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Stability in Cardiac Attributions Before and After Cardiac Rehabilitation

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Abstract

Purpose: This study examined temporal patterns in causal attributions generated by patients with cardiovascular disease before and after cardiac rehabilitation (CR).

Design: Qualitative, descriptive survey.

Methods: Eighty-six participants were asked what they believed was the primary cause of their cardiac events. Cardiac attributions were collected at the beginning of CR, at the end of CR, and 15 months after baseline.

Findings: Content analyses showed that heredity and behavior were the most commonly generated causes. Most participants showed stability in attributions over time, although we found a trend for more participants endorsing behavioral attributions at the end of the study.

Conclusions: Cardiac attributions remain relatively stable across time.

Clinical Relevance: Cardiac rehabilitation staff should approach patients differently, depending on their causal narratives. Some patients enter CR understanding that behavior played a causal role, whereas some do not. Encouraging appreciation of the importance of behavior in cardiovascular disease onset and recurrence is vital.

Keywords: Cardiac; cause; qualitative research.

Cognitive adaptation theory (Taylor, 1983) suggests that creating meaning following a threatening event is important for adjustment. For most people, meaning creation comes from the generation of a causal attribution. For patients with cardiovascular disease (CVD), the causal narrative answers the question: “Why did I experience this cardiac event or CVD diagnosis?” Indeed, researchers have found that most patients create one or more attributions about the origins of their CVD (Bennett & Marte, 2013). Taylor (1983) suggests that meaning lends itself to perceived control and that over time perceived control aids adjustment. Several studies have examined the types of attributions patients with CVD create, some using checklist-type methods (Cameron, Petrie, Ellis, Buick, & Weinman, 2005; Day, Freedland, & Carney, 2005; Dunkel, Kendel, Lehmkuhl, Hetzer, & Regitz-Zagrosek, 2011; Reges et al., 2011; Stafford, Jackson, & Berk, 2008) and others using qualitative approaches (Astin & Jones, 2004; Bennett, Clark, Harry, & Howarter, 2016; Bennett & Marte, 2013; Darr, Astin, & Atkin, 2008; French, Maissi, & Marteau, 2005; Martin et al., 2005; Richards, Reid, & Watt, 2003). Research also has examined effects of attributions on cardiac health outcomes, but only three studies have tested their temporal patterns (Affleck, Tennen, Croog, & Levine, 1987; Cameron et al., 2005; Reges et al., 2011). Of note, no studies of which we are aware have examined temporal patterns using a qualitative approach, and that is the purpose of this study.

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Common Themes of Cardiac Attributions

Studies using a checklist method often ask patients with CVD to endorse causes that they believe contributed to disease onset from an established list of possibilities. Many of these causes break down into behavioral ones and biological ones. For example, Cameron et al. (2005) sampled patients with myocardial infarction (MI) shortly after diagnosis and found that the most commonly endorsed causes were stress, high cholesterol, heredity, poor diet, and hypertension; a similar study of patients with MI reported smoking, stress, and heredity as the most commonly endorsed causes (Reges et al., 2011). Other studies report a mix of behavioral and biological causes endorsed by patients with CVD (Dunkel et al., 2011; Stafford et al., 2008). In addition, one study found that patients with heart disease experiencing anxiety or depressive symptoms were more likely than their nondistressed counterparts to endorse negative emotion attributions such as stress, anger, sadness, nervousness, fear, and loneliness (Day et al., 2005). Studies also suggest a socioeconomic status (SES) difference for endorsement of heredity as a causal factor: highly educated patients with acute coronary syndrome (Perkins-Porras, Whitehead, & Steptoe, 2006) and patients with MI categorized as high in social class (Affleck et al., 1987) were more likely to endorse heredity compared to their counterparts.

The other means of measuring attributions comes from asking participants open-ended questions, allowing them to generate causal narratives in their own words. This method has been used by several researchers and has yielded three overarching themes similar to checklist methods: behavioral causes, biological causes, and stressors (Bennett et al., 2016; Bennett & Marte, 2013; Darr et al., 2008; French et al., 2005; Richards et al., 2003). For example, Martin et al. (2005) content analyzed attributions generated by patients with MI and found the following common themes: stress, comorbidities, heredity, diet, smoking, and physical inactivity. They also noted a gender difference: Men were more likely to create a behavioral attribution than women; 3 months later, men were more likely to self-report improvements in diet and exercise than women. These themes and gender differences were also reported by Astin and Jones (2004), with men more likely to generate a behavioral cause than women and women more likely to generate a biological cause than men.

Cardiac Attributions as Predictors of Outcomes

Studies also have examined cardiac attributions as predictors of health outcomes, with most suggesting protective effects of behavioral attributions on health. Martin et al. (2005) found that creating behavioral attributions was linked to self-reported gains in parallel domains 3 months later; for example, most patients who attributed their MIs to dietary factors made self-reported gains in diet at follow-up. Blair et al. (2014) found that patients who created behavioral attributions following hospitalization were more likely to attend cardiac rehabilitation (CR) than their counterparts who did not create a behavioral attribution. An intervention study by Broadbent, Ellis, Thomas, Gamble, and Petrie (2009) to encourage behavioral attributions post-MI found that the intervention group was significantly more likely to return to work at the 3-month follow-up and to self-report gains in exercise at the 3- and 6-month follow-ups, compared to their control group counterparts. Bennett et al. (2016) reported that patients in CR who created a behavioral attribution at the beginning of CR had concurrently higher perceived control than patients who did not create a behavioral attribution, but they also had higher anxiety symptoms 21 months later. Research is mixed with regard to the health effects of stress attributions. For example, Dunkel et al. (2011) showed that stress and personality attributions by patients with coronary artery bypass graft were associated with an increase in depressive symptoms 1 year later, after controlling for demographic and clinical factors. However, another study found that creating a stress attribution was predictive of an increase in functional capacity among patients in CR (Bennett & Marte, 2013).

Temporal Patterns of Cardiac Attributions

To date, limited research has tested temporal patterns of cardiac attributions, the focus of the current study. Using a checklist method, Affleck et al. (1987) asked patients 7 weeks and 1 year post-MI what caused their cardiac events. At both times, stress was the most commonly endorsed cause, followed by their own behavior. These authors calculated correlations between scores on the causal checklists at Times 1 and 2. Results showed high degrees of stability: The correlation between stress attributions was .57 ($p < .001$), and the correlation between past behaviors was .56 ($p < .001$). Thus, Affleck et al. concluded that cardiac attributions remained relatively stable over the year following an MI. Likewise, Cameron et al. (2005) assessed the stability of causal endorsements on a checklist at hospital admission for MI, at hospital discharge and 3 and 6 months later. Repeated measures ANOVAs revealed no differences across the four data collection times for any of the five main causal themes. Thus, again, results suggest a moderate degree of stability in the narratives patients create following a cardiac event.

Reges et al. (2011) examined the stability of causal attributions by patients with MI using a checklist method, comparing endorsements of 13 potential causes during hospitalization to endorsements made approximately 2 years later. Results showed stability in 9 of the 13 causes across time. However, patients made significantly more endorsements to the following causes at follow-up compared to baseline: hyperlipidemia (33.1% vs. 7.9%), sedentary lifestyle (24.2% vs. 5.6%), heredity (33.1% vs.

16.3%), and work stressors (32.0% vs. 10.7%). Furthermore, participants who completed a CR program were more likely to increase their endorsement of sedentary lifestyle as a cause from baseline to follow-up compared to patients who did not participate in a CR program. Thus, all three studies that have examined temporal patterns in cardiac attributions show moderate stability. The one study (Reges et al., 2011) with evidence of change across time used a longer follow-up period and suggested an interesting effect of participating in a CR program: a strengthening over time of the recognition of lack of physical activity as a risk factor for CVD onset. Notably, we were unable to find any studies that have used a qualitative approach to examine temporal patterns of cardiac attributions.

Research Question

This study examined temporal patterns of attributions generated by patients with CVD to explain their cardiovascular events. To date, we are only aware of three studies to examine temporal patterns of cardiac attributions, all using the checklist method. To our knowledge, no other research has qualitatively examined patterns of cardiac attributions over time. Therefore, the following research question was examined: *Do causal attributions by patients with CVD participating in a CR program change over time?*

Method

Design

This was a qualitative, descriptive study of patients in CR followed across three time periods: at the beginning of CR (Time 1), 12 weeks later at the end of CR (Time 2), and 12 months after the end of CR or 15 months following CR entry (Time 3). Data reported here represent part of a larger, parent study examining social-cognitive predictors of recovery during and after CR (Bennett et al., 2016). These data were collected via self-administered questionnaires at the three time periods, and clinical variables were extracted from participants' medical charts at their CR programs following program completion. Data collection for the parent study began in July of 2005, and follow-ups ended in September of 2012.

Procedures

Participants were recruited following hospitalization for a cardiovascular event from two hospital-based CR programs in a Midwestern state within the United States. Patients were eligible to participate in the study if they were at least 18 years of age, completed an intake appointment with CR staff, spoke English, and did not have any cognitive or physical impairments that would preclude completion of study instruments. For eligible patients, CR staff gave general, introductory information about the study (i.e., "the study will examine recovery processes among patients during and after cardiac rehabilitation") during intake appointments. If a patient consented to learning more about the study, he or she completed a permission form with contact information that was forwarded to our research team. Subsequently, each patient was contacted within a week by telephone by one of our research team members. In these phone calls, our team members shared more details about the purpose and procedures of the study and answered any questions patients posed. If a patient was interested in receiving mailed information about the study, an introductory packet was then mailed to him or her. This packet included a cover letter summarizing the study purpose and recent phone conversation, two copies of the consent form, the Time 1 questionnaire, and a return, postage-paid envelope. Consenting participants returned one of the signed consent forms (the other was for their records) and the completed questionnaire in the prestamped envelope. Follow-up questionnaires were mailed 12 weeks (i.e., Time 2) and 15 months (i.e., Time 3) later. All study procedures were approved by the appropriate university and hospital institutional review boards.

Measures

Participants completed an open-ended item within the study's questionnaire assessing their cardiac attributions at all three time periods. This open-ended question was part of the larger questionnaire administered in the Bennett et al. (2016) study. The question asked, "If you had to pick one major cause for your cardiac event, in your own words, what would that cause be?" Participants were provided several blank lines on which to write their response. Written answers were used verbatim for coding analyses. The use of a single item to qualitatively assess cardiac attributions has been previously validated (French, Senior, Weinman, & Marteau, 2001). Participants also answered demographic questions about their gender, ethnic background, marital status, occupational status, education (1 = *less than 9th grade*, 7 = *graduate degree*), and annual household income (1 = <*$10,000*, 11 = >*$100,000*).

Participants

Eighty-six participants completed questionnaires at all three data collection periods. Participants described here represent a subsample of the Time 1 sample reported by Bennett et al. (2016); we used participants' Time 1 cardiac attribution data from Bennett et al., and here we report longitudinal data collected from the sample participants at Times 2 and 3. A series of chi-square analyses and *t* tests were computed in order to determine whether the subsample used here (n = 86) differs from participants in the Bennett et al. sample that were dropped because they did not complete questionnaires at Times 2 and 3 (n = 116). Comparisons showed that the samples did not differ on gender, employment status, or marital status ($\chi^2[1] = 0.44$, *ns*; $\chi^2[1] = 1.91$, *ns*; and $\chi^2[1] = 3.70$, *ns*, respectively). However, the subsample used here was older (M = 64.1 vs. M = 60.9; $t[200] = 2.04$, $p < .05$), more educated (M = 5.1 vs. M = 4.5; $t[198] = 3.20$, $p < .01$), and had higher income (M = 7.2 vs. M =6.3; $t[188] = 2.15$, $p < .05$) compared to participants from Bennett et al. who were excluded due to missing data.

Participants had been hospitalized for a cardiac event, and all were participating in a Phase II CR program. The CR programs were outpatient in nature and lasted for 12 weeks. Over the 12 weeks, patients could complete a maximum of 36 one-hour monitored exercise sessions. These CR exercise sessions were augmented by psychoeducational meetings with CR staff targeting heart-healthy eating, stress management, and cardioprotective medication adherence.

Content Analysis

Content analysis of attributions occurred in three stages. First, because coding categories had already been extracted and used to analyze Time 1 data in Bennett et al. (2016), those same 12 coding categories (and a "blank/missing" category) were employed for analysis of attribution data at Times 2 and 3. Thus, we used the previously coded data from Bennett et al. for the 86 participants included in our sample at Time 1; the four coders in this study content analyzed responses at Times 2 and 3. Second, the four coders independently reviewed a subset of Time 2 data, assigning attributions into 1 of the 12 coding categories. Subsequently, a group meeting was held to discuss each coder's assignments; where there was disagreement, a discussion was held to resolve discrepancies until consensus was achieved. At that time, we also discussed the possibility of revising the coding categories but did not feel that it was necessary. Third, the remaining Time 2 attributions and all of the Time 3 attributions were independently reviewed by each coder and assigned into one of the coding categories. A second group meeting was then held where we discussed our assignments and resolved discrepancies to achieve consensus; no edits to the coding categories were required. In all, the four coders agreed 93% of the time when coding the Times 2 and 3 attributions, yielding a free marginal kappa of .93. As reported by Bennett et al., coders agreed 91% of the time while analyzing the Time 1 data, yielding a free marginal kappa of .90.

Results

Participant Characteristics

At Time 1, most participants were male (67.4%), European American (92.9%), married/partnered (80.2%), and not working outside the home (62.8%). Ages ranged from 38 to 81 years, with an average of 64.1 years (SD = 9.0). Education levels varied widely: 1.2% completed some high school, 17.4% completed high school or a GED, 34.9% completed some college or trade school, 18.6% completed a 4-year college degree, and 27.9% completed a graduate degree. The median annual household income range was between \$70,000 and \$79,999, with the largest percentage of participants (20.2%) reporting annual incomes of more than \$100,000. Most participants were of low (54.9%) or medium (42.3%) risk for disease progression (American Association of Cardiovascular and Pulmonary Rehabilitation, 2004). Participants completed an average of 17.4 CR sessions (SD = 7.0). The most common diagnoses were placement of a stent (29.1%), coronary artery bypass graft (22.1%), and MI with the placement of a stent (14.0%).

Coding Categories

All 86 participants completed the open-ended cardiac attribution question at Time 1. Most participants (i.e., 72) provided one cause, but 12 participants provided two causes and 2 participants provided three causes. Thus, at Time 1, the 86 participants created 102 distinct causal attributions (or *mentions*). At Time 2, most participants (i.e., 59) created one cause, whereas 23 participants created two causes, 1 participant created three causes, and 3 participants did not answer the question; in total, the sample generated 108 distinct cardiac attributions (or *mentions*) at Time 2. At Time 3, 68 participants generated one cause, 15 participants generated two causes, and 1 participant generated three causes; 2 participants left this question blank. In all, then, 101 distinct causes (or *mentions*) were generated at Time 3.

Table 1 presents results of the content analyses: the 12 coding categories, verbatim examples of cardiac attributions, and number of *mentions* across the three data collection times. As seen in Table 1, heredity was generated more frequently than the other 11 categories at all three data collection times: 25.5% of the mentions at Time 1, 18.5% of the mentions at Time 2, and 22.8% of the mentions at Time 3. The next most frequently

Table 1 Attribution categories and themes across time (*n* = 86)

Overarching Themes, Coding Categories, and Verbatim Examples	Number of Mentions (%)		
	Time 1	Time 2	Time 3
Behavioral	42.1%	47.1%	50.4%
Lack of exercise ("not enough exercise")	8 (7.8%)	11 (10.1%)	8 (7.9%)
Poor diet ("not eating right")	14 (13.7%)	20 (18.5%)	22 (21.7%)
Poor general self-care ("lack of taking care of my heart and body")	12 (11.8%)	9 (8.3%)	10 (9.9%)
Overweight ("somewhat overweight")	2 (1.9%)	2 (1.9%)	1 (1.0%)
Smoking ("smoking since I was 14")	7 (6.9%)	9 (8.3%)	10 (9.9%)
Biological	42.2%	35.2%	37.6%
Heredity ("family genes")	26 (25.5%)	20 (18.5%)	23 (22.8%)
Age ("getting older")	3 (2.9%)	2 (1.9%)	2 (2.0%)
Cardiac-related conditions ("infection around mitral valve")	7 (6.9%)	9 (8.3%)	7 (6.9%)
Non-cardiac-related conditions ("Agent Orange from Vietnam tour and other health problems")	7 (6.9%)	7 (6.5%)	6 (5.9%)
Stress ("stress caused by lack of time")	11 (10.8%)	12 (11.1%)	6 (5.9%)
Other	4.8%	6.5%	5.9%
Personality ("Type A personality")	2 (1.9%)	2 (1.9%)	1 (1.0%)
Misc. ("probably just the way I was created")	3 (2.9%)	5 (4.6%)	5 (4.9%)
Blank	0	3	2

Note. Time 1 was before CR; Time 2 was 12 weeks later, at the end of CR; and Time 3 was 12 months after the end of CR (or 15 months after Time 1). Time 1 percentages are out of 102 attributions generated by the 86 participants, Time 2 percentages are out of 108 attributions generated, and Time 3 percentages are out of 101 attributions generated.

generated cause was poor diet: 13.7% of the mentions at Time 1, 18.5% of the mentions at Time 2, and 21.7% of the mentions at Time 3. Thus, a slight increase in mentions of poor diet occurred over the course of the study. Conversely, mentions of stress declined over the course of the study: 10.8% at Time 1, 11.1% at Time 2, and 5.9% at Time 3. Mentions of the other nine coding categories were relatively stable across the data collection periods.

Overarching Themes

Consistent with Astin and Jones (2004) as well as Bennett et al. (2016), the 12 coding categories were collapsed into three overarching themes: behavioral causes, biological causes, and stressors. Behavioral themes are represented by the following five coding categories: lack of exercise, poor diet, poor general self-care, overweight, and smoking. Biological themes are represented by the following four coding categories: heredity, age, cardiac-related conditions, and non-cardiac-related conditions. And, stress is its own coding category. Given the causal ambiguity and sparse mentions of attributions in the "personality" and "miscellaneous" categories, those two were excluded from subsequent analyses. As outlined in Table 1, 42.1% of the mentions at Time 1, 47.1% of the mentions at Time 2, and 50.4% of the mentions at Time 3 were classified within the behavioral theme. In addition, 42.2% of the mentions at Time 1, 35.2% of the mentions at Time 2, and 37.6% of the mentions at Time 3 were classified within the biological theme.

Temporal Patterns of Themes

Patterns of possible change of cardiac attribution themes over time were assessed. Tallying of descriptive statistics showed stability in attribution themes across the three data collection times for most of the sample: 25 participants (29.0%) generated behavioral attributions at all three times, 22 participants (25.6%) created biological attributions at all three times, and 4 participants (4.6%) created stress attributions at all three times. Thus, nearly two thirds of the sample generated the same attribution theme at all three times. Seventeen participants (19.8%) changed their attribution themes across the study, with a plurality (8 participants) changing from biological to behavioral themes. The remaining 18 participants (20.9%) were excluded from this descriptive trajectory analysis because they had missing data for at least one time point or because they generated attributions in the "miscellaneous" or "personality" categories. In order to test for any demographic differences between the "stable behavior," "stable biological," and "changing" theme groups, chi-square analyses were conducted. Results showed that the three groups did not differ on gender, marital status, or employment status ($\chi^2[2] = 1.58$, *ns*; $\chi^2[2] = 0.27$, *ns*; and $\chi^2[2] = 0.14$, *ns*, respectively). One-way ANOVAs also were conducted, showing no group differences in age, education, income, risk stratification, or number of CR sessions completed ($F[2, 61] = 0.14$, *ns*; $F[2, 61] = 0.29$, *ns*; $F[2, 60] = 1.50$, *ns*; $F[2, 50] = 0.84$, *ns*; and $F[2, 50] = 0.43$, *ns*, respectively).

Therefore, these three groups were relatively homogenous on baseline demographics.

Generalized estimating equations were used to model changes in the proportion of *participants* (out of 86) making attributions within the behavioral and biological themes across the three data collection times. For these analyses, making either a behavioral or biological attribution was coded as "1," whereas not making that type of attribution was coded as "0"; Time 1 was set as the intercept. We were interested in changes between Times 1, 2, and 3 and, thus, treated time as ordinal. At baseline, the odds ratio (*OR*) of making a behavioral attribution was .75 (95% CI [0.49, 1.16]) and nonsignificant ($\chi^2[1] = 1.66$, *ns*). Between Times 1 and 2, the change in *OR* was not significant ($\chi^2[1] = 2.02$, *ns*), but change between Times 1 and 3 approached significance ($\chi^2[1] = 3.70$, $p = .055$); the change in *OR* was 1.43 (95% CI [0.93, 2.07]), resulting in a Time 3 *OR* of 1.08, or a 52% probability of participants making a behavioral attribution. When a similar analysis was repeated with biological attributions as the outcome, the baseline *OR* was .95 (95% CI [0.62, 1.46]) and nonsignificant ($\chi^2[1] = 0.05$, *ns*). Likewise, the changes from Times 1 to 2 and from Times 1 to 3 were also nonsignificant ($\chi^2[1] = 1.58$, *ns* and $\chi^2[1] = 1.49$, *ns*, respectively). Therefore, results suggest that the use of both types of attributions was mostly stable over time, with a slight trend toward an increase in the use of behavioral attributions at follow-up.

Discussion

This study examined temporal patterns of causal attributions qualitatively collected from patients to explain their cardiovascular events. Content analyses revealed consistency between results reported here and past research regarding commonly mentioned causal themes, as well as the relative stability of those themes across time. First, with regard to themes, results support the centrality of behavior (like poor diet and poor self-care) and heredity as perceived causes of CVD onset. In fact, of the 12 coding categories extracted from these data, heredity was the most commonly generated cause, with mentions coming from between one fourth to one fifth of the sample at different times of the study. Past research has found significant differences in endorsement of genetics as a cause of CVD, with patients from higher SES classifications being more likely to endorse genes than their counterparts (Affleck et al., 1987; Perkins-Porras et al., 2006). Given the sociodemographic composition of the current sample, our results are consistent with those studies. On account of the economic stability and social capital that many people of high SES experience, they may have cumulatively fewer behavioral risk factors for CVD than their middle- and low-SES counterparts (Mozaffarian et al., 2016). However, because of the interactive nature of CVD risk, behavior undoubtedly combines with heredity to establish true susceptibility.

Consistent with past research, behavioral themes were commonly generated at all three time points. In fact, they were generated more than the biological theme and more than stressors at Times 2 and 3. This is consistent with results of a review of cardiac attribution studies by French et al. (2001) and echoes findings of more recent studies (Cameron et al., 2005; Martin et al., 2005). Attributions to behaviors should be related to perceived control over those behaviors in the future, and past research has documented that behavioral attributions are linked to positive cardiac outcomes (Blair et al., 2014; Broadbent et al., 2009). Departing from past studies (Cameron et al., 2005; Dunkel et al., 2011; Reges et al., 2011; Stafford et al., 2008), however, stress was not a cause generated by many of our participants. It is possible that our sample did not view stress to be a contributor because of its social position, along with the fact that most of the participants were no longer working outside the home. Together, these demographic variables may result in stressors not being perceived as a salient precursor to CVD.

Stability in Themes

Most participants in this study generated the same attribution theme across the three time points. This stability echoes results from the checklist method studies cited above (Affleck et al., 1987; Cameron et al., 2005; Reges et al., 2011). Of the 51 participants who generated the same theme at all three time points, nearly one half of those created behavioral attributions. Recognition of the behavioral origins of one's diagnosis should lead to perceived control over future risk reduction. However, nearly one half of the sample did not mention their behavior as a cause, even after having participated in a CR program that focuses on exercise training and dietary changes. These findings imply that many patients, even after completing CR, have not changed their minds about the origins of their disease. To the extent that perceived causes affect motivation for behavior change, these results suggest that health providers should focus efforts to broaden patients' causal narratives to include behavioral risk factors.

Notably, about one fifth of the sample changed their attributions across the study, with a plurality of those moving from biological themes to behavioral themes. This type of change is encouraging within CR patients and likely reflects their growing understanding of behavioral risk factors. In fact, results of our multilevel modeling suggested a trend in the generation of behavioral themes across time, which is consistent with findings reported by Reges et al. (2011):

Participants who completed CR were more likely to strengthen their endorsement of sedentary lifestyle as a cause for their MIs compared to participants who did not complete CR. Given the focus on reduction of behavioral risk factors for recurrence within CR programs, a strengthening of the presumed behavioral origins of CVD is encouraging. Furthermore, because research has found positive health effects of behavioral attributions, encouraging behavioral explanations even in patients who presume heredity was the primary cause of their CVD seems warranted.

Clinical Implications

Because CR nurses and exercise physiologists have sustained and intense interactions with patients during their CR programs, opportunities for formal and informal intervention abound. Results of attributional searches likely have intrapersonal implications for patients in CR. First, there may be an effect on motivation levels for behavior change and estimations of risk for recurrence. Our data suggest that some patients arrive to CR with an acknowledgment of behavior as a cause; for them, CR nurses' and staff members' efforts may need to focus on increasing perceived behavioral control, as well as enhancing and maintaining motivation and self-efficacy for sustained change during and after CR. For example, one study showed that a nurse-led intervention increased self-efficacy for disease management among patients with chronic obstructive pulmonary disease (Wong, Wong, & Chan, 2005). These intervention efforts can be done informally during monitored exercise sessions or formally via referrals to mental health professionals (e.g., licensed social workers or clinical psychologists). However, some patients may enter CR without knowing or acknowledging the role of their behavior as a cause of their cardiac event. Even for those with a strong genetic risk for CVD, behavior undoubtedly plays a role; evidence supports epigenetic theories, so psychoeducation about the interconnection between genetic susceptibility and behavior can be provided by CR nurses. In addition, the interdisciplinary team seen by many patients with CVD should correct misconceptions about the etiology of CVD and encourage patients to feel control over future behaviors. Importantly, care should be taken to avoid patients feeling shame for past behaviors; rather, CR staff should enhance self-efficacy to change future risk.

Limitations and Future Directions

Although this is the first study of which we are aware to longitudinally assess qualitative cardiac attributions, there are several limitations worth noting. First, the sample used in this study was ethnically homogenous, affluent, and of low to moderate risk for recurrence. Relatedly, the sample size was relatively small, representing a subset of another study (Bennett et al., 2016); comparisons showed that participants lost to attrition from the larger study were more likely to be younger, less educated, and with lower incomes. Therefore, caution is warranted in generalizing these results to participants from the larger study. Future research should collect responses from a larger sample of patients with CVD, not just the ones in CR programs given low referral and participation rates (e.g., Brown et al., 2009; Suaya et al., 2007). Subsequent studies also should test whether attribution patterns over time predict physical and psychological health outcomes using objective measures; avoidance of self-report measures will protect against shared method variance and the inflation of statistical estimates. Determining the predictive ability of attributions and their trajectories over time will enhance the education provided to patients during their CR programs.

Key Practice Points

- Most patients create at least one causal attribution following a cardiac event.
- Creating behavioral attributions for a cardiac event has been linked to positive health outcomes.
- The most commonly mentioned causes are behavior (e.g., poor diet, lack of exercise) and heredity.
- Most of the patients retain the same cardiac attribution 1 year after completing CR; this is true even for those patients who entered CR believing that heredity was the primary cause of their cardiac events.

Conclusion

This study examined temporal patterns of patients' cardiac attributions during and after CR. The content of those attributions largely echoes past studies, with importance assigned to behavioral and genetic factors. Our results also showed moderate stability in attributions over time: Most patients retained their initial cardiac attributions 1 year after completing CR. There were some changes in attributions across time, and we found a trend for more participants making behavioral attributions at the end of the study. Findings suggest different approaches based on patients' initial causal narratives: encouragement of sustained motivation/self-efficacy for change among those who already believe behavior was a cause, and psychoeducation about interactions between heredity and behavior for patients who assign primary or complete blame to genetics.

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