Coping subtypes for men with coronary heart disease

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COPING SUBTYPES FOR MEN WITH CORONARY HEART DISEASE : RELATIONSHIP TO WELL-BEING, STRESS AND TYPE A BEHAVIOUR.

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SYNOPSIS

We used cluster analysis to delineate coping subtypes in a sample of 166 men with coronary heart disease who completed the Antwerp outpatient rehabilitation program. These subtypes were identified on the basis of three well-defined superordinate traits that were selected from a comprehensive taxonomy: Negative Affectivity, Social Inhibition, and Self-Deception. Using Ward's minimum variance method and the cubic clustering criterion, we identified four coping subtypes: low-negative affectivity (*N*=48;), high-negative affectivity (*N*=30), inhibited (*N*=62), and repressive (*N*=26) individuals. The accuracy of the resulting classification was demonstrated across parallel data sets and was further validated against external, health-related correlates that were not included in the clustering. The identified coping subtypes were significantly related to self-reports of subjective distress/perceived stress, ratings of Type A behaviour and anger-in, return to work, prevalence of chest pain complaints, and use of minor tranquilizers and sleeping pills. The major findings of this study suggest that (a) male coronary patients represent a heterogeneous population with distinctly different coping subtypes, and that (b) a relatively small number of homogeneous subtypes can account for a substantial amount of variance in subjective well-being, coronary-prone behaviour, and return to work. These findings indicate that psychosomatic research should focus on how superordinate traits interact within individuals and corroborate the appropriateness of a class model to describe coping styles of male coronary patients. It is argued that discrepant findings across studies of Type A behaviour and hostility may be related to the coping subtypes of the subject sample. Further attempts to cross-validate this classification scheme and to examine its health-related correlates are needed.

INTRODUCTION

Personality is not a fiction; it is a set of regularities in human behavior and experience. Our challenge is not to prove its existence but to measure it adequately. (McCrae, 1982,p 302)

With the recent growth of behavioural medicine, there is a renewed interest in the role of personality factors in health and disease (Krantz & Hedges, 1987). Personality refers to regularities and consistencies in the behaviour of individuals and to structures and processes that underlie these regularities and consistencies (Gangestad & Snyder, 1985). Personality traits have been in considerable dispute during the past twenty years (e.g., Mischel, 1968). However, studies examining (a) the correspondence between traits and behaviour (e.g., Mischel & Peake, 1982; Gormly, 1984), (b) the correspondence between self-reports and ratings (e.g., Funder, 1980; McCrae, 1982; McCrae & Costa, 1987), and (c) the stability of personality across lifespan (Caspi, 1987; Costa & McCrae, 1988) have restored confidence in the use of individual difference models of personality. Although evidence suggests that personality factors are equal to biological and situational factors in predicting mood states and health complaints (Costa & McCrae, 1987; Watson & Pennebaker, 1989), most life stress researchers have treated groups of individuals as homogeneous entities (Depue & Monroe, 1986). With reference to coronary heart disease (CHD), a great deal of effort has been devoted to the delineation of a "behaviour profile" of coronary patients. While some studies found that Type A behaviour (characterized by time-urgency and free-floating hostility) was associated with increased risk for CHD (Rosenman et al. 1975; Haynes et al. 1980; Belgian-French Pooling Project, 1984), others failed to replicate this association (Shekelle et al. 1985; Case et al. 1985; Ragland & Brand, 1988). As a consequence, research has focused on specific coronary-prone components such as hostility (Williams et al. 1980; Barefoot et al. 1983; Dembroski et al. 1989) and anger-in (Dembroski et al. 1985; MacDougall et al. 1985). These and other highly specified analyses of coronary-prone factors have produced findings of major importance.

One approach to analyzing variations in CHD that has been largely overlooked, however, is identifying whether or not there are subtypes of CHD patients who display a similar coping style. This holistic perspective of CHD and the impact it has on individuals focuses on one's general approach to life, stress, and disease. The current study was therefore undertaken in an attempt to delineate coping subtypes for men with CHD. Since the initial choice of variables determines the characteristics of the subtypes that can be identified, a clear rationale for the selection of these variables is of primary importance. Evidence suggests that most personality measures are linked to a small set of superordinate traits that are relevant to behaviour in a large number of situations and therefore have potential explanatory and predictive power (Zuckerman et al. 1988; Weinberger & Schwartz, 1990; Funder, 1991). These traits have been described in two factor (Weinberger & Schwartz, 1990), three factor (Tellegen, 1985; Eysenck & Eysenck, 1987), and five factor (McCrae & Costa, 1987; Digman, 1989) models of personality. We selected three superordinate traits for the description of coping subtypes.

Negative Affectivity, Positive Affectivity, and Self-Deception

Research indicates that emotional experience is dominated by two broad and largely independent dimensions: negative affect and positive affect (Warr et al. 1983; Diener & Emmons, 1984; Watson & Tellegen, 1985). These dimensions can be observed either as transient fluctuations in mood (i.e., as a state) or as stable and persistent differences in general affective level (i.e., as a trait). The superordinate traits Negative Affectivity (NA) and Positive Affectivity (PA) indicate the disposition to experience the corresponding state mood factor (Tellegen, 1985; Watson & Pennebaker, 1989), and are significantly related to neuroticism and extraversion, respectively (Costa & McCrae, 1980; Warr et al. 1983; Meyer & Shack, 1989). NA reflects pervasive and stable differences in psychological distress, somatic complaints, and self-concept (Watson & Clark, 1984; Watson & Pennebaker, 1989). This dimension has also been conceptualized as neuroticism (Costa & McCrae, 1987; Eysenck & Eysenck, 1987), a trait characterized by the tendency to experience distressing emotions and to possess associated cognitive/behavioral features (e.g., preoccupation, insecurity). Since high-NA individuals may be chronically unable to cope effectively with the ongoing events of their lives (Tellegen, 1985; Depue & Monroe, 1986; McCrae & Costa, 1986), these individuals are more likely to experience distress at all times and in any situation (Watson & Clark, 1984). Given the consensus that NA or neuroticism is centrally defined by the tendency to experience negative affect (Costa & McCrae, 1987; Watson & Pennebaker, 1989), this coping style is assessed well by self-report measures of anxiety and depression (Watson & Clark, 1984; Gotlib, 1984). In contrast, PA reflects general levels of energy and engagement with the environment (Watson & Pennebaker, 1989). High-PA individuals lead a happy life and maintain a generally high activity level (Costa & McCrae, 1980; Watson, 1988). This dimension is assessed well by self-report measures of introversion (reverse-keyed) - extraversion (Meyer & Shack, 1989; Watson & Pennebaker, 1989). Not only are NA and PA largely independent dispositions; they also have quite different correlates. NA is strongly associated with perceived stress and self-rated health but is unrelated to social and physical activities; conversely PA is related to social engagement and physical activities but shows little or no association with stress and health complaints (Watson, 1988; Watson & Pennebaker, 1989). Hence, it appears that the NA-PA traits provide an adequate framework for the differentiation of CHD patients in the two-dimensional mood/personality space (Meyer & Shack, 1989).

Self-Deception as measured by the Marlowe-Crowne scale (MC) (Crowne & Marlowe, 1960) was selected as a third superordinate trait. The MC scale was originally developed to measure the tendency to withhold unfavorable information about oneself in order to win social approval. Defensiveness was thus conceptualized as a deliberate strategy to present oneself in a positive light. More recently, however, defensiveness is conceptualized as a self-enhancing strategy: the subject is unaware of unpleasant realities and therefore does not report them (Gur & Sackeim, 1979; Paulhus & Levitt, 1987). This self-deception reinterpretation of defensiveness

implies that self-reports are an accurate reflection of what the subject knows about his/her own emotions, cognitions, and behavior. To enhance their self-esteem, people often bias information and subjective "illusions" such as unrealictic optimism may be adaptive because they promote the ability to cope with stressful events (Taylor & Brown, 1988). Evidence indeed suggests that the MC scale taps a trait which protects against lifetime prevalence of psychiatric disorders (Lane et al. 1990). Although measures of "social desirability" are still widely used to assess the validity of self-reports and to correct scores for individuals, research indicates that neither of these functions is justified and that the MC scale is itself an individual difference variable that should be studied in its own right (McCrae & Costa, 1983; McCrae et al. 1989). Hence, it appears that the MC scale may be of significant importance in the delineation of coping subtypes. On the whole, NA, PA, and Self-Deception provide a sound and comprehensive basis for classification purposes: these complementary traits (a) are well-defined; (b) tend to generalize across situations; and (c) have a varied set of referent attributes.

Delineation of Coping Subtypes

Subtypes can be described either on an a priori basis or on an empirical basis employing multivariate statistical procedures. An appealing a priori model is described by Weinberger et al. (1979) who differentiated four coping subtypes using a trait anxiety scale and the MC scale: low-anxious (low anxiety/low MC), repressive (low anxiety/high MC), high-anxious (high anxiety/ low MC), and defensive high-anxious (high anxiety/high MC) individuals. This model suggests that some low anxiety scorers may in fact defensively repress negative affect. The ability of the MC to distinguish repressors from "true" low-anxious individuals was documented more than two decades ago (Boor & Schill, 1967). Weinberger et al. (1979) elaborated this strategy and provided construct validity for distinctions among low-anxious, repressive, and high-anxious styles as three general patterns of coping with threatening situations. Their findings were replicated by others (Asendorpf & Scherer, 1983), and psychosomatic research further documented the utility of differentiating these coping subtypes (Shaw et al. 1986; Jensen, 1987; Jamner et al. 1988; Denollet, 1991). Nevertheless, this a priori model can be critisized on two grounds. (a) There exists considerable disagreement about the conceptualization of defensive high-anxious individuals since these individuals are relatively rare (Weinberger et al. 1979) and tend to have similar performance outcomes relative to "true" high-anxious individuals (Asendorpf & Scherer, 1983; Shaw et al. 1986). (b) No reference is made to the impact of PA, the counterpart of NA (or trait anxiety) in the two-dimensional mood/personality space (Meyer & Shack, 1989).

To overcome these problems in the current study, we used cluster analysis to identify coping subtypes on empirical grounds. Clustering is the grouping of entities on the basis of their similarity across a set of attributes into homogeneous subtypes (Lorr & Suziedelis, 1982). Cluster analysis has, for instance, been used in alcoholic (e.g., Kline & Snyder, 1985) and chronic pain (e.g., Costello et al. 1987) populations. To our knowledge, this approach has been largely

overlooked in cardiac populations. We view CHD patients as a heterogeneous population with multiple personality dynamics that contribute to health, disease, and recovery. Consequently, we applied multivariate statistical procedures in preliminary studies that aimed at the identificaction of CHD coping subtypes (Denollet et al. 1989; De Potter, 1989). The use of multivariate methods to empirically delineate subtypes is associated with a number of methodological difficulties (Blashfield, 1976, 1980; Lorr, 1983). First, multivariate studies need to be conducted on well-defined and meaningful traits (McCrae & Costa, 1987). Second, the reliability of any derived cluster solution needs to be demonstrated by means of replication across parallel data sets. Third, the validity of the cluster solution needs to be demonstrated by examining the relationship between the derived subtypes and additional criterion variables that were not involved in the clustering. The current study was designed with these considerations in mind. The purposes of this research are four-fold: (a) to examine the conceptual validity of the variables that were selected for the delineation of subgroups; (b) to identify homogeneous and replicable coping subtypes for men with CHD; (c) to examine some health-related correlates (i.e., subjective distress, cardiorespiratory fitness, perceived stress, coronary-prone behaviour, return to work, chest pain, smoking, alcohol/tranquilizers use) of the generated subtypes; and (d) to examine the stability of subtype differences at 3 and 15 months follow-up.

METHOD

Subjects

The subjects in this study were 166 male CHD patients who agreed to participate in the study and who completed the outpatient cardiac rehabilitation program of the University Hospital of Antwerp between July 1986 and December 1988. This program is based on an accelerated, multidisciplinary approach and includes exercise training, group therapy, and individual counseling (medical-psychological-dietary) during a period of three months. Cardiac patients enter the outpatient rehabiliation program either after completion of the inpatient rehabilatation program (50%) or after referral by an external cardiologist or general practitioner (50%). Approximately 10% of CHD patients in the catchment area of the University Hospital of Antwerp enter the rehabilitation program. The factors that determine the presence of these patients on a rehabilitation program are largely a function of the attitude of cardiologists and general practitioners towards cardiac rehabilitation. In the 2½ year of data collection, 24 of 221 male CHD patients (11%) dropped out of the program before completing the 3-month rehabilitation period. Of the remaining 197 patients, two deceased during the one-year follow-up period after completion of the rehabiliation program, and 29 patients failed to return the 15-month follow-up questionnaire. Hence, the study population consisted of the 166 patients (=85%) who did return a follow-up questionnaire one year after they completed the Antwerp rehabilitation program. The mean age of this sample was 55.7 years (*SD*=7.2) with a dispersion between 35 and 73 years. The medical indication for entry in the rehabilitation program was: acute myocardial infarction (AMI) *N*=37

(22%); coronary artery bypass graft surgery (CABG) *N*=72 (43%); CABG following AMI *N*=34 (21%); percutaneous transluminal coronary angioplasty (PTCA) *N*=23 (14%). All of these patients filled out questionnaires on three occasions: on admission to the program, at discharge, and at one year after rehabilitation.

Measures

The following measures were used for the identification of coping subtypes.

Negative Affectivity. NA is assessed well by self-report distress measures such as the trait form of the State Trait Anxiety Inventory (STAI) (Spielberger et al. 1970). The Dutch adaptation of this scale has a á=.89 internal consistency, and correlates significantly with neuroticism (r=.82) and depression (r=.81) in males, indicating its validity as NA measure (Van Der Ploeg et al. 1980). The Despondency scale of the Heart Patients Psychological Questionnaire (HPPQ) (Erdman et al. 1986) was selected as a measure of general dysphoria. The HPPQ was validated in the Netherlands on a reference group of 1,649 cardiac patients. The ten items of the Despondency scale have a á=.80 internal consistency, and are significantly related to neuroticism (r=.67) and depression (r=.63). The Premorbid Pessimism scale of the Millon Behavioral Health Inventory (MBHI) (Millon et al. 1982) was selected as a measure of general dissatisfaction with life. This scale has a .90 internal consistency, and correlates significantly with the Beck (r=.60) and MMPI (r=.57) Depression scales. The Dutch-language adaptation of the MBHI was validated in a chronic pain population (Denollet et al. 1987). The Anxiety, Despondency, and Pessimism scales were conceptualized as measures of different emotional components of the same underlying NA trait.

Social Inhibition. Since PA is assessed well by self-reports of introversion-extraversion, the Social Inhibition scale of the HPPQ (Erdman et al. 1986) was used as a marker of this second dimension in the mood/personality space. The six items of this scale focus on social behavior, have a á=.64 internal consistency, and are negatively correlated with extraversion (r=-.46). A low Social Inhibition scorer is decisive and talkative in social settings; conversely a high Social Inhibition scorer lacks in assertiveness and tends to feel insecure among other people. Shyness (i.e., tension and inhibition when with others) and sociability (i.e., preference for being with others) are related but distinctive components of extraversion (Cheeck & Buss, 1981). We therefore maintained the original designation of this HPPQ scale (i.e., social inhibition).

Self-Deception. The MC scale (Crowne & Marlowe, 1960) was used to assess the nonconscious, self-deceptive component that underlies defensiveness (Lane et al. 1990). Three items were omitted because they were judged to be typical of an American population (Denollet, 1991). This scale has a .88 internal consistency.

The following markers of psychological and physical health among CHD patients were selected to examine the predictive validity of the identified coping subtypes.

Subjective Distress. The state form of the STAI (Spielberger et al. 1970) is probably the most widely used measure of transient affect (Watson & Clark, 1984). In addition to the Dutch

adaptation of this scale (á=.87), we selected the HPPQ scales Well-Being and Feelings of Disability since they provide relevant information about the emotional condition of cardiac patients (Erdman et al. 1986). The 12 items of the Well-Being scale have a á=.93 internal consistency, and address the mood state, e.g.: "Lately, I feel self-confident", "Lately, I feel relaxed", etc. The 12 items of the Disability scale have a á=.87 internal consistency, and address the dicrepancy between the time before and the time after onset of the disease, e.g.: "I was able to take on much more work in the past", "I am no longer worth as much as I used to be", etc. Self-reports of transient distress, well-being, and feelings of disability were conceptualized as markers of subjective distress in the weeks following an acute coronary event.

Cardiorespiratory Fitness. Six weeks after the cardiac event (= ± two weeks after admission to the rehabilitation program), all subjects underwent a sign- or symptom- limited bicycle exercise test. The level of cardiorespiratory fitness was measured in WATT. This European standard for work capacity was conceptualized as an objective measure of health status.

Perceived Stress. Chronic stress was assessed by the MBHI Chronic Tension scale, which taps the tendency to live under considerable self-imposed pressure (Millon et al. 1982). This scale has a .77 internal consistency, and is associated with Type A behaviour (r=.59) and lack of tolerance (r=-.46) and self-control (r=-.44). The trait form of the State Trait Anger Scale was used to assess the disposition to experience a lot of situations as frustrating and to react in those situations with anger (Van Der Ploeg et al. 1982). This scale has a á=.88 internal consistency. Self-reports of chronic tension and anger were conceptualized as correlates of perceived stress.

Type A Behaviour & Anger-In. On admission to the rehabilitation program, all subjects underwent an interview (M. Friedman & Powell, 1984) in order to rate Type A behaviour based on self-reported symptoms (e.g., a sense of time-urgency) and oberved signs (e.g., speech characteristics). The interview was not recorded on video, but audiotaped and quantified for the presence of Type A symptoms and signs using a check list. This audiotaped Type A interview correlates significantly with the Jenkins Type A score (r=.54) (Denollet, 1991). Anger-in was also rated during the interview using the method discussed by MacDougall et al. (1985). Anger-in refers to the inability or unwillingness to expres anger and is associated with the avoidance of interpersonal conflict. Since evidence suggests that Type A behaviour (H. Friedman & Booth-Kewley, 1988) and anger-in (Dembroski et al. 1985; MacDougall et al. 1985) are related to CHD, we conceptualized ratings of these variables as markers of psychosocial coronary risk factors. The score for most manifestations of Type A behaviour and anger-in was calculated as 0,1,2, or 3 depending upon the intensity or frequency of any particular manifestation. At present, no intercoder reliability information of the audiotaped Type A interview is available.

At the end of the rehabilitation program (3 months after the initial assessment), all subjects filled out again the STAI and HPPQ questionnaires in order to investigate the stability of the coping subtype differences in subjective distress. Information about work status was also obtained at this point in time. Since 52 of 166 subjects (31%) were no longer economically active prior to the coronary event (50 were retired and 2 had been unemployed for several years), the percentage of

subjects returning to work was examined as a function of coping subtype in a subset of 114 subjects. At 12 months after discharge from the rehabilitation program, the 197 male CHD patients that completed the program were contacted via telephone for the 15-month follow-up assessment. A follow-up questionnaire was mailed to 195 patients (two patients deceased within the year following rehabilitation); this questionnaire contained the STAI and HPPQ standardized psychological tests and a number of questions regarding chest pain complaints, smoking, alcohol abuse, and use of tranquilizers and sleeping pills. The 166 patients that returned the follow-up questionnaire comprised the current subject sample.

Statistical Analyses

Pearson correlations were calculated in order to evaluate individual relationships among the variables that were selected for the identification of coping subtypes. Factor analysis (principal components with varimax rotation) was carried out to further investigate the construct validity of the conceptualized superordinate traits.

Next, cluster analysis was used to determine whether homogeneous and replicable coping subtypes could be identified. Cluster analysis is designed to find natural groupings or types that are discrete or categorial (Lorr & Suziedelis, 1982). However, different mehods of cluster analysis use distinctly different procedures and can result in distinctly different solutions to a given problem (Blashfield, 1976). We apllied a hierarchical agglomerative clustering procedure using Ward's minimum variance method to the negative affectivity, social inhibition, and self-deception scores of our subject population. Ward's method uses the squared within-group deviations about the cluster means as its distance measure, thereby generating clusters in such a way that the variance within the clusters is minimal. This method (a) outperforms most of the clustering methods available in recovering cluster structures (Blashfield, 1976 ; Lorr, 1983), (b) appears to be clearly preferable if one wishes to generate a classification (Blashfield, 1976), and (c) appears to produce classifications that strongly agree with taxometric methods in the identification of latent class variables (Gangestad & Snyder, 1985). We used the cubic clustering criterion to decide on the optimum number of subgroups to retain. A sharp increase in the whithin-group sum of squares indicates that a great deal of accuracy has been lost by reducing the number of clusters (Lorr & Suziedelis, 1982; Lorr, 1983). To examine the reliability of the generated cluster solution, we replicated this solution across parallel data sets (Blashfield, 1980). For this purpose, the subject population was randomly divided into two samples (Sample 1 and Sample 2), comprising 83 subjects each. Once homogeneous clusters could be identified in Sample 1, the same clustering procedure was applied to the data of Sample 2.

Finally, the predictive validity of the cluster analytic solution was evaluated against a number of external measures. This strategy implies that, after the cluster analysis has been performed, the resulting classification is tested against the purpose for which it was generated (Blashfield, 1976, 1980). Our purpose was to generate coping subtypes with distinctive health-

related correlates. Scores on the subjective distress, cardiorespiratory fitness, perceived stress, and coronary-prone measures were therefore broken down by the derived coping subtypes. Multivariate analyses of variance (MANOVA) were then performed to determine the significance of the overall subtype differences. Univariate analyses of variance (ANOVA) and post hoc analyses using Student-Newman-Keuls Procedure (SNK) were performed to determine further the significant subtype differences on each of the health-related measures. A discriminant analysis was performed to determine the degree to which the coping subtypes could be distinguished by self-report measures of subjective distress and perceived stress. Repeated measures analyses of variance were performed to examine the stability of subtype differences on subjective distress measures at 3 months and 15 months after the initial assessment. Crosstabulation was used to examine the relationship between subtypes and return to work (at 3 months follow-up), chest pain complaints, smoking, alcohol abuse, and use of minor tranquilizers/sleeping pills (at 15 months follow-up).

RESULTS

Construct Validity of the Superordinate Traits

MANOVA indicated that the 24 dropouts from the rehabilitation program tended to score higher on the NA measures than the 197 patients who completed the 3-month rehabilitation program [Wilk's λ=0.97,F(3,221)=2.58,p=.06]. This finding confirms the observation that dropouts from a cardiac rehabilitation program are more depressed and anxious than patients who remain in the program (Blumenthal et al. 1982). MANOVA revealed no overall difference among the categories of coronary disease included in the study (i.e., AMI, CABG, PTCA) on the NA, Social Inhibition, and Self-Deception measures [Wilk's λ=0.95,F(9,390)=0.89, p=.53]. Pooling of the subjects in one CHD category therefore seemed to be justified with respect to the identification of coping subtypes. The left side of Table 1 presents the intercorrelations among the scales that were used to operationalize the superdinate traits.

- Insert Table 1 about here -

Significant correlations in the .70 to .80 range emerged among the Anxiety, Despondency, and Pessimism scales, indicating their convergent validity as NA measures. Social Inhibiton correlated in the .20 to .30 range with the NA scales, indicating a small but significant amount of shared variance (i.e., 6-11%). Self-Deception correlated in the -.40 range with the NA scales, suggesting that the MC scale indeed measures a substantive trait which protects against emotional disorder (Lane et al. 1990). However, these correlations are sufficiently low to justify jointly using NA and Self-Deception measures to define coping subtypes. A factor analysis provided further evidence for the construct validity of the three superordinate traits (Table 1, right side). According to our conceptual framework, three factors were extracted which accounted for 86% of the total variance. Factor I (53% variance) clearly represented the disposition to experience emontional distress.

Factor II (22%) and factor III (11%) loaded high on the Self-Deception and Social Inhibition measures, respectively. On the whole, these findings suggest the validity of our conceptual framework. Since the Anxiety, Despondency, and Pessimism scales are roughly interchangeable in this population, we selected the STAI trait scale as NA measure for the identification of coping subtypes (Watson & Clark, 1984; Gotlib, 1984).

Delineation of Coping Subtypes

In order to identify replicable subtypes, the subject population was randomly divided in two samples (i.e., Sample 1 and Sample 2) of 83 subjects each. These samples closely ressembled each other with respect to age [$F(1,164)=0.001, p=.97$], CHD category [$\div^2(3)= 3.45, p=.33$], and trait scores [Wilk's $ë=0.99, F(3,162)=0.67, p=.58$]. Using Ward's method and the cubic clustering criterion, we identified four coping subtypes in Sample 1. The standardized mean T scores of the NA, Self-Deception, and Social Inhibition scales for each of these four clusters are shown in Figure 1 (continuous line). Cluster analysis carried out on the data of Sample 2 identified four clusters that were very similar to the clusters of Sample 1 (Figure 1, discontinuous line). Visual inspection of Figure 1 suggests a lack of meaningful,

- Insert Figure 1 about here -

average coping style differences between the replicated clusters. A 4 (cluster) x 2 (sample) MANOVA indicated that the cluster x sample interaction was not significant [Wilk's $ë=0.95$, $F(9,380)=0.98, p=.45$], which confirmed the observation that the same clusters were generated in both samples. As could be expected given the type of classification used, an overall cluster main effect emerged on the NA, Self-Deception, and Social Inhibition measures [Wilk's $ë= 0.09, F(9,380)=70.30, p<.0001$]. Since differences within subtypes were negligible compared to differences between subtypes, data from Sample 1 and 2 were pooled in order to further investigate the trait characteristics of the coping subtypes. Table 2 shows the means, standard deviations, results of univariate tests, and SNK post hoc comparisons for each trait scale across

- Insert Table 2 about here -

the four coping subtypes. Overall, clusters 1 and 2 displayed a low level, and clusters 3 and 4 a high level of self-deception. Cluster 1 ($N=48$) exhibited moderate to low levels of NA, self-deception, and social inhibition, suggesting that this cluster comprised low-NA subjects with adequate social skills. In contrast, cluster 2 ($N=30$) was mainly characterized by a high level of NA, suggesting that this cluster comprised high-NA subjects. Cluster 3 ($N=62$) showed elevated levels of social inhibition and self-deception, suggesting that this cluster comprised inhibited subjects with a rather submissive attitude towards others and a tendency to avoid negative affect. Cluster 4 ($N=26$) was characterized by low levels of NA and social inhibition and a high level of self-deception, suggesting that this cluster comprised repressive subjects. Age [$F(3,162)=1.12, p=.34$] and CHD

category [$\chi^2(9)=9.42, p=.40$] were not significantly different as a function of cluster membership. In order to show that clusters are significantly different, studies often report a MANOVA, multiple ANOVAs, or a discriminant analysis. However, when these analyses are performed on the variables originally used to form the clusters, the results have no meaning (Blashfield, 1980). We therefore examined the predictive validity of the derived coping subtypes against external health-related correlates.

Predictive Validity of Coping Subtypes

Figure 2 shows the mean subjective distress, cardiorespiratory fitness, and perceived stress scores for each of the four coping subtypes. MANOVA indicated an overall difference

- Insert Figure 2 about here -

among coping subtypes on the subjective distress [Wilk's $\lambda=0.47, F(9,390)=15.79, p.0001$] and the perceived stress [Wilk's $\lambda=0.56, F(6,322)=18.32, p<.0001$] measures. ANOVAs confirmed that these differences occured on the Transient Distress ($F=53.94$), Well-Being ($F=27.03$), Disability ($F=10.33$), Chronic Tension ($F=30.01$), and Anger ($F=25.27$) scales (all Fs: $df=3,162$, $p<.0001$). Post hoc analyses indicated that cluster 2 showed the highest level of subjective distress, clusters 1 and 3 the next highest levels, and cluster 4 the lowest level of distress (SNK, $p<.05$). Cluster 2 also showed the highest level of perceived stress, cluster 1 the next highest, and clusters 3 and 4 the lowest levels of perceived stress (SNK, $p<.05$). Using the distress/stress self-report measures, discriminant analysis yielded two significant functions correctly classifying 60% of the subjects with respect to their cluster membership [Wilk's $\lambda=0.33$, $\chi^2(15)=178.59$, $p<.0001$]. This figure clearly outperforms the prior probability of 25% correct classification by chance alone. Discriminant analysis using external correlates thus provided additional evidence for the differentiation of coping subtypes. In contrast, mean levels of cardiorespiratory fitness were not significantly different as a function of coping subtype [$F(3,162)=0.47, p=.70$], suggesting that subtypes were not related to objective health status. Figure 3 shows the mean Type A behaviour and Anger-In ratings for each of the four coping

- Insert Figure 3 about here -

subtypes. MANOVA indicated an overall difference among coping subtypes on interview-ratings of psychosocial risk factors [Wilk's $\lambda=0.83, F(6,322)=5.35, p<.0001$]. ANOVAs confirmed significant differences on both the Type A behaviour [$F(3,162)=7.28, p<.0001$] and Anger-In [$F(3,162)=5.73, p<.001$] ratings. Post hoc analysis revealed, however, a different pattern of association among both ratings. Cluster 2 displayed the highest level of Type A behaviour, clusters 1 and 4 the next highest levels, and cluster 3 the lowest level of Type A behaviour (SNK, $p<.05$). Conversely, cluster 3 displayed a significantly higher level of Anger-In than the other three clusters (SNK, $p<.05$). On the whole, self-reports of stress/distress and ratings of Type A behaviour/anger-in provided evidence for the predictive validity of the coping subtypes.

Follow-up Assessment at 3 and 15 Months

Table 3 shows the mean entry (1), end (2), and 15 month follow-up (3) scores of the STAI and HPPQ subjective distress scales as a function of coping subtype. A repeated measures

- Insert Table 3 about here -

analysis of variance with coping subtype (cluster 1 to 4) as between-subjects factor and time (entry/3 month/15 month assessment) and measure (Transient Distress/Well-Being/Disability) as within-subjects factors indicated a significant subtype x time x measure interaction effect [Wilk's ë=0.84,F(12,421)=2.32,p<.01]. Hence, the interaction between coping subtype and changes in subjective distress over time was significantly different as a function of the measure being used. Since the focus of the present study was on the moderating effect of coping subtype membership, the subtype x time interaction was analyzed seperately for each of the subjective distress measures. A 4 (subtype) x 3 (time) repeated measures analysis of variance revealed that changes in Transient Distress were significantly different as a function of subtype membership [Wilk's ë=0.87,F(6,322)=3.86,p<.01]. However, cluster 2 still displayed a significantly higher STAI-State score than the other subtypes at 3 and 15 months after the initial assessment (SNK,p<.05), despite a significant decrease on this scale at 3 months. No significant time main effect was found on the STAI-State scale for clusters 1,3, or 4 at three months follow-up, or for any of the clusters at fifteen months follow-up. Repeated measures analyses of variance showed no significant subtype x time interaction effect on the HPPQ scales Well-Being [Wilk's ë=0.94, F(6,322)=1.63,p=.14] and Disability [Wilk's ë=0.96,F(6,322)=1.21,p=.30]. In contrast to the STAI, coping subtypes did not differ in their change in distress as measured by the HPPQ. Moreover, the time main effect indicated a significant increase in Well-Being [Wilk's ë=0.76, F(2,161)=25.2,p<.0001] and a significant decrease in Disability [Wilk's ë=0.62,F(2,161)= 49.95,p<.0001] for each of the coping subtypes at 3 months after the initial assessment. These positive changes were maintained at 15 months follow-up. On the whole, these findings suggest the stability of differences among coping subtypes on measures of subjective distress.

Table 4 shows the relationship between coping subtypes and return to work (3 months follow-up), chest pain complaints, smoking, alcohol abuse, and use of minor tranquilizers and sleeping pills (15 months follow-up). As can be seen from this table, subjects of clusters 2/3 tended to return less often to work at the end of the rehabilitation program than their counterparts of clusters 1/4. Twenty-one of 64 subjects in clusters 2/3 (=33%) failed to return to work, while only 6 of 50 subjects in clusters 1/4 (=12%) did not return to work [$\div^2$(1)=

- Insert Table 4 about here -

6.73,p<.01]. MANOVA indicated that subjects who did not return to work had significantly higher entry scores on the NA and Social Inhibition measures than their counterparts who resumed work

after cardiac rehabilitation [Wilk's ë=0.94,$F(2,111)=3.68$,$p<.05$]. Conversely, a 2 (no return/return to work) x 2 (time) repeated measures analysis of variance on the entry
and 3-month cardiorespiratory fitness levels indicated that neither the return to work x time interaction effect [$F(1,112)=0.22$,$p=.64$] nor the return to work main effect [$F(1,112)=1.30$, $p=.26$] were significant, suggesting that return to work was not related to objective health status. Likewise, coping subtypes were not related to entry/3-month WATT levels [$F(3,162)= 0.70$,$p=.55$] or to increase in WATT level [$F(3,162)=1.38$,$p=.25$] as measured by exercise stress testing. A significant time main effect emerged, indicating that all clusters displayed a similar increase in cardiorespiratory fitness from 142.5 WATT (mean entry level) to 173.6 WATT (mean 3-month level) [$F(1,162)=285.56$,$p<.0001$]. Follow-up at 15 months indicated no difference among coping subtypes regarding smoking behaviour or alcohol abuse. Subjects of cluster 2 reported, however, significantly more (a) chest pain complaints ($p<.01$) and (b) use of minor tranquilizers and sleeping pills ($p<.05$) than subjects of the other clusters. Overall, these findings suggest that the identified subtypes had some predictive validity regarding non-test indicators of well-being such as return to work, chest pain complaints, and use of tranquilizers.

DISCUSSION

The major findings of this study suggest that (a) CHD patients represent a heterogeneous population with distinctively different coping subtypes, and that (b) a relatively small number of homogeneous subtypes can account for a substantial amount of variance in subjective distress, perceived stress, and coronary-prone behaviour. A type may be defined as a subset of entities each member of which is more like every other member than it is like entities in any other type (Lorr & Suziedelis, 1982). Cluster analysis lended support for the identification of the low-NA, high-NA, and repressive subgroups of the Weinberger et al. (1979) a priori model. No evidence was found, however, for the identification of a defensive high-anxious subgroup. In stead, an inhibited subgroup emerged as a fourth distinctive coping subtype. We adopted this four-cluster solution because it maintained clinical distinctiveness lost in a three-cluster solution (Lorr & Suziedelis, 1982; Lorr, 1983). The accuracy of the resulting classification was demonstrated across parallel data sets and was further validated against external variables that were not included in the clustering (Blashfield, 1976, 1980). But most important, subtypes were described on the basis of well-defined traits that were selected from a comprehensive theoretical framework. Although the intial choice of variables determines the characteristics of the identified subgroups, a frequent shortcoming of cluster-analytic research is the lack of a clear rationale for the selection of variables that are used in the classification of subjects. Most psychological studies that applied cluster analysis used the Minnesota Multiphasic Personality Inventory (MMPI) (e.g., Kline & Snyder, 1985; Costello et al. 1987). The MMPI clinical scales do not provide, however, the comprehensive and well-defined taxonomy that is needed for classification purposes. If the interest is in methodological research or theory testing, then the traits must have a theoretical context and

evidence of construct validity in previous research (McCrae & Costa, 1987; Zuckerman et al. 1988). We therefore utilized a small number of well-defined superordinate traits to identify coping subtypes.

There are, however, a number of difficulties that arise with respect to the interpretation of the current findings. First, the finding that dropouts from the rehabilitation program scored significantly higher on NA measures - although consistent with the research of Blumenthal et al. (1982) - implies that the generalizability of this study is limited to male CHD patients who complete an outpatient rehabilitation program. This raises the possibility that the current findings may relate only to a rather specific subject group. In the absence of a comparison group, it is also impossible to determine if the identified clusters are in any way particular to male CHD patients or in fact are subtypes that can be found in patients suffering from other conditions as well. Second, many of the predicted measures were very similar in content and method to the predictor variables that were used to delineate coping subtypes. More specifically, the use of subjective distress and perceived stress scales as external measurements of validity of subtype membership is certainly problematic from this point of view. Coping subtypes were, however, also associated with non-test behaviours such as return to work, chest pain complaints, and use of minor tranquilizers/sleeping pills, and these associations were consistent with previous research and with the underlying theoretical framework of our research. Third, the lack of inter-rater reliability data on the Type A interview makes it impossible to offer any firm conclusions regarding associations between coping subtype and Type A behaviour. Clearly, these limitations should be kept in mind when one considers the current findings.

Delineation of Coping Subtypes

Low-NA individuals (characterized by low levels of NA, Self-Deception, and Social Inhibition) reported moderate levels of subjective distress/perceived stress and had moderate ratings of coronary-prone behaviour. Research suggests that this coping subtype may be high in psychological hardiness (Allred & Smith, 1989), indicating an adaptive style of coping with stressful events. High-NA individuals (characterized by high levels of NA and Social Inhibition and a low level of Self-Deception) reported high levels of transient distress, disability, chronic tension, and anger, and a low level of well-being. They also had the highest ratings of Type A behaviour. These findings support the notion that high-NA individuals may be chronically unable to cope effectively with the ongoing events of their lives (Tellegen, 1985), and that they are hyper-vigilant, constantly scanning their world for signs of impending trouble (Watson & Pennebaker, 1989). Since cardiorespiratory fitness was not related to coping subtype, it also appears that perceptual and attentional characteristics of high-NA individuals magnify or exagerate any true NA-related differences in actual health status (Barsky et al. 1988; Watson & Pennebaker, 1989). Conversely, defensive individuals (scoring high on Self-Deception) tend to focus attention away from their somatic/psychological reactions to a stressor; consequently they may report a low level

of distress, whereas physiologic and behavioural measures reflect a high state of arousal (Weinberger et al. 1979; Asendorpf & Scherer, 1983). We identified two distinctive subtypes of defensive CHD patients. Inhibited individuals (characterized by high levels of Self-Deception and Social Inhibition and a low level of NA) reported low levels of distress/stress and had the lowest ratings of Type A behaviour. They also had, however, significantly higher ratings of anger-in than the other three subtypes. Some high MC responders display high levels of agreeableness (Denollet, 1991), as well as tension in assertion situations (Kiecolt & McGrath, 1979), suggesting that they may be dependent and tend to avoid conflict by the self-effacing solution of moving toward people (McCrae & Costa, 1987). Repressive individuals (characterized by low levels of NA and Social Inhibition and a high level of Self-Deception) reported low levels of distress/stress and had moderate ratings of Type A behaviour.

The fact that the identified coping subtypes were validated against self-report measures of distress/stress is, however, problematic, in that most of these measures are very similar in content and method to the predictors. We therefore attempted to examine the stability and pervasiveness of subtype differences by means of (a) follow-up assessments at 3 and 15 months after the initial assessment, and (b) inclusion of non-test indicators of subjective well-being. Follow-up assessment revealed that high-NA still reported signficantly elevated levels of subjective distress at 3 and 15 months after the initial assessment, suggesting that CHD patients high in NA tend to report more negative affect and feelings of disability across time and regardless of the situation (Denollet, 1991). Follow-up at three months also indicated that seventy-six percent of the 114 subjects who were economically active before the coronary event returned to work. High-NA and inhibited subjects were less likely to return to work than their low-NA and repressive counterparts, and this difference in resumption of work was independent of cardiorespiratory fitness as measured by exercise stress testing. This finding is consistent with previous research indicating the importance of psychological factors (Cay & Walker, 1988) and subjective perception of health status (Smith & O'Rourke, 1988) as predictors of return to work after a coronary event. Follow-up at fifteen months revealed that coping subtype membership was significantly related to prevalence of chest pain complaints as well as use of minor tranquilizers and sleeping pills. In the current study, high-NA subjects were found to have a high (43%) and repressive subjects to have a low (4%) prevalence rate of chest pain complaints one year after completion of the rehabilitation program. Once again, these findings confirm previous research indicating that CHD patients high in NA are more likely to perceive and report physical complaints including anginal pain (Williams et al. 1986), while repressive CHD patients tend to underreport physical complaints (Denollet, 1991). High-NA subject were also more likely to use minor tranquilizers and sleeping pills than low-NA, inhibited, or repressive subjects. Although chest pain complaints and use of sleeping pills were conceptualized as markers of subjective well-being in the current study, it is also possible to speculate how these variables may relate to mortality. On the one hand, evidence from a recent study suggests that somatic complaints may be associated with risk of coronary death in men who

did survive an initial myocardial infarction (Shekelle et al. 1991). On the other hand, repressors may fail to detect significant somatic feedback (Schwartz, 1983), implying that they may be at risk for silent myocardial ischemia (Barsky et al. 1990) and thus may fail to seek appropriate medical treatment and follow-up. Research also suggests that use of sleeping pills (Kripke et al. 1979) and prevalence of sleeping problems (Wingard & Berkman, 1983; Carney et al. 1990) may be associated with an increased mortality risk and the development of CHD.

Interaction of Higher-Order Traits

Beyond the description of distinctive coping subtypes, the results of this research make several conceptual points regarding the validity of superordinate traits and the way these traits interact within male CHD patients. Among other things, the current findings support the restored confidence in the use of superordinate traits to describe behaviour (McCrae & Costa, 1987; Weinberger & Schwartz, 1990). Superordinate traits encompass more than merely the sum of concrete behaviours; they are global dispositions that summarize the tendencies, styles, and preferences of individuals (McCrae, 1982). The number of traits that one regards as basic depends on the level at which one chooses to describe personality. A view which regards behaviour as highly specific to situations may be limited to narrower, specific traits; conversely at the highest level of analysis, the focus is on superordinate traits that are replicable across instruments and observers and have more predictive power over longer periods of time (Zuckerman et al. 1988; Weinberger & Schwartz, 1990; Funder, 1991). Although NA, Self-Deception, and Social Inhibition may not encompass the entire range of individual differences in human personality, these complementary traits do represent major components of personality in that they are relevant to behaviour in a large number of situations. Hence, it appears that these traits are sufficiently broad to be used in the delineation of coping subtypes (Hampson et al. 1986). Evidence was provided for the assumption that in CHD, self-report measures of individual differences in distress all essentially assess one construct, which may be labeled NA (Watson & Pennebaker, 1989), neuroticism (Costa & McCrae, 1987), or general psychological distress (Gotlib, 1984). Evidence was also provided for the conceptualization of the MC scale as a measure of a substantive trait that should be studied in its own right (McCrae et al. 1989; Lane et al. 1990). Research indicates that this trait is related to constructs such as self-deception, approval dependence, and social adaptation. Furthermore, our findings suggest that high-MC responders may comprise two distinctive subtypes, of which one is characterized by a high level of social inhibition. Social inhibition (i.e., shyness and tension when with others) and social avoidance (i.e., preference for being alone rather than being with others) share a great deal of variance with measures of introversion-extraversion, but social inhibition is more closely related to psychological insecurity than to low sociability (Cheeck & Buss, 1981).

However, our findings also suggest that the identification of higher-order traits provides only a partial view since it is mainly the interplay of various components that determines the

organization of personality (Weinberger & Schwartz, 1990). Consequently, research should more often look beyond the traditional question of how single traits affect single behaviours, to how multiple traits interact within persons (Funder, 1991). This implies that the focus of research should move from the traditional strategy of calculating correlations between isolated dimensions or dividing subjects into two groups along a single dimension, to the more complex strategy of identifying the patterns of characteristics of subjects (Weinberger & Schwartz, 1990). Although personality research has tended to accumulate findings about isolated traits (e.g., trait-anxiety, sociability, defensiveness) without addressing how these traits are configured within individuals, some studies did confront the complexity of personality organisation by jointly using different personality traits as independent variables (Cheeck & Buss, 1981; Weinberger & Schwartz, 1990). Some studies in the field of behavioural medicine have also focused on the way NA and defensiveness combine in the determination of health and disease (Shaw et al. 1986; Jensen, 1987; Jamner et al. 1988; Denollet, 1991). The current study suggests that if important variables are excluded in psychosomatic research, poor or misleading findings may result. Since no difference in NA was found between low-NA and inhibited individuals, these coping subtypes may be particularly difficult to differentiate from each other on NA measures alone. Likewise, inhibited and repressive individuals can not be differentiated on Self-Deception measures alone; yet they do display significantly different ratings of Type A behaviour and anger-in, as well as different attitudes towards resumption of work. Or in the worst case, if only a Social Inhibition measure is used to classify subjects, both high-NA and inhibited individuals would be classified in one subtype despite the fact that they display quite different personality and health-related correlates.

Holistic Approach to Variations in CHD

On the whole, the evidence presented in this article corroborates the appropriateness of a class model to describe coping styles of men with CHD. This proposition runs counter the widespread presumption that differences between people are differences in degree, not differences in kind. Although there exists a prevailing assumption that the units of personality are continuous dimensions (and an accompanying prejudice against class variables), certain units of personality are not continuously distributed, but are differently distributed into discrete categories (Gangestad & Snyder, 1985). Evidence strongly supports, for instance, the presence of latent class variables underlying distant phenomena such as schizophrenia (Golden & Meehl, 1979), self-monitoring (Gangestad & Snyder, 1985), and Type A behavior (Strube, 1989). As a matter of fact, every science has found it necessary to develop classifications of its basic phenomena (Zuckerman et al. 1988), and across the sciences, categorial presentations tend to be more efficacious than dimensional ones when one is interested in entities that differ on a large number of attributes (Weinberger & Schwartz, 1990). It is apparent that the identification of coping subtypes at this higher-order level reveals important clinical/health-related correlates which warrant further investigation. Evidence presented here suggests that, apart from demographic variables such as sex

and age (Matthews & Stoney, 1988), coping subtype is an important determinant in the study of stress-health relationships. This may help to explain why robust and convincing associations between traits and disease remain largely elusive (Krantz & Hedges, 1987). If one assumes, for instance, that both Type A behaviour and anger-in are related to CHD (H. Friedman & Booth-Kewley, 1988), then both high-NA individuals (displaying elevated ratings of type A behaviour) and inhibited individuals (displaying elevated ratings of anger-in) are at risk for the development of CHD. Since the former subtype is high and the latter low in NA, it would seem as if NA is not related to CHD if solely this isolated trait is taken into account. Although this is a highly speculative point, it may be that a possible association between NA and CHD is masked by the inhibited coping style that characterizes some individuals low in NA. Likewise, discrepant findings across studies of Type A behaviour (e.g., Rosenman et al. 1975; Shekelle et al. 1985) and hostility (e.g., Barefoot et al. 1983; Leon et al. 1988) may be related to the coping subtypes of the subject sample. Once again, there are currently little or no data, however, that provide evidence for this contention.

Nevertheless, we feel that the holistic approach described in the current paper, which addresses how characteristics are configured within individuals and conceptualizes a person as a whole, may provide a framework for the integration of studies examining psychosocial correlates of CHD and its treatment. Accordingly, by merely focusing the experimental analysis of cardiac function on its most elementary subsystems, one may overlook perhaps the most important property of the heart, namely that of the biologically ordered supersystem (Brutsaert & Sys, 1989). Likewise, the assumption underlying our research is that CHD patients are heterogeneous with regard to personality variables, but that at a higher-order level of analysis a small number of homogeneous coping subtypes can be identified. However, further attempts to cross-validate this classification scheme are needed. After all, a cluster analysis solution is the beginning of a research process, not the end (Blashfield, 1980).

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Table 1. **Intercorrelation matrix and factor analysis of Negative Affectivity, Social Inhibition, and Self-Deception measures (*N*=166).**

Trait Measures			**Intercorrelation Matrix***				**Factor Analysis†**		
			1b	1c	2	3	Factor I	Factor II	Factor III
1a	*Anxiety*	(STAI)	.83	.79	.33	-.41	***.91***	-.16	.17
1b	*Despondency*	(HPPQ)	-	.78	.24	-.47	***.90***	-.24	.06
1c	*Pessimism*	(MBHI)		-	.34	-.43	***.87***	-.21	.20
2	*Social Inhibition*	(HPPQ)			-	.02	.18	.03	***.98***
3	*Self-Deception*	(MC)				-	-.28	***.96***	.04

Note. STAI indicates State Trait Anxiety Inventory (Trait Form); HPPQ, Heart Patients Psychological Questionnaire; MBHI, Millon Behavioral Health Inventory; MC, Marlowe-Crowne Scale.

***** All correlations: $p<.001$, except: $r=.24$, $p<.01$, and $r=.02$, *n.s.*

† Principal components with varimax rotation.

Table 2. **Means, standard deviations, and analysis of variance results for trait scales of the pooled sample as a function of coping subtype (*N*=166).**

Trait Mesures	**Cluster 1** (*N*=48)	**Cluster 2** (*N*=30)	**Cluster 3** (*N*=62)	**Cluster 4** (*N*=26)	**ANOVA**	**SNK†**
Negative Affectivity	35.9 *(8.0)*	56.1 *(6.5)*	34.7 *(7.6)*	28.1 *(4.7)*	*F*=86.1*****	[2,1] [2,3] [2,4] [4,1] [4,3]
Self-Deception	17.6 *(2.9)*	15.3 *(4.0)*	23.2 *(3.1)*	24.4 *(2.1)*	*F*=73.5*****	[1,2] [3,1] [3,2] [4,1] [4,2]
Social Inhibition	9.3 *(2.2)*	12.9 *(2.2)*	13.3 *(2.2)*	7.5 *(1.1)*	*F*=69.2*****	[2,1] [2,4] [3,1] [3,4] [1,4]

Note. Standard deviations appear in parentheses. Negative Affectivity is measured by the Trait Form of the State Trait Anxiety Inventory; Self-Deception by the Marlowe-Crowne Scale; Social Inhibition by Scale 4 of the Heart Patients Psychological Questionnaire.

***** *df*=3,162, *p*<.0001.

† Student-Newman-Keuls Procedure: multiple range test denoting pairs of clusters that are significantly different at the .05 level.

Table 3. **Mean entry (1), end (2), and follow-up (3) scores and analysis of variance results for subjective distress scales as a function of coping subtype (*N*=166).**

	Cluster 1 (*N*=48)	**Cluster 2** (*N*=30)	**Cluster 3** (*N*=62)	**Cluster 4** (*N*=26)	**ANOVA**	**SNK§**
Transient Distress 1	36.2 (*9.2*)	56.5 (*10.0*)	35.4 (*9.3*)	28.2 (*7.0*)	*F*=53.93*****	[2,1] [2,3] [2,4] [4,1] [4,3]
Transient Distress 2	34.1 (*8.7*)	49.8 (*10.9*)	34.1 (*9.4*)	30.7 (*9.4*)	*F*=25.05*****	[2,1] [2,3] [2,4]
Transient Distress 3	35.3 (*8.6*)	46.3 (*10.9*)	32.5 (*8.4*)	28.5 (*7.7*)	*F*=22.62*****	[2,1] [2,3] [2,4] [4,1]
Change score 1 - 2	-2.1, *F*=2.81	-6.7, *F*=8.58‡	-1.3, *F*=1.19	+2.5, *F*=1.37		
Change score 2 - 3	+1.2, *F*=1.15	-3.5, *F*=1.94	-1.6, *F*=1.52	-2.2, *F*=1.60		
Well-Being 1	27.1 (*6.7*)	16.9 (*5.7*)	26.9 (*7.5*)	31.7 (*4.1*)	*F*=27.03*****	[2,1] [2,3] [2,4] [4,1] [4,3]
Well-Being 2	31.3 (*4.5*)	21.5 (*7.8*)	31.3 (*6.2*)	33.7 (*3.5*)	*F*=27.63*****	[2,1] [2,3] [2,4]
Well-Being 3	29.9 (*6.2*)	22.6 (*7.6*)	31.8 (*5.9*)	32.4 (*6.2*)	*F*=16.26*****	[2,1] [2,3] [2,4]
Change score 1 - 2	+4.2, *F*=25.63†	+4.6, *F*=12.86‡	+4.4, *F*=19.19†	+2.0, *F*=4.44‡		
Change score 2 - 3	-1.4, *F*=3.83	+1.1, *F*=0.61	+0.5, *F*=0.33	-1.3, *F*=1.30		
Feelings of Disability 1	26.3 (*6.0*)	31.0 (*4.3*)	26.9 (*5.3*)	22.9 (*6.2*)	*F*=10.33*****	[2,1] [2,3] [2,4] [4,3] [4,1]
Feelings of Disability 2	21.2 (*5.5*)	27.8 (*6.6*)	23.0 (*5.9*)	19.0 (*6.1*)	*F*=12.07*****	[2,1] [2,3] [2,4] [4,3]
Feelings of Disability 3	22.5 (*7.0*)	27.2 (*7.2*)	22.1 (*5.6*)	19.1 (*5.3*)	*F*=8.08*****	[2,1] [2,3] [2,4]
Change score 1 - 2	-5.1, *F*=46.45†	-3.2, *F*=11.33‡	-3.9, *F*=34.16†	-3.9, *F*=13.82‡		
Change score 2 - 3	+1.3, *F*=3.83	-0.6, *F*=0.48	-0.9, *F*=1.78	+0.1, *F*=0.05		

Note. Standard deviations appear in parentheses. Transient Distress is measured by the State Form of the State Trait Anxiety Inventory; Well-Being and Feelings of Disability by Scales 1 and 2 of the Heart Patients Psychological Questionnaire; 1: entry score; 2: end score (three months after initial assessment); 3: follow-up (15 months after initial assessment and 12 months after end assessment).

***** *df*=3,162,*p*<.0001; † *p*<.0001, ‡ *p*<.01, *df*s= 1,47 (cluster 1), 1,29 (cluster 2), 1,61 (cluster 3), and 1,25 (clusters 4).

§ Student-Newman-Keuls Procedure: multiple range test denoting pairs of clusters that are significantly different at the .05 level.

Table 4. **Return to work (after 3 months), chest pain, substance abuse, and use of tranquilizers/sleeping pills (after 15 months) as a function of coping subtype.**

Follow-up Measures		**Cluster 1** (*N*=48)	**Cluster 2** (*N*=30)	**Cluster 3** (*N*=62)	**Cluster 4** (*N*=26)	**Crosstabulation**
3 months	*Return to Work* No: 16%	**No: 36%**	**No: 31%**	No: 5%		$\div^2(3)= 7.73, p=.05$
(*N*=114) *****		*N*= 5(N)/26(Y)	*N*= 9(N)/16(Y)	*N*=12(N)/27(Y)	*N*= 1(N)/18(Y)	
15 months	*Chest Pain*	Yes: 17%	**Yes: 43%**	Yes: 18%	**Yes: 4%**	$\div^2(3)=15.05, p<.01$
(*N*=166)		*N*= 8(Y)/40(N)	*N*=13(Y)/17(N)	*N*=11(Y)/51(N)	*N*= 1(Y)/25(N)	
	Smoking	Yes: 15%	Yes: 20%	Yes: 11%	Yes: 12%	$\div^2(3)= 1.43, p=.70$
		N= 7(Y)/41(N)	*N*= 6(Y)/24(N)	*N*= 7(Y)/55(N)	*N*= 3(Y)/23(N)	
	Alcohol Abuse Yes: 8%	Yes: 13%	Yes: 7%	Yes: 8%		$\div^2(3)= 1.27, p=.74$
		N= 4(Y)/44(N)	*N*= 4(Y)/26(N)	*N*= 4(Y)/58(N)	*N*= 2(Y)/24(N)	
	Minor Tranquilizers	Yes: 19%	**Yes: 43%**	Yes: 15%	Yes: 19%	$\div^2(3)=10.49, p<.05$
		N= 9(Y)/39(N)	*N*=13(Y)/17(N)	*N*= 9(Y)/53(N)	*N*= 5(Y)/21(N)	
	Sleeping Pills Yes: 17%	**Yes: 37%**	Yes: 10%	Yes: 19%		$\div^2(3)=10.04, p<.05$
		N= 8(Y)/40(N)	*N*=11(Y)/19(N)	*N*= 6(Y)/56(N)	*N*= 5(Y)/21(N)	

Note. (N) denotes NO, (Y) denotes YES.

***** Of the 166 subjects, 114 (69%) were economically active before onset of the acute coronary event.

LEGENDS

Legend to Figure 1

Mean standardized T scores on the Negative Affectivity, Self-Deception, and Social Inhibition measures for the four clusters of male CHD patients of samples 1 and 2.

Note. NA indicates Negative Affectivity as measured by the Trait Form of the State Trait Anxiety Inventory; SD, Self-Deception as measured by the Marlowe-Crowne Scale; IN, Social Inhibition as measured by Scale 4 of the Heart Patients Psychological Questionnnaire. Sample 1 (continuous line): *N*= 24, 17, 32, and 10 for clusters 1 to 4, respectively; Sample 2 (discontinuous line): *N*= 24, 13, 30, 16 for clusters 1 to 4, respectively.

Legend to Figure 2

Mean subjective distress, cardiorespiratory fitness, and perceived stress scores for the four clusters of male CHD patients of the pooled sample.

Note. Transient Distress is measured by the State Form of the State Trait Anxiety Inventory; Well-Being and Feelings of Disability by Scales 1 and 2 of the Heart Patients Psychological Questionnaire; Cardiorespiratory Fitness by exercise stress testing; Chronic Tension by Scale A of the Millon Behavioral Health Inventory; Anger by the Trait Form of the State Trait Anger Scale. *N*= 48, 30, 62, and 26 for clusters 1 to 4, respectively.
*****MANOVA: overall difference among clusters on subjective distress measures ($p<.0001$).
******MANOVA: overall difference among clusters on perceived stress measures ($p<.0001$).
◦ANOVA: no significant difference among clusters on cardiorespiratory fitness ($p=.70$).

Legend to Figure 3

Mean Type A behaviour and anger-in interview ratings for the four clusters of male CHD patients of the pooled sample.

Note. Type A Behaviour is rated using the interview described by M. Friedman & Powell (1984); Anger-In is rated using the method described by MacDougall et al. (1985). *N*= 48, 30, 62, and 26 for clusters 1 to 4, respectively.
MANOVA: overall difference among clusters on coronary-prone behaviour ratings ($p<.0001$).

Dr. M. Fisher, 9 August 1991
Editor *Psychological Medicine*
Institute of Psychiatry
De Crespigny Park,
Denmark Hill, London SE5 8AF
ENGLAND

Dear Dr. Fisher,

Re: "*Coping Subtypes for Men with Coronary Heart Disease: Relationship to Well-Being, Stress and Type A Behaviour",* J. Denollet and B. De Potter

I wish to thank you for your letter of 29 July enclosing reviewers comments on the above manuscript. I do appreciate that you would be willing to consider this revised paper for publication in *Psychological Medicine*. I am indebted to the anonymous reviewers for their constructive comments and I am convinced that the manuscript is now improved by the revision you recommended.

We are in complete agreement with the comments of the reviewers and therefore have corrected the paper in a fashion that deals with the various issues raised by them. The subject sample is described in more detail, and mention is now made of the way the subjects were recruted, the factors that determine the presence of these patients in a rehabilitation program, and the percentage of CHD patients in the catchment area of our hospital that enter the program. The test-retest coefficients of the measures are deleted and replaced by alpha coefficients of internal consistency. Figures 2 and 3 are corrected by the inclusion of standard error bars. Data on the predictive validity of the delineated coping subtypes now comprise follow-up assessments at 3 and at 15 months after the initial assessment. The predicted measures now include non-test indicators of well-being such as return to work, chest pain complaints, and use of minor tranquilizers and sleeping pills. The limitations of the study (generalizability of the findings, use of self-report measures, lack of inter-rater reliability data on the Type A interview) are now pointed out in the Discussion section.

Since the current study is an extension of a previous paper on negative affectivity and repressive coping that has been accepted for publication in Psychosomatic Medicine, I hereby include a copy of the latter manuscript.

I hope that the revision of the current manuscript meets the various points raised by your referees and that you therefore would be willing to consider this study for publication in *Psychological Medicine*. Please find enclosed 3 copies of the revised manuscript and the corrected figures 2 and 3 (figure 1 is unchanged).

Address for correspondence : Yours sincerely,

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Responses to Comments of Reviewer # 1.

MAJOR

Your point regarding the material provided in the section on predictive validity is well taken. As a matter of fact, you anticipated our intentions. The previous version of the current manuscript only comprised the first part of our study (focusing on the delineation of subtypes), because we initially decided to report on the second part of our study (focusing on non-test behaviours and follow-up data related to coping subtypes) in a separate paper. In the light of the points raised by the referees, we decided, however, to include these data in the revised manuscript. We think that this adaptation may strenghten the findings of the paper. Consequently, the revised manuscript describes how coping subtypes are related to return to work, chest pain complaints, and use of minor tranquilizers/sleeping pills.

MINOR

The subject sample is now described in more detail. Mention is made of the factors that determine the presence of the subjects in the rehabilitation program and of the percentage of CHD patients in the catchment area of our hospital that enter the program. The limitations of the study are pointed out in the Discussion section, indicating that our findings may relate only to a rather specific subject group and that in the absence of a comparison group it is impossible to determine if these results are in any way particular to CHD patients. Figures 2 & 3 were corrected by the inclusion of standard error bars.

Responses to Comments of Reviewer # 2.

Page 3, 1st paragraph, last line: the word 'facets' is now deleted and replaced be 'factors'.

Page 6, Method section: We agree that the subject population was poorly described. The current revision therefore describes more in detail how the patients were recruited and how this may have affected the way this sample is representative of out-patient CHD patients (see also limitations of the study in the Discussion section).

Page 11: The use of subjective distress measures to validate the coping subtypes is problematic indeed. The current revision therefore also includes non-test behaviours (i.e., return to work, chest pain complaints, use of tranquilizers/sleeping pills) as an external measurement of validity.

Responses to Comments of Reviewer # 3.

The test-retest coefficients of the measures are deleted and replaced by alpha estimates of internal consistency.

We agree that data on the inter-rater reliability of the Type A interview is fundamental to the findings of the study regarding coronary-prone behaviour. We therefore pointed out in the discussion that in the absence of these data, it is impossible to draw correct conclusions regarding associations between subtype membership and coronary-prone behaviour.

Finally, the subject sample is described more in detail, and mention is now made of the fact that the way patients were selected may have affected our findings (see Discussion section).