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A structural model of health behavior modification among patients with cardiovascular disease

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ABSTRACT

Purpose: The purpose of the study was to test a structural equation model in which social support, health beliefs, and stage of change predict the health behaviors of patients with cardiovascular disease.
Method: A cross-sectional correlational design was used. Using convenience sampling, a survey about social support, health belief, stage of change, and health behavior was completed by 314 adults with cardiovascular disease from outpatient clinics in 2 university hospitals in Korea. Data were analyzed using a structural equation model with the Analysis of Moment program.
Results: The participants were aged 53.44 ± 13.19 years (mean ± SD), and about 64% of them were male. The proposed model fit the data from the study well, explaining 19% and 60% of the variances in the stage of change and health behavior, respectively.
Conclusion: The findings indicate that the performance of health behavior modification among the patients with cardiovascular disease can be explained by social support, health belief, and stage of change based on a health-belief and stage-of-change model. Further studies are warranted to confirm the efficacy of health-promoting strategies in initiating and maintaining the performance of health behaviors by providing social support from family and medical staff and enhancing health belief.

1. Introduction

Cardiovascular disease (CVD) includes disorders of the heart and blood vessels, such as hypertension, coronary heart disease, stroke, and peripheral vascular disease. CVD is the leading cause of death globally, and according to the World Health Organization (2015), an estimated 17.5 million people died from CVD in 2012, being the top three causes of global deaths.

A healthy diet, regular physical activity, nonsmoking, and low stress are important lifestyle factors for patients with CVD (Artinian, Fletcher, Mozaffarian, et al., 2010). These positive lifestyle features have many benefits for patients with CVD, including higher aerobic capacity and quality of life, and making it possible to carry out daily activities and live independently. A healthy balanced diet can help protect patients from CVD by helping to maintain a healthy weight and reduce the risks of diabetes, high blood pressure, and high cholesterol (Haghighatdoost et al., 2013). Encouraging healthy eating can help protect from further CVD problems, high blood pressure, and high cholesterol, as well as maintain a healthy weight (Lavie, Thomas, Squires, Allison, & Milani, 2009; Warburton, Nicol, & Bredin, 2006). Furthermore, smoking cessation and reducing stress are essential factors in the prevention and treatment of CVD (Merriman, 2013).

Previous studies have investigated the relationships of social support with health belief and health behaviors. An and Kim (2012) suggested that social support is a vital factor for promoting health behaviors when managing chronic disease. Jackson, Tucker, and Herman (2007) reported that social support had a significant effect on self-efficacy and the adoption of a health-promoting lifestyle among college students. Bai, Chiou, and Chang (2009) found that a higher level of social support led to a higher level of self-care behaviors among older patients with type 2 diabetes. Chen and Wang (2007)) reported that patients with rheumatoid arthritis who received a higher level of social support from medical staff exhibited higher levels of self-efficacy and self-care behaviors.

The health-belief model (HBM) is a model for protecting health that attempts to explain and predict health behaviors, and it has been widely used as a theoretical framework for interventions that attempt to influence behaviors (Champion & Skinner, 2008). The addition of self-efficacy to the model has increased its explanatory power (Champion & Skinner, 2008). As a value expectancy theory, the HBM assumes that an individual's behavior is the result of the subjective value that he or she places on a given outcome, and his or her belief that a particular action will lead to that outcome (Champion & Skinner, 2008). The central constructs of this model include perceived self-efficacy regarding protective behaviors, perceived benefits of these protective health

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behaviors, perceived barriers to performing these behaviors, perceived susceptibility to a health threat, and perceived severity of the health threat. A review of HBM studies on behaviors for reducing the CVD risk (e.g., exercise, medication adherence, and smoking cessation) found statistically significant relationships among perceptions of benefits, barriers, susceptibility, and severity, with perceived barriers being most strongly associated with health behavior (Lim, Sung, & Joo, 2010; Tovar, Rayens, Clark, & Nguyen, 2010; Yeun, Baek, & Kim, 2013). A study of coronary heart disease (Ali, 2002) found that the HBM variable most strongly associated with adherence behaviors was perceived susceptibility of recommended treatment or action.

A stage-of-change (SOC) model also has been shown to be an effective framework for predicting health behavior, assuming that behavior change is a process rather than an event (Prochaska & DiClemente, 1992). In the SOC model, behavior changes were divided into five stages: precontemplation, contemplation, preparation, action, and maintenance. The model proposed that people at different SOCs can benefit from personalized interventions matched to their stage at that time. SOCs together with the HBM provide a more comprehensive depiction of behavior, explaining which cognitive factors are most relevant to each stage of change. Health beliefs affect health behavior through their influence on the cognitive processes of behavior change; especially the first three stages in the SOC model. Health beliefs are directly related to SOCs. A literature review revealed several studies that have demonstrated significant correlations between health belief, SOCs, and various health behaviors (Champion & Skinner, 2008; Tovar et al., 2010). In addition, behavior change was viewed as a process, and it was appropriate to develop individualized interventions matched to the individual's SOC of behavior (Evers et al., 2006).

Other studies have identified associations between health behavior and age (An & Kim, 2012; Chen & Wang, 2007), gender (Kim, 2002; Toljamo & Hentinen, 2001; Yeun et al., 2013), education (Bai et al., 2009), duration of disease (Bai et al., 2009), and income level (Bai et al., 2009).

While previous studies have demonstrated how various variables influence health behavior, the effects of the social support, and health belief on health behaviors have been shown to vary depending on the health context being studied respectively. However there was few study that viewed health behavior change as a process and no study to examine the structural equation model to ascertain the relationships among social support, health belief, stage of change and health behavior in CVD patients. The present study viewed health behavior change as a process, and the purposes were to (1) describe the levels of perceived social support, health belief, SOC, and health behaviors in adults with CVD in Korea and (2) to verify the relationships and predictions among the variables by using structural equation modeling (SEM). The relationships are graphically presented in Fig. 1. The specific aims of the study were as follows:

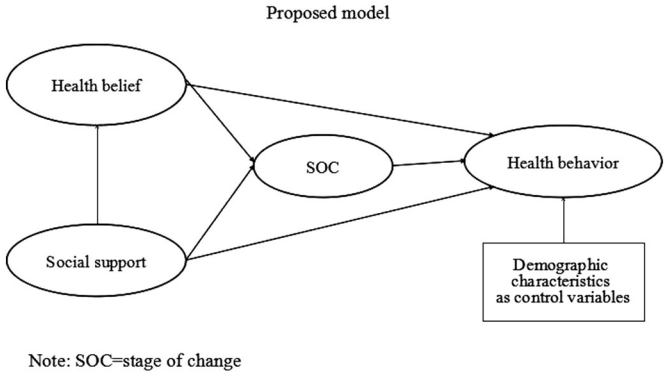

Fig. 1. Proposed model. Note: SOC = stage of change.

1. To test a proposed model of social support, health belief, and SOC for explaining health behavior after controlling for demographic characteristics.
2. To verify the direct and indirect effects of exogenous variables (demographic characteristics, social support, health belief, and SOC) on endogenous variables (health belief, SOC, and health behavior).
3. To determine whether SOC mediates the relationship between health belief and health behavior, behavior change being viewed as a process.

2. Methods

2.1. Design of the study

A descriptive correlational cross-sectional design was used to explore the relationships among the variables in this study.

2.2. Sample and setting

This study involved a convenience sample of 314 adults with CVD recruited from outpatient clinics in 2 university hospitals in Korea, from January to June, 2013.

SEM depends on tests that are sensitive to sample size and to the magnitude of differences in covariate matrices (Kline, 2010). In the literature, sample sizes generally range from 200 to 400 subjects for models with 10 to 15 indicators. Kline (2010) believed that the use of samples smaller than 100 was invalid in SEM. According to Stevens (2009), another rule of thumb is to include at least 15 cases per measured variable or empirical indicator. The present study included 4 latent constructs with 17 empirical indicators. According to the rule of Stevens (2009), the required sample size would be 255 cases, and so the inclusion of 314 adults in the present study was sufficient.

2.3. Instrumentation

2.3.1. Social support

Social support was measured using a family support scale (Jeong, 2006) and medical staff support scale (Tae, 1985) in the present study. The family support scale consisted of 15 items, each of which scored from 1 (strongly disagree) to 5 (strongly agree). It was verified to have good reliability, with a Cronbach's alpha coefficient of 0.86 (Jeong, 2006). The reliability was also confirmed in the present study, with a Cronbach's alpha coefficient of 0.86. The medical staff support scale consisted of 8 items, each of which scored from 1 (strongly disagree) to 5 (strongly agree). It was verified to have good reliability, with a Cronbach's alpha coefficient of 0.84 (Tae, 1985). The reliability was also confirmed in the present study, with a Cronbach's alpha coefficient of 0.79. The CFA produced the following results for the model: chi square (χ^2)/df = 2.79 (less than 3), $p < 0.001$, GFI = 0.93, AGFI = 0.91, CFI = 0.94, SRMR = 0.045, and RMSEA = 0.046 (0.021–0.067). Except for the significant χ^2, all of the other evaluation results were satisfactory for the scale.

2.3.2. Health belief

Health belief was measured using the Health Beliefs Related to Cardiovascular Disease (HBCVD) scale (Tovar et al., 2010) and the self-efficacy scale (Sherer et al., 1982), which were translated by Song, June, Ro, and Kim (2001) and Song (2006) respectively. The HBCVD scale is a 27-item self-report scale that consists of 4 subscales: perceptions of benefits (7 items), and barriers (10 items), susceptibility (5 items), and severity (5 items). Each subscale has four response options ranging from strongly disagree to strongly agree, with higher scores indicating higher levels of the perception. Cronbach's alpha coefficients for each sub-dimension were 0.73 to 0.86, and 0.74 for the whole scale (Song et al., 2001). The reliabilities were also confirmed in