Special Section

Assessing the Relationship Between a Multidimensional Psychological "Control Profile" and Cardiovascular Risk

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This article begins by citing apparently conflicting sets of literature regarding the association between control and cardiovascular risk. Each set of findings is based on a unidimensional understanding of control. To gain more precise information, a multidimensional control inventory, the Shapiro Control Inventory (SCI), was given to twenty individuals at the time of their yearly physical. Results showed that low perceived control on the domain specific control scale was associated with higher cardiovascular risk. Further, several findings between specific risk parameters — smoking, calories from fat, blood pressure, and cholesterol level (HDL)— were significantly associated with different dimensions of the control profile. Case study data from the two individuals at highest risk suggest that different control profiles may be associated with cardiovascular risk. Guidelines and suggestions for future research are offered.

Introduction

Control as a psychosocial variable has been associated with cardiovascular risk, but the data is conflicting and often appears contradictory. In one set of findings, low perceived control is associated with cardiovascular risk; in the second set, perceived control is associated with cardiovascular risk; and in the third set, desire (and efforts) for control are associated with cardiovascular risk.

The first set of findings shows that low perceived control, a low external locus of control, and poor self-control are associated with cardiovascular risk. Several studies have shown that those with lower levels of perceived control over job demands have an increased risk of heart disease, and essential hypertension (1-2). In an in-vivo study by Bugental (3) suggesting a possible mediating mechanism for this finding, individuals with low perceived control reacted with significantly higher autonomic arousal to the social challenge of a difficult to control situation. Related findings were reported in Wright's (4) factor analysis of heart disease risk. Two factors were revealed, one comprised of family history and the other representing six known physical risk factors grouping together as a single psychosocial factor marked by poor self-discipline, external locus of control, and impulsivity.

The second group of findings suggest a relationship between higher levels of perceived control, and greater cardiovascular reactivity and risk. Seeman (5) found-in a sample of patients undergoing coronary angiography that higher levels of personal control or mastery (high internal locus of control) were associated with more severe atherosclerosis (even when other known heart disease risk factors were controlled for). (The variable of personal control and mastery was not significantly correlated with the Type A behavior pattern). Thus, in these findings, high internal locus of control, high perceived control, and high belief in self as source of control are associated with cardiovascular risk.

A third group of findings involves the motivational variable of desire for control, fear of loss of control, as well as efforts for control. Glass (6) initially

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proposed a relationship between a "high need for control" and the Type A behavior pattern. He theorized that Type A behaviors result when individuals who evidence a high need for control are presented with environmental challenges that threaten their perceived control of the physical or social environment. Using the Burger and Cooper (7) "Desirability of Control Scale" Dembroski (8) tested the above hypothesis and found a significant relationship between high scores on desire for control and the Type A behavior pattern. This association was both independent of and significantly stronger than the association between locus of control and the Type A pattern. Desire for control may lead to higher efforts for control. Experimental research with both humans (9-10) and animals (11) suggest that effortful attempts to exert social control (or influence) and dominance may contribute to cardiovascular disease. Houston (12) using cluster analytic techniques, identified a pattern of characteristics within the Type A classification reflecting "controlling, socially dominant behavior" which was found to be independently predictive of coronary heart disease. Finally, how a person responds to difficulties in efforts to control, such as Elliot's (13) hot reactors or the hostility component of Type A discussed by Williams (14) may be important aspects of the construct of control to investigate. Thus, high desire for control over the external environment, particularly when coupled with seeing the environment as untrustworthy and hostile, and resulting high overcontrolling efforts appear to be associated with cardiovascular risk.

Given the above findings, it has been argued (8) that what is needed are more sensitive and rigorous measures to assess the different aspects of control and their relationship to cardiovascular risk factors.

Multi-dimensional Method of Assessing a Control Profile

Over the past fifteen years, Shapiro and colleagues have developed a nine-scale multi-dimensional measurement of the molar construct of control (15).The inventory first measures a person's overall sense of control in both the general and specific domain through the use of four different scales. These scales can provide information related to the first two sets of literature discussed above—on low perceived control and high perceived control.

The inventory also has four scales to measure modes of control—cognitive and/or behavioral strategies individuals use to gain a sense of control. The two positive modes are positive assertive, in which a person tries to alter the environment or the self in accordance with personal needs or goals; and positive yielding, in which a person gains a sense of control from accepting and accommodating to the situation. Each mode can have a negative side. Assertiveness can become overcontrolling. Yielding can become passivity and timidity, fear of taking action. The SCI also has a desire for control scale, as well as measurement of the source of a person's sense of control—self and/or other. The mode scales, agency measurement, and the desire for control scales may help us understand the third set of findings above—i.e., when there is a too a high desire for control, coupled with high negative assertiveness (overcontrol), and high scores on self as agency of sense of control.

Goals of the Current Study

The main goal of the current cross-sectional study is to assess the relationship between cardiovascular risk and a multi-dimensional control inventory. Through refinement of associations between different aspects of cardiovascular risk and dimensions of the control inventory, we hoped to pinpoint some of the reasons for the apparently contradictory findings of the literature review.

METHODOLOGY

Subjects and Setting

Subjects were 20 individuals who were undergoing a comprehensive physical exam at the UCI Corporate Health Program at the University of California, Irvine. There were sixteen men (80%) and four women; mean age 45.1 years; (sd=8.63). Their ethnicity was 95% Caucasian, 5% Black. All subjects were college educated, working in upper level management positions. Eighty percent of subjects were married, 15% were single, 5% widowed, and none were divorced.

Physiological, Biological, Lifestyle Parameters:

Blood samples from each subject were analyzed at the UCI Medical Plaza laboratory. An enzymatic method was used to determine levels of total cholesterol (16). HDL cholesterol levels were precipitated from LDL and VLDL using a combination of polyanionic dextran sulfate and magnesium ion (17). Percent body fat measurements were obtained by measuring skinfold thickness of seven sites(18-19).

Target weight was then calculated by determine change in fat weight needed to reach ideal percent for their sex and age. Maximum aerobic capacity (VO2 max) was indirectly measured during a Bruce Protocol maximal stress test (20). Stress was measured by a ten item "face validity" questionnaire developed by the Corporate health Center.

Twelve-year mortality scores were assessed using longitudinal data from Framingham research (21).

This score is the result of a predictive equation using the values of several risk factors: sex, age, current smoked per day, serum glucose level, left ventricular hypertrophy, serum cholesterol, HDL level, and systolic blood pressure. Research comparing five all-cause mortality prediction equations showed the Framingham's prediction equation to be one of the most reliable and valid measures of heart disease risk (22). When controlled for age and sex, a median 12 year risk factor is determined. Thus, a 2.0 risk factor means that this person has two times the average risk (for his sex and age) of dying of a heart attack in the next twelve years.

Psychosocial Assessment of Control

The patient's "Control Profile" was measured by the Shapiro Control Inventory (SCI), a 187 item inventory which provides a nine scale "Control Profile" covering four content areas: Sense of Control includes three sense of control scales in the general domain; and one domain specific sense of control scale which incorporates twenty-five specific parameters of control and self-control. Modes of Control involves four scales reflecting four characteristic cognitive and/or behavioral styles of responding to control-related issues: positive assertive, positive yielding, negative assertive, and negative yielding. Motivation for Control contains a desire for control scale, information on mode and parameter satisfaction, overcontrol issues, and preferences for dealing with domain-specific parameters of concern regarding control. Agency of Control provides information on the source of a person's sense of control. There have been over sixteen SCI studies detailing its reliability and validity in both clinical and normative populations (see (14) for summary).

RESULTS

Descriptive statistics for the physiological, biological, and lifestyle parameters are summarized in Table 1. As can be seen from that Table, the average median twelve year mortality risk factor for this sample was 1.8 (sd=1.1).

We then compared those individuals whose domain specific sense of control scale was one standard deviation in an unhealthy 23 direction compared to a psychiatrically screened normal group.

Their average median twelve year mortality risk factor was 2.78, which was significantly higher than the 1.45 mortality risk factor for those who had a normal domain specific sense of control scale score (Mann Whitney U, U=9.5, exact 2-tailed p-value=.011).

The overall correlation between the domain specific sense of control scale and the median 12 year mortality risk factor was r=-.30 (Spearman correlation coefficient). In other words, lower perceived sense of control was associated with higher mortality risk. Three of the domain specific parameters were significantly negatively correlated with the 12 year mortality risk: body weight in control (r=-.67, p=.005); eating behavior in control (r=-.46, p=.05); and physical appearance in control (r=-.59, p=.007).

Overall cardiovascular risk was also negatively correlated r=-.33 with the desire for control scale. Although this finding is not significant, it accounts for approximately ten percent of the variance, which is comparable to the percentage of the variance (7.8%) accounted for by family history (r=.28) in regard to 12 year mortality risk.

When individual variables of cardiovascular risk were examined, several interesting associations with aspects of the control profile were found.

SMOKING. The negative assertive (overcontrol) scale was positively correlated with average cigarettes smoked per day (r=.52, p_=.02) and with number of

Table 1. Physiological, Biochemical, Lifestyle Data.

	Mean	SD	Range
CARDIOVASCULAR RISK			
12 Year Mortality, median Risk Age and Sex Adjusted	1.8	1.1	.4-4.0
INDIVIDUAL VARIABLES			
Cholesterol (mg/dl)	225	41.1	175-328
HDL (mg/dl)	50.5	16.8	31-95
Risk Ration (TC/HDL)	4.9	1.6	2.2-8.4
Systolic BP	121	14.8	100-150
Diastolic BP	84	8.5	70-100
V02 Max (ml/kg/min)	40.1	7.7	23.5-59.7
Body Fat (%)	21.5	6.4	8.9-31.0
% Cal. from fat	32.2	7.4	19-43
Actual Weight minus ideal weight	12.1	14.7	0-48
Exercise (day per week)	1.6	1.8	0-5
Smoking			
Years Smoked	6.9	10.1	0-25
Ave per day	6.9	12.1	0-40
Current non-smokers 85%			

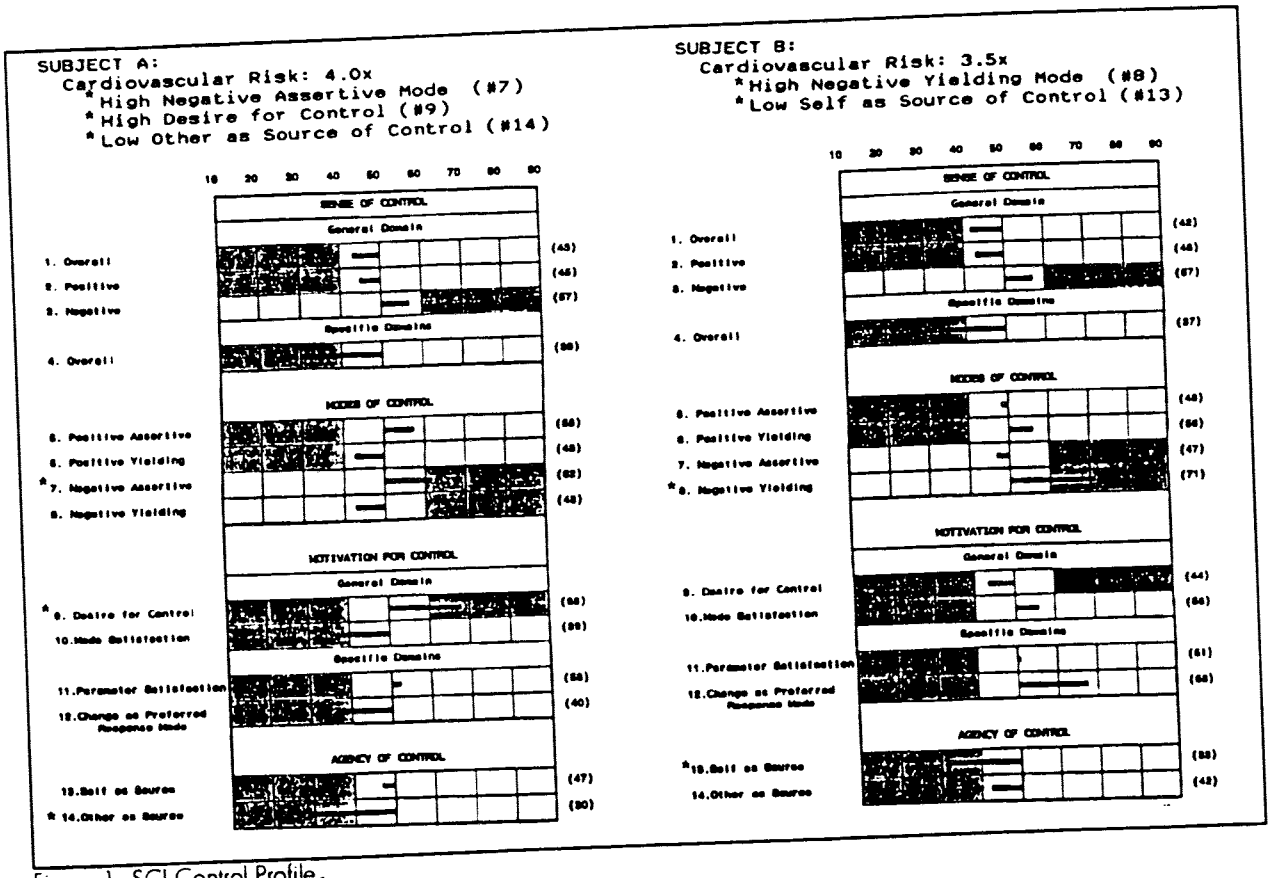

Figure 1. SCI Control Profile.

years smoked (r=.61, p=.005). In other words, higher negative assertive scores were associated with longer time smoked, and more cigarettes per day smoked. The item "having power is important to me" was also positively correlated with average cigarettes smoked per day (r=.45, p=.05); and the item "I am too aggressive and overcontrolling" was correlated with both years smoked (r=.58, p=.01) and average cigarettes per day (r=.45, p=.05).

CALORIES FROM FAT. was positively correlated with the negative yielding scale (too little control) at r=.43 which approached significance, p=.06. In other words, higher feelings of too little control was associated with higher calories from fat. The item "I make a great deal of effort to stay in control of my life was negatively correlated with calories from fat (r=-.49, p=.04).

BLOOD PRESSURE. An association between others as a positive source of control and lower systolic blood pressure was found (r=-.57, p=.008). Also, lowered systolic blood pressure was associated with relationships with friends being in control (r=-.45, p=.05). <(Interestingly, higher stress was associated with higher scores on feeling that one's self is the agency of control (r=.72, p=.04)>. Finally, feeling that one's attention and concentration was in control was associated with lowered diastolic blood pressure (r=-.43) which approached significance (p=.06).

CHOLESTEROL. HDL was positively correlated with feeling in control about eating behavior r=.45, p=.05) and that one's physical appearance was in control (r=.62, p=.004).

DISCUSSION

The data from this study provide a helpful beginning to refine and understand the conflicting information regarding the three sets of literature reviewed in the introduction. For example, we found that lower perceived control on the domain specific scale accounts for 9% of subject risk, a finding consistent with the first set of the literature showing an association between low perceived control and cardiovascular risk.

The study also suggests that there may be different control pathways operating on the individual variables making up cardiovascular risk. For example, the negative assertive scale, overcontrol, is positively associated with smoking; and the negative yielding scale, too little control, is positively associated with calories from fat. Further, feeling in control in eating and regarding one's physical appearance is associated with higher

HDL.

Agency, or the source from which one gains one's sense of control, also seems to be an important variable. For example, lowered systolic blood pressure is associated with gaining a sense of control from others; and with feeling that relationships with one's friends are in control. Conversely, higher feelings of stress are associated with feeling that one's sense of control is from oneself.

From the above, it appears that there may be different pathways by which control is associated with cardiovascular risk. There may also be different overall control profiles for individuals at risk.

To investigate this idea through a case study method, we examined those two individuals who had the highest risk in our study. The SCI can be used to provide an individual control profile in graphic form by transforming the raw data scores into standard scores (with a mean of 50 and a standard deviation of 10) based on a psychiatrically screened healthy normal cohort group (14, 23). As can be seen in Figure 1, any black lines which fall in the gray area represent scores at least one standard deviation in a non-psychologically healthy direction.

The profiles of the two individuals at highest risk in this study are shown in Figure 1. As can be seen from that figure, both subjects have an overall domain specific sense of control which is in the unhealthy direction (#4). This finding is consistent with the overall domain specific correlation of -.30 with mortality risk. By carefully investigating other aspects of these two subjects' profiles, we can see that two different profiles regarding negative mode and agency appear. Subject A is the person at highest risk in our study, with a 4.0 median risk factor. In other words, for his age and sex, he has four times the average risk of dying of a heart attack in the next twelve years. On his control profile, he has a high negative assertive scale score (#7); a high desire for control scale score (#9); and a low other as positive source of control score (# 14).

Subject B has a 3.5 median 12 year cardiovascular risk factor. Yet, even though his risk factor is also quite high, his control profile is quite different than Subject A on the negative mode, desire for control, and agency. Specifically, in contrast to subject A's negative assertive mode (#7), Subject B's negative yielding modes is high (#8). Further, in terms of agency, self as positive source of control is low (#13). Thus, although both of these subjects have a low overall domain specific sense of control, their negative modes and agency areas are opposite.

Relating the above control profiles to our earlier review of the literature, we can see that Subject A's low perceived control as representative of the first set of literature. His high belief in "self" as a source of control (agency) is consistent with findings found in the second set of literature on high perceived internal locus of control and cardiovascular risk; and his high desire and efforts toward control is consistent with findings illustrated by the third set of studies reviewed earlier. Subject B, on the other hand, has low perceived control, but also feelings of too little control, and low efforts. His profile more nearly approximates the first set of studies cited in the introduction.

Interestingly, both individuals seem to realize the problematic nature of their control profiles. Thus, in response to how he wants to deal with parameters of concern, Subject A notes that he would like to be much more accepting (Figure 1, #12); Subject B, on the other hand, clearly prefers change as the preferred mode for addressing parameters of concern (Figure 1, #12).

If high desire for control is associated with cardiovascular risk, as suggested by the third set of literature reviewed in the introduction, how do we explain our findings of a negative correlation between desire for control and cardiovascular risk? There are two possible explanations. First, control is thought important in relationship to two pathways—one over the external world, and one over the inner world (24). Burger's desire for control scale (7) only measures desire over the external world, whereas the SCI measures both desire for control over self and over the external environment. Desire for control in and of itself may not be problematic. As Subject A illustrates, the toxicity may occur when desire for control is associated with high negative assertive overcontrol, and with high belief in self as the source of control.

FUTURE DIRECTIONS

The immediate next step is clearly to develop a larger population sample, and see to what extent certain control profiles are associated with cardiovascular risk in the general population. This study suggests that there may be no one control profile that puts a person at risk, but rather certain individual styles may be harmful for different individuals: e.g., too high a desire for control; too high negative assertive; too high negative yielding; too low a positive sense of control; too low sense of control from self; too low sense of control from others. It may be that the different sets of literature reviewed at the start of the paper are not necessarily contradictory. Rather, they could be reflecting different profiles of different individuals who are at risk. If it could be determined that there are different control profiles associated with cardiovascular risk, this information would have important implications in terms of tailoring preventive health interventions based on these profiles. It could then be determined whether helping individuals to develop healthier control profiles would be reflected in decreased cardiovascular risk.

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