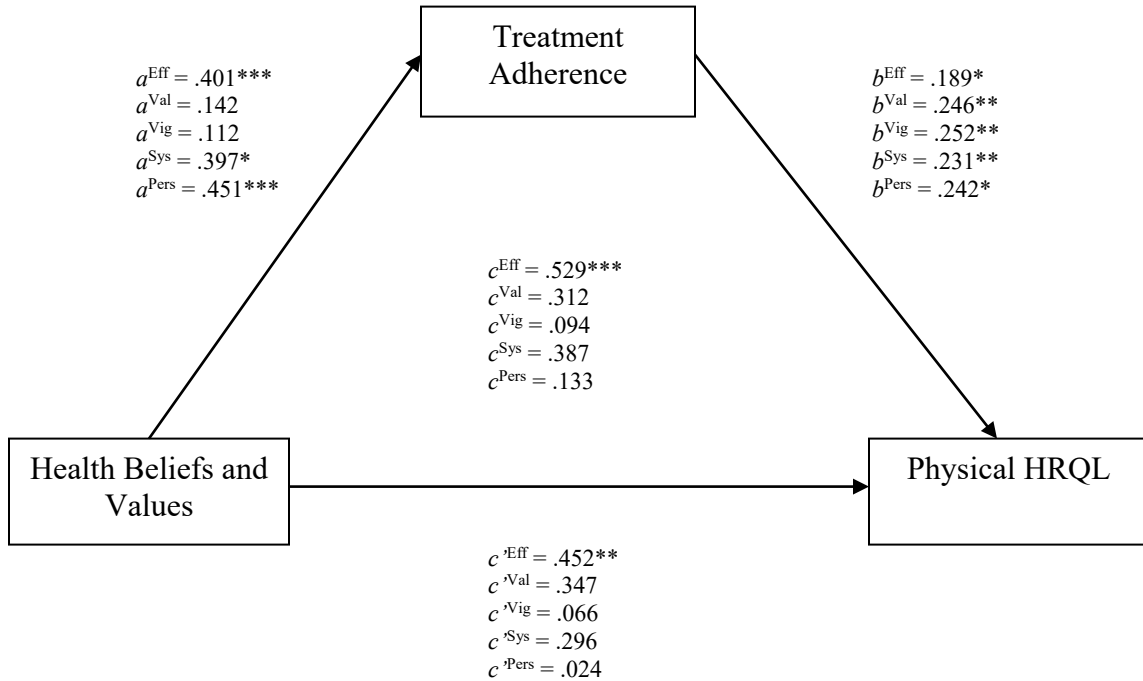
Note: Efficacy, Values, Vigilance, Trust in System, Trust in Personnel = Multidimensional Health Profile – Health Functioning Index (MHP-H); Treatment Adherence = Medical Outcomes Study (MOS) Measure of Patient Adherence - General Adherence Items; Mental HRQL = Short-Form-36 Health Survey (SF-36v2).

Note. Bootstrap sample size = 10,000. BCa CI = Bias-corrected and accelerated confidence interval; 95CI values not containing 0 are considered significant and are bolded.

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 1:

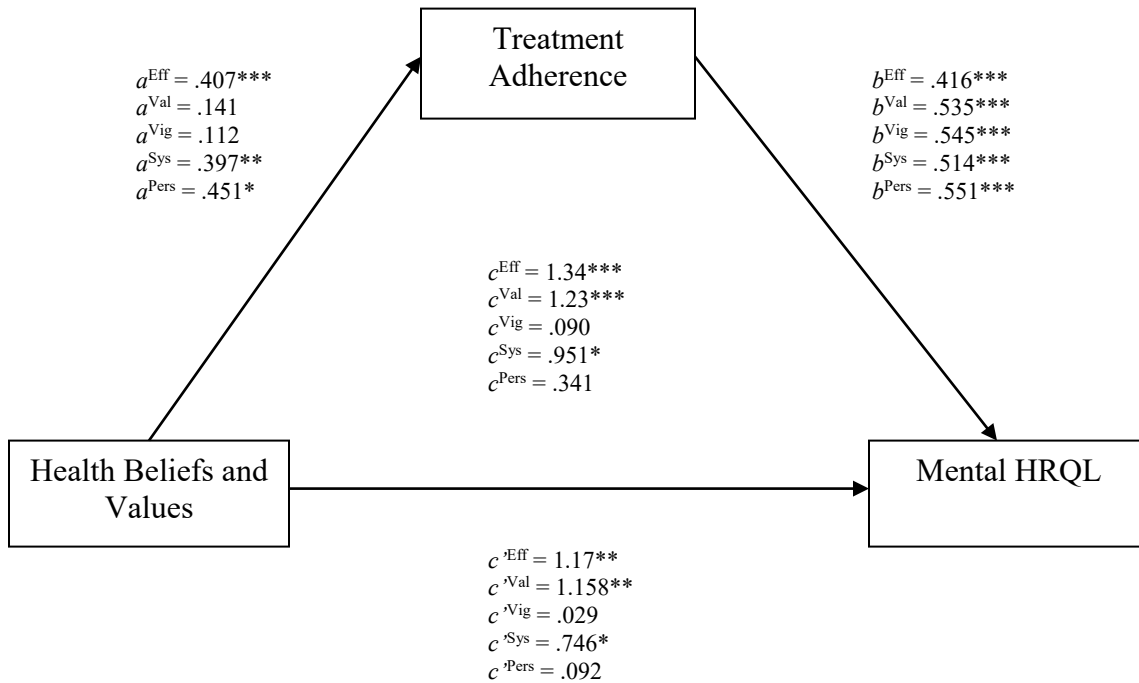
Diagram of Direct and Indirect Associations between Health Beliefs and Attitudes, Treatment Adherence, and Physical HRQL



Note: Efficacy, Values, Vigilance, Trust in System, Trust in Personnel = Multidimensional Health Profile – Health Functioning Index (MHP-H); Treatment Adherence = Medical Outcomes Study (MOS) Measure of Patient Adherence - General Adherence Items; Mental HRQL = Short-Form-36 Health Survey (SF-36v2). * $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 2:

Diagram of Direct and Indirect Associations between Health Beliefs and Attitudes, Treatment Adherence, and Mental HRQL



Note: Efficacy, Values, Vigilance, Trust in Personnel, Trust in System = Multidimensional Health Profile – Health Functioning Index (MHP-H); Treatment Adherence = Medical Outcomes Study (MOS) Measure of Patient Adherence - General Adherence Items; Mental HRQL = Short-Form-36 Health Survey (SF-36v2). * $p < .05$, ** $p < .01$, *** $p < .001$.