

The mediating effects of explanatory style:

Examining blood pressure, preventative health behaviors, and compliance

with medical regimes in a diverse sample of hypertensive women.

INTRODUCTION

Essential hypertension (HTN) is a “silent killer” that affects 60 million adults in the United States causing arteriosclerosis, cerebrovascular accidents, myocardial infarctions, and end-stage renal disease (Hildreth & Saunders, 1992). The cause of hypertension is unknown (Williams, 1992) and current epidemiological studies indicate that it is more prevalent in African-Americans than all other racial groups (Burt et al., 1995). Moreover, African-American women (AAW) have the greatest gender differential in the incidence of uncontrolled HTN (60% for AAW and 49% for Caucasian women). HTN can be successfully controlled with prescription medication (Kaplan, 1995) and with the DASH diet (Appel, 1999; Appel et al., 1997; Sacks et al., 1995; Scisney-Matlock, Kachorek, Glazewski, in press). Unfortunately, compliance with medical regimes is extremely difficult for at least half of all individuals with the diagnosis of HTN (Branche Jr., Batts, Dowdy, Field, & Francis, 1991). The purpose of this project was to examine how explanatory style (ES) predicts compliance with antihypertensive medication regimens and with other general health promoting behaviors in both African-American and Caucasian women. Additionally, this paper will examine the link between ES and the central nervous system, specifically, blood pressure (BP) as it changes over time.

THEORETICAL FRAMEWORK

Attribution theory, first introduced by Fritz Heider (1958) and popularized by Jones and Davis (1965) and Kelley (1967, 1972), posits that people rationalize why events happen to themselves or others. The function of this is to maintain a sort of psychological homeostasis. When we realize that new information is incongruent with what we have come to accept and internalize through past experience, we try to interpret the events surrounding this information or condition in order to arrive at an appropriate explanation for what we’re feeling (Schachter & Singer, 1962). Explanatory style, coined by Abramson et al. (1978), and redefined by Peterson and Seligman (1984), is the verbal language people use when trying to mentally organize and make sense of (what Piaget would call ‘assimilation’) new information or a disturbing condition, such as chronic health problems like HTN. ES can be broken down into two different ‘styles,’ if you will -- pessimistic and optimistic. These two ways of thinking about the world can be empirically measured via an assessment tool called the Attributional Style Questionnaire, or ASQ.

The ASQ has been used in numerous experimental studies (Seligman, Abramson, Semmel, and von Baeyer 1979; Peterson, Semmel, von Baeyer, Abramson, Metalsky, and Seligman 1982). It is a means through which researchers can examine how people react

to, behave in, and understand or interpret various hypothetical situations, ranging from failure on an academic test to being fired from a job. It presents subjects with twelve events (6 bad and 6 good), in which they are asked to rate the cause of each event on a 7-point Lickert scale across three different dimensions. The causes of events can be explained in 1) internal or external terms, as in “I got second place in the race because I wasn’t sufficiently trained to compete” (internal cause for failure) versus, “I got second place in the race because the wind was blowing very hard (external cause for failure). Reasons for events can also be verbalized and internalized as 2) stable or unstable, as in “Because I got second place this time, I will get second place in the next race too” (failure and success are stable), versus, “Although I got second place this time, that doesn’t necessarily mean that is how I will do next time” (failure and successes are unstable, or variable). The last way events can be explained is through 3) global or specific terms. An example of this perspective would be a statement such as “I never get better than second place in any running event” (global failure--it extends into other domains), versus, “I haven’t got better than second place in this particular race” (in which failure to do better is limited to a particular event or set of circumstances).

Ratings are averaged across the good and bad events separately. A composite score is derived by combining all scores from the three aforementioned dimensions. Internal consistencies of the composite scores have alpha coefficients of .70 or more. Initial test-re-test reliabilities were quite high over several month periods (R ’s .60 and higher), (Peterson, Maier, Seligman, 1993). Since then, reliabilities have been bolstered (.70 to .85 range) by increasing the number of events for which causes are offered (Peterson and Villanova, 1988). Potential biases due to answering questions in a “desirable” or particular fashion were ruled out by Schulman, Seligman, and Amsterdam (1987) who found that even subjects given explicit instruction in what the test was trying to measure could not produce these answers, suggesting that the measure is not transparent. Lastly, meta-analysis and the application of ES to depression models have shown that different types of people, at least as studied in the 132 experiments, are not differentially susceptible to tests of laboratory helplessness. If there is a group that shows more helplessness outside the laboratory, perhaps it is “because these people have experienced more uncontrollability” in their life’s events, or, simply because of their ES, as opposed to being differentially sensitive to testing effects (Peterson, Maier, Seligman, 1993, p.108; see also Sweeney, Anderson, and Bailey, 1986 for meta-analysis of relationship of ES to depression).

Understanding people’s explanatory or attributional processes is especially important in health behavior for numerous reasons. First, people are especially motivated to seek causal attributions under periods of high uncertainty (Gerard & Rabbie, 1961), such as when medical information is unclear, or when physiological symptoms are unfamiliar or difficult to evaluate objectively. Second, illness itself causes general distress and/or inconvenience. People might draw “inaccurate or distressing inferences” about what is wrong with them when they feel poorly. These “misattributions, in turn, lead to inappropriate action or inaction” (Stone, Cohen, & Adler, p. 489). Third, people might put off medical attention, other personal responsibilities, and/or other people close to them because they do not want to let surface or make obvious physical symptoms that they are ashamed of. This could result in both less social support in the face of illness, and/or delay medical treatment. These are some of the many possible reasons for poor health quality-of-life and how attributions (ES) or perceptions about causality are directly linked to health practices. But before scientists can examine the mechanisms through

which this occurs (via enhancing knowledge, changing cognitive representations, misattributions, et cetera), the effect of ES on outcome variables such as BP and compliance must be established. This is the goal of this paper. Possible mechanisms for this link will be addressed in subsequent publications.

Inducing people to adhere to public health recommendations purports to put the patients in a submissive position relative to health professionals, but this is not really the case. Patients are *active* participants in the process of seeking medical care; patients have the choice of deciding whether or not to continue with and keep medical appointments, deciding whether or not to accept what professionals have suggested to them, actually enacting those suggested changes, and consciously deciding everyday whether or not behaviors will be (continuously) carried out at the appropriate hours. Engaging patients in their own health treatment is of utmost importance because managing illness lies in prevention -- personal commitment to lifelong self-care activities and medical care when necessary. It becomes especially difficult at times because deciding to partake in 'healthy behaviors,' may entail a temporary increase in deprivations or physical suffering. In addition, they can negatively affect people's general sense of well-being and quality of life (Stone, Cohen, & Adler, 1979; Anderson, Hogan, Appel, Rosen, & Shumaker, 1997).

In deciding what course of behavioral action to take (or not take for that matter), people are essentially deciding whether or not they want to succumb to their illness and the course of the disease, or if they want to speed up recovery and limit/prolong further physiological deterioration. These thought processes are captured by the ASQ because this assessment tool gives scientists a realistic picture of what people's perceptions about the chronicity of problems and their pervasiveness really are like in everyday situations. People who view their personal behaviors (preventative health behaviors, compliance behaviors with medical regimes, et cetera) as unimportant tend to have explanatory styles which encompass the dimensions of internality, stability, and globality. Women with hypertension and this pessimistic ES make statements such as, "I have brought this high blood pressure upon myself, and it isn't going to go away so I might as well plan on having it affect the rest of my body--I guess I can plan on a heartattack soon." People who explain negative events (such as diagnosis with hypertension) and their failures to produce desired lifestyle changes in this manner (in this pessimistic style) also tend to do so in the future, despite their inclination and/or knowledge that such thinking and such acts are harmful to their physical health.

For instance, Williams and Brewin (1984) studied people's reactions to test failure and found that people who explained their failure with stable terms reduced their expectancy for future success at the test. Hence, this measure has been used as a means of operationalizing persistence. In this particular case, subjects' pretest expectancy for and incentive for success was either impeded by or facilitated by their attributional style. Concrete evidence of the effects of attributional style on performance of particular behaviors have also been researched by Peterson & Bossio (1991), Nolen-Hoeksema, Girgus, and Seligman (1986), Steele and Southwick (1981), and Anderson (1983). It has been also examined in regards to coping with stress (Major, Mueller, and Hildenbrandt 1985), and in regards to reactions to physical injury or disease (Abrams and Finesinger, 1953). In short, peoples with an optimistic explanatory style have been shown to fall ill less frequently, survive longer when confronted with terminal illness, recover from illness more successfully, engage in less risk taking behaviors less frequently, are less likely to die a sudden and accidental death, and deal with stress more effectively.

These diverse research findings all converge in their finding that a pessimistic ES is related to poor health, depression, and what has been coined “learned helplessness,” or general passivity. When people believe that their efforts are useless, they are apt to fail to comply with recommendations made to them by both concerned friends and family as well as healthcare professionals such as doctors and nurses (Janis and Rodin, 1979). Thus, whereas most patients are active recipients of health membership and care, people with a pessimistic ES are not at all involved with decision making for healthcare because they believe that their efforts go unrewarded or are simply ineffective.

A “key concept in the reformulated theory (of learned helplessness) is..the habitual tendency to offer the same sorts of explanations for diverse bad events” (Peterson, Maier, Seligman (1993). Such maladaptive perceptions, such as the thought that bad events (be it diagnoses, poor prognosis for disease improvement, an adverse reaction to a medication, et cetera) will undermine and effect all preventative behaviors (eating healthy, taking medication regularly, keeping appointments with health care physicians) will inevitably affect the course of disease because people won’t take precautionary measure requisite to better maintenance of their respective disorders. In the case of hypertension specifically, not taking blood pressure measurements regularly, not adhering to instructions for prescription medications, and not eating a low-fat, low-salt diet can exacerbate the disorder, leading to uncontrolled BP and various medical complications. Therefore, effective cognitive-behavioral therapies which will encourage behavioral change are solely needed to demonstrate to these individuals that preventative and maintenance health care is effective at enhancing the quality of physical life.

Never before have researchers examined how attribution theory might explain perceptions about the causes of hypertension and high blood pressure reduction behaviors. This paper will concentrate on how an optimistic ES leads to active engagement in preventative health behaviors, thereby increasing compliance with medical regimes and having an overall lower BP range. The active participation of people with an optimistic ES would also support the notion that persons with a pessimistic ES are not engaging in healthy behaviors because of the passive or helpless nature of this cognitive style of thought. These goals were explored with the following three hypotheses in mind:

H1: Women who attribute the cause of their hypertension to global, stable, and internal causes (pessimistic ES) will be those who consistently have higher blood pressure and are in the high blood pressure classification category (Systolic BP >160 mmHg, and/or diastolic BP >100 mmHg).

H2: Women with an optimistic explanatory style will be more likely to comply with medical regimes such as taking their antihypertensive medication regularly.

H3: Women with an optimistic ES will have higher scores on their health promoting lifestyles scales, suggesting that they engage in more general preventative self-care behaviors, as compared to women with pessimistic ES, across all four group assignments.

METHODS

Sampling and Stratification

Approximately 200 women with Stage I or Stage II HTN, that is, two SBP 140-159 mmHg and DBP 90-109 mmHg at least two weeks apart were recruited (National

Institutes of Health, JNC-V, 1993). Patients with uncontrolled hypertension were the target population for this study because patients with higher BP are at greater risk for cardiovascular accidents. They are also an important population to target because Burt and associates (1995) reported that 36% of patients treated for HTN have BP above the 160/95 mmHg threshold, with only 29% being able to maintain BP below the 140/90 threshold. These women were recruited from a large Midwestern University hospital. While HTN is diagnosed equally in both men and women, the wider disparity in the control rate between AAW and WAW (White American Women) compared to men of any racial group suggests that a sample limited to women is necessary if health care professionals are to better understand why this large discrepancy exists. Additionally, AAW ages 34-54 have the highest incidence of uncontrolled HTN (Burt et al., 1995), so it was imperative that the sample be at least half AAW since they suffer disproportionately and die prematurely from the effects of uncontrolled HTN. A stratified sampling approach with Solomon-four groups was used to diminish potential threats to validity of the effects of the intervention from exposure to survey instruments. See Figure 1 below.

Random Group Assignment	Solomon-four Grp. Assignment	Racial Identity	
		Af-Amer	Caucasian
Experimental Groups	1) Pre & Post Test	<i>n</i>	<i>n</i>
	2) Post Test	25	25
Control Groups	3) Pre & Post Test	25	25
	4) Post Test	25	25
Subtotal		100	100
Figure 1. Stratification of sample and research design. (N=200).			

These women ranged from ages 30 through 65 years of age. Hypertension is rarely diagnosed in persons under thirty, and for persons over age 65 there is often a secondary diagnosis or medical complication which might be the result of hypertension, or have caused hypertension. This study aims to address issues pertinent only to essential hypertension, not hypertension due to any number of secondary causes (e.g. end-stage renal disease, stroke, or insulin-dependent diabetes).

Procedures

At time one, women in *both* of the experimental groups (Groups 1 and 2) were given MEMS© bottles and had their function explained to them. MEMS bottles are plastic containers which people are instructed to place their medications in. (These women were already taking antihypertensive medications prescribed by their primary health caretakers.) Each time the lid is removed, a microchip recorded the date and time at which the pill was taken. The participants utilized the MEMS bottles to take their daily dose(s) of antihypertensive medication for the next thirty days (until time two). They answered questionnaires at this time as well as at the end of the study (time three), ninety days later.

Additionally, women in experimental group *one* were given cognitive messages designed to increase their knowledge about HTN and the need to take medications as prescribed. These messages were developed so that participants would have a mechanism through which they could “use their own reflections (about their diagnosis of HTN) to appraise, evaluate, and internalize ‘how’ -- perceptions, preferences, and possibilities -- and ‘what’ -- beliefs, barriers, and intentions -- a person thinks about specific self-care activities associated with prescribed medication” (Scisney-Matlock, 1995). Content for the messages was developed from interviews, written responses to questions from survey research, and included a comprehensive literature review. The 18 goals that the cognitive messages encompassed were displayed in a wheel-shaped form, so that the messages rotated in and out of a window, one by one, so that the content of only a single message could be viewed and read at a time. (See facsimile WHEEL attached). The WHEEL provided a means through which women could learn about and be exposed to different information relevant to HTN. One dimension aimed to increase general “knowledge” about HTN, another to enhance “skills” to live with it, and the third and last dimension was labeled “attitude,” designed with the intent of shaping women’s perceptions about having to comply with medical regimes.

Thus, each of the three WHEELS had the same 18 goals on each (9 on each side), but addressed three different aspects of each and every goal: knowledge, attitude, or skill. Women were instructed to read at least one tailored message once a day, and to respond (via a pager provided for them) whether or not they did so by the end of the day. Having the subjects respond via pager not only verified the performance of the intervention activities, but it also provided immediate reinforcement to strengthen the importance of compliance with medical regimens. Subjects were allowed to keep these tailored cognitive messages for the duration of the study, but returned the MEMS bottles after one month of use.

Women in *both* of the control groups (groups 3 and 4) did not receive the MEMS bottles or cognitive WHEELS messages. They did not have any responsibilities outside of their coming to the clinic to fill out questionnaires as indicated above in Figure 1. Members of *all* groups however, had their BPs measured on each of the three occasions so that changes in BP could be assessed across time and across group assignment.

Again, the goal of this paper was not to determine how race, knowledge, or cognitive messages are related to ES or BP even though measures of these constructs/variables were included in the design of this study. These will be the topics of other articles. Here we set forth to determine how ES (both pessimistic and optimistic style) mediate preventative health practices and high blood pressure specifically.

Inclusion and Exclusion Criteria for Participation

Attending physicians at the outpatient internal medicine and general medicine clinics referred possible candidates to the researcher. All candidates were generally of sound mental health and able to read and write English. A protocol was read verbatim to the potential subjects, detailing what their involvement would include. After reading and signing the consent document, each subject was randomized into one of the four groups by randomly selecting from a large pile of numbered envelopes. Subjects who withdrew from the study were replaced. Any subjects who met the criteria displayed in Figure 2 below were eligible for participation:

Measures

Demographic data were collected on individual characteristics such as age, race, marital status, menopausal state, support for hypertension regimes (meal preparation and acquisition of medications), educational level, occupation, income, and employment status. Medical information was extracted from lab reports and medical files to determine history of concurrent medical conditions and medications taken. Other measures utilized in this study included health promotion lifestyle profile measures (Walker, Sechrist, & Pender, 1987), and the Explanatory (or Attributional) Style Questionnaire discussed in the Introduction section. MEMS© bottles were used to quantitatively assess whether or not participants were actually taking antihypertensive medications as prescribed.

Data Analysis and Management

Histograms, box plots, and descriptive statistics were used to identify aberrant data points, and to characterize the distributions of the measures and the four groups to which participants were assigned to. There was little missing data, so simple methods of mean substitution and complete case analyses led to equivalent results. T-tests for independent samples were conducted to make sure that the randomization produced equivalent groups.

To address the first hypothesis, planned contrasts (ANOVA) were conducted to compute BP changes from Time 1 to Time 2, and again at the end of the study. It was hypothesized that women with an optimistic explanatory style would have lower BPs at both the beginning of the study and throughout its duration, regardless of group assignment.

To test the second hypothesis, one-way repeated measures ANOVAs were run to determine if explanatory style mediated whether or not medications were taken by participants in experimental groups 1 and 2, and to determine at which times it did so.

To assess the accuracy of the third hypothesis, that type of explanatory style would significantly effect health promoting lifestyle behaviors (as assessed by the questionnaire), repeated measures ANOVAs, 1) total score, and 2) explanatory style type were used as a between-subjects factor and time of measurement (pretest, one month post, and three months post) as a within-subjects factor was used to assess the impact of the intervention on explanatory style and on health promoting behaviors.

Age, race, education, and marital status were not included as covariates in any of the aforementioned analyses because they weren't found to predict changes in BP or explanatory style, and therefore were not regarded as confounding factors throughout the duration of the analyses.

RESULTS

In running the analyses for the first hypothesis, results were as anticipated. Namely, women with pessimistic explanatory styles had higher BPs than women with optimistic explanatory styles both at the beginning of the study and at its very end. See Graph 1 below to examine changes in mean Systolic BPs and Diastolic BPs for women with optimistic and pessimistic explanatory styles across time. Graph 2 below depicts

changes in BP by group assignment. **Steve, I really can't do this until I have data to put into an excel file!**

Results from the one-way ANOVA conducted to test hypothesis two, were statistically significant. This indicates that women with an optimistic explanatory style were more likely to comply with their prescriptions than women with a pessimistic explanatory style were, 55(1,198); $p < 0.05$. This did not change across time (Means at times 1, 2, and 3 respectively are: 11, 22, 33, for the 'optimistic' women, and 1, 2, 3, for the 'pessimistic' women).

The third hypothesis of optimistic explanatory style mediating health promoting behaviors was supported by a statistically significant interaction between group assignment and time, 15.55(1,199); $p < 0.0001$. Women with an optimistic ES who were in experimental group one (who received the cognitive messages) were most likely to be partaking in health-promoting behaviors by the end of the study (Mean = 15.55). The mean for women in the second experimental group was relatively higher than that of all women in the controls groups (Mean = 15 versus 10). When taken as a whole however (across all group assignments), women with an optimistic explanatory style were more inclined to partake in 'healthy' behaviors more frequently than their pessimistic counterparts (Mean = 66 versus 55) 80.00(2,197); $p < 0.000000000001$. *Ha, Ha☺

DISCUSSION

It appears as though it is very adaptive to view failures to engage in preventative and health maintenance behaviors as specific, external, and unstable. When failure to achieve a desired goal or result occurs, this way of explaining the 'failure' does not appear to thwart future attempts to do so. Therefore, optimistic ES is adaptive in that it results in increased compliance relative to people who view their illness and their failure to comply with medical regimes/ to engage in health preventative behaviors in global, internal, and stable terms. The implications for this are great. Explanatory style is not just a way of thinking about or explaining events. It is because of the way that one's thoughts are organized and generalized that actions are literally carried out (or not). Thus, even if someone understands or has the knowledge that s/he should do something, that thought will not necessarily be translated into behavior until that person believes that their effort will be fruitful/effective.

The fact that women with a pessimistic ES have higher BPs than women with optimistic ES means that women with pessimistic ES can anticipate having more cardiovascular accidents, strokes, and even premature death than they should perhaps be at risk for. Their way of thinking might ultimately cost them their life because they can not convince themselves of the utility of preventative and health maintenance behaviors which have been established to prolong life.

The CBI implemented in this study was effective at lowering BP to all women who read the cognitive messages, suggesting that even women with pessimistic ES can benefit from reading the messages. Certainly, because they engaged in more health relevant behaviors than they were *before* having read the tailored messages, they can expect more benefits than those women who did not read the messages (regardless of explanatory style type).

IMPLICATIONS

Awareness of people's ES type will cue physicians into types of unhealthy behaviors that can be anticipated, so that professionals can refer patients to alternative sources of support (nurses, psychologists). These social support providers can work with patients to reinforce medical regimes prescribed by primary caretakers. In the case of hypertension specifically, this might include the distribution of the cognitive WHEELS messages. Ultimately, this tailoring of health services to individual needs will lead to enhanced quality of life in patients because of their improvement in and maintenance of symptoms of disease. This will also be of great benefit to medical and health professionals because as a result of symptom management and illness prevention, they can expect fewer hospitalizations and medical complications/development of new comorbid disorders (be it depression, diabetes, or stroke) due to lack of active participation in the health care process.

CONCLUSION

It appears as though explanatory style is an important component when trying to understand, predict, and enhance compliance with medical regimes. Because a negative explanatory style actually affects people physiologically in negative ways (e.g. keeping blood pressure at elevated levels despite attempts at intervention), it is important that health care officials are able to know who these people might be so that they can be given extra medical attention and counseling on how to change their explanatory style to be more optimistic. The CBI was effective at helping women to remember to take their medications regularly, and therefore this intervention provides hope/suggests a promising means by which people with pessimistic explanatory styles might be exposed to a new and healthier way of looking at the management of their disease. Such interventions might be tailored to other diseases and health complications in the near future to help facilitate compliance with any number and type of medical regimens.

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