Alexithymia May Influence the Diagnosis of Coronary Heart Disease

JUSSI KAUHANEN, MD, PHD, GEORGE A. KAPLAN, PHD, RICHARD D. COHEN, MA, RIITTA SALONEN, MD, AND JUKKA T. SALONEN, MD, PHD MPH

A number of psychosomatic studies have suggested that alexithymia, impairment in identifying and expressing inner feelings, might somehow affect the course of various illnesses. However, none of these studies have distinguished between an impact of alexithymia on actual pathophysiological change versus an impact only on illness behavior. In the present study, a population-based random sample of 2297 middle-aged men from Eastern Finland was evaluated for alexithymia using the Finnish version of the self-report Toronto Alexithymia Scale (TAS). Although high TAS scores were associated with prior diagnosis of coronary heart disease (CHD), they were not associated with greater prevalence of ischemia on an exercise tolerance test. The results of B-mode ultrasonography of the carotid artery for those who had a CHD diagnosis showed that carotid atherosclerosis actually decreased significantly as alexithymia increased. An interaction analysis indicated that alexithymia was related to increased probability of being diagnosed with CHD only among those who had mildly or moderately progressed carotid atherosclerosis, and not among those with the most severe progression. Alexithymia was associated with higher perceived exertion, and to some extent, with more self-reported symptoms during the exercise tolerance test. The findings support the hypothesis that alexithymia relates to increased symptom reporting rather than pathophysiological changes in CHD. The results also suggest that alexithymic men may get diagnosed earlier, perhaps because of their different illness behavior.

Key words: Alexithymia, atherosclerosis, coronary heart disease, illness behavior, population, symptoms.

INTRODUCTION

Alexithymia is a term for cognitive-affective impairment in a person's ability to identify and verbally describe his or her inner feelings (1). Literally this word, coined by Sifneos (2), means "no words for mood." It conceptualizes a long tradition of observations and theoretical reasoning in clinical psychosomatic research (3–5).

According to the prevailing formulations (1, 5), alexithymia consists of four features: difficulty in identifying feelings and distinguishing between emotions and bodily feelings; difficulty in describing feelings verbally to others; reduction or absence of imaginative ability, and; external, operative cognitive style.

Most recent attempts to validate the alexithymia construct have adopted a measurement-based, construct validational methodology (1, 6, 7). Of the several instruments developed to operationalize and quantify alexithymic features, only the Toronto Alexithymia Scale (TAS) (8, 9), and, to some extent, the Rorschach test (10) have appeared to be consistent with the theoretical construct of alexithymia. The 26-item TAS has demonstrated internal consistency, test-retest reliability, and a stable factor structure in studies among several different samples (9, 11, 12).

Growing number of studies have shown a relationship between alexithymia and various illnesses and conditions (13–16). The original claim (2) that this is an important psychosomatic construct has thus received some empirical support. It has also been suggested that alexithymia might be independently associated with exacerbation or persistence of bodily symptoms (17, 18).

The evidence is by no means conclusive, and we are still far away from understanding whether alexithymia acts as a disposing, precipitating, or illness-sustaining factor (19). An even more basic question has yet to be explored: does the excess morbidity apparently associated with alexithymia reflect the etiologic role of alexithymia in pathophysiological processes, or has it more to do with the effect of alexithymia on illness behavior, such as symptom awareness and complaints, and care-seeking?

Because a positive association was found between alexithymia and prior diagnosis of coronary heart disease (CHD) in the general population sample of the Kuopio Ischemic Heart Disease Risk Factor

From the Human Population Laboratory, State of California Department of Health Services, Berkeley, California (J.K., G.A.K., R.D.C.), and Research Institute of Public Health, University of Kuopio, Finland (J.K., R.S., J.T.S.).

Address reprint requests to: Jussi Kauhanen, MD, Department of Community Health and General Practice, University of Kuopio, P.O. Box 1627, 70211 Kuopio, Finland.

Received for publication September 15, 1992; revision received March 10, 1993

0033-3174/94/5603-0237$03.00/0

Study, our aim was to examine alternative explanations for the association. We investigated the extent to which pathophysiological measures (ischemia on maximal exercise test; the severity of carotid atherosclerosis) were consistent with the observed relationship between alexithymia and prior CHD diagnosis. The alternative hypothesis, that the observed alexithymia-CHD association could be better explained by factors related to illness behavior (symptom reporting) was also examined.

METHODS

This population-based cross-sectional study was part of the Kuopio Ischemic Heart Disease Risk Factor Study. The KIHD study is a large prospective epidemiologic project launched to investigate new and unestablished risk factors for coronary heart disease in men, and to explore the biological pathways of the risk factor effects.

The extensive baseline examination in the KIHD study included various biochemical, physiological, and anthropometric measures, a maximal exercise tolerance test, and, in a subsample, ultrasonographic examination of the common carotid arteries. History of prior symptoms and diagnosed diseases, and information on lifestyle, behavioral risk factors, socioeconomic and psychosocial factors, were obtained in a questionnaire. The KIHD design and methodology have been described in greater detail elsewhere (20, 21).

The group of middle-aged men participating in the KIHD study (N = 2682) was a representative population sample of four age cohorts (42, 48, 54, and 60 years) of men living in the city of Kuopio or the surrounding rural area in Eastern Finland. Slightly over half (53%) lived in urban or suburban communities and the rest in rural areas. On average they had acquired 8.6 years of education (SD 3.4), which is typical for these age cohorts in Finland. Most men (86.6%) were married, 6.6% had remained unmarried, and 6.9% were either divorced or widowers. The main lifetime occupation was in white collar category for 39.5% of the men, 44.5% were blue-collar workers, and 16.2% farmers.

Alexithymia was assessed using the Finnish version of the Toronto Alexithymia Scale (TAS) (8). At the time of the study this 26-item scale was the best validated alexithymia measure, and it was also feasible for use in a population study (9, 12, 22). Validation studies of the TAS in the present sample (23) yielded a factor structure that was congruent with the earlier Canadian studies (8, 12). The Cronbach's alpha was 0.72, and, in a subsample of 50 men (23), the 8-month retest reliability coefficient was 0.78. The TAS score was also in fair agreement (Kappa coefficient 0.48) with an interview-based global assessment of alexithymia (23).

Because a pilot study with the Finnish TAS scale (J. Julkunen, unpublished) had suggested that alexithymic men may more frequently than nonalexithymic men answer "I don't know," this neutral response option was omitted from the original 5-point Likert scale. Scoring the individual items from 0 to 3 instead of 1 to 5 changed the range of the total TAS score as compared to earlier reference (8). Factor structure of the new 4-point scale, however, remained essentially unchanged, and the distribution was very close to normal, suggesting the appropriate ability of this scale to distinguish men according to their alexithymic features.

The men were asked in the questionnaire, whether a physician had ever given them a diagnosis of either one of the two major manifestations of coronary heart disease: cardiac angina pectoris or myocardial infarction. This self-reported information was confirmed in the medical history taken by the research physician at the baseline examination. The men also completed the Rose questionnare for typical CHD symptoms (24).

Carotid atherosclerosis has been shown to be associated with the incidence of coronary heart disease (25), and it can be viewed as an important indicator of the pathophysiological process of the disease. To see if alexithymia is related to this measure, the TAS scores were analyzed together with the maximal intima-media thickness (IMT) readings of carotid arteries. It was also possible to check for possible effect modifications by looking at the relationship of alexithymia with a CHD diagnosis at different severity levels of atherosclerosis. The atherosclerosis measure was obtained from a subsample of KIHD participants (N = 1288) by using a high-resolution B-mode ultrasonographic examination (ATL UM4 Duplex) (26). The scanning of carotid arteries was performed by a physician while the subject was lying in the supine position. Complete data on ultrasonography, alexithymia, history of diseases, and cardiovascular risk factors were available on 1046 men. There is no evidence that this sample differed in any important ways from the base population where it was drawn (27). There were slightly more 60 year olds (p = .04) in this group, but otherwise no statistically significant differences were seen in marital status (p = .8), educational level (p = .62), urban/rural residence (p = .07), smoking (p = .15), or prior history of CHD (p = .9).

To get clinical and diagnostically relevant evidence of the actual ischemic processes in the myocardium, a progressive, small incremental, maximal exercise tolerance test was performed on an electrically braked bicycle ergometer (28). The maximal load was reached at exhaustion. The ECG-tapes were read both at maximal work load and 1 minute after the exercise. The criteria for ischemia were: ST-segment deviation at 80 msec after J-point in lead aVF was 0.5 to 0.9 mm and the segment horizontal or downsloping, or the deviation was 1.0 mm or more, or the maximal heart rate failed to exceed 130 beats per minute in spite of compliant effort. Maximal oxygen uptake, measured during the exercise by using the direct method, was obtained as an indicator of aerobic fitness. This allowed us to adjust for differences in physical fitness, which among other factors such as age and smoking, could have confounded the observed associations.

Self-reported physical symptoms such as shortness of breath, fatigue, and chest pain (29) as well as the level of perceived exertion (Borg-score) (30) were recorded during the exercise test. The assumption was that, when adjusted for pertinent clinical cofactors, levels of these variables would independently indicate the general tendency of reporting symptoms and distress.

Cardiovascular risk factors were measured in the KIHD project according to the standard epidemiologic protocol (20, 25). To get information on medications, the participants were asked to list in the questionnaire the brand names of all prescribed drugs they were currently taking. The examining physician reviewed this information with the participant. The medications were coded according to the Nordic Pharmacopoeia. An indicator of current use of nitroglycerine was formulated from the appropriate drug codes.

The crude associations between categorical or ordinal variables were tested in 2 × K tables using standard chi-square statistics. Multivariate logistic regression models were applied to determine whether the association between the TAS and probability of having the diagnosis for CHD would remain statistically significant after adjustment for possible confounders and interactions. The same was done to examine the possible relationship of the

TAS with ischemia on exercise. The association of alexithymia with carotid atherosclerosis was examined using general linear models procedures which gave estimates of the mean carotid intima media thickness (IMT) in each TAS quartile, adjusting for age and major cardiovascular risk factors. The relationships of the TAS with perceived symptoms during the exercise, and with the Borg score (perceived exertion), were analyzed using similar models, where age, smoking, and physical fitness were held constant. The analyses for IMT and performance on exercise test were repeated separately for those with and without prior diagnosis of CHD. SAS statistical package version 5.18 was used in all analyses (SAS User's guide 1985).

RESULTS

The response rate for the TAS was 85.9 per cent (N = 2297). The scores ranged from 6 to 57, the distribution was nearly normal (mean 31.9), and the upper cutoff points for the 25th, 50th, and 75th percentile were 27, 32, and 37, respectively.

Alexithymia and Prior Diagnosis

Table 1 shows the significant relationship between unadjusted alexithymia score and prior diagnosis of CHD. The TAS scores are shown by quartiles in order to examine possible nonlinearities in the association. When the two component categories of the CHD diagnosis were examined separately, a significant and linear relationship was again observed between the TAS score and prevalence of angina pectoris, whereas the association of the alexithymia score with a prior diagnosis for myocardial infarction was only marginally statistically significant.

The association of alexithymia with prior CHD diagnosis (either angina pectoris or myocardial infarction) remained statistically significant ($p < .05$) when it was examined in a multiple logistic regression model adjusting for extent of carotid atherosclerosis, age, smoking, serum LDL, and systolic blood pressure. The relative risk of having a CHD diagnosis between the highest and lowest TAS quartiles, as estimated in the model by the adjusted odds ratio, was 2.9 (95% confidence interval 1.2–7.3).

When the association between TAS scores and angina and prior myocardial infarction were considered separately in logistic models, adjusting for all previously mentioned cofactors, TAS was significantly related to angina pectoris ($p < .02$), but not to myocardial infarction ($p = .47$). Estimated by odds ratios, men in the highest TAS quartile were at 3.2 times higher risk than men in the lowest quartile, of having a prior angina pectoris diagnosis (95% confidence limits 1.3 and 8.2), with adjustment for major cardiovascular risk factors and level of carotid atherosclerosis.

The results were re-examined by broadening the definition of CHD to include a positive result for angina pectoris using the Rose questionnaire, and regular use of nitroglycerine. This expansion of the CHD variable did not appreciably change the results (adjusted OR 2.7, CI 1.2–6.3).

Adding an interaction term between TAS and extent of carotid atherosclerosis (TAS × IMT) made a statistically significant contribution ($p = .02$) to the model when continuous measures for alexithymia and atherosclerosis and risk factors were also included. This suggested that the alexithymia-CHD association may vary at different levels of atherosclerosis. In order to examine in greater detail the nature of this interaction, the continuous atherosclerosis measure was divided into quartiles, and the alexithymia-CHD association was examined at these four increasing levels of atherosclerotic thickening. The results showed that at low or moderate levels of atherosclerosis (the three lowest quartiles) more men in the highest alexithymia quartile as compared to the lowest had been diagnosed with CHD. The relationship was strongest among those with the very least atherosclerosis; at the most severe level (fourth quartile), on the other hand, there was no indication of the relationship (Figure 1).

TABLE 1. The Percentage of Men in Each TAS Quartile (4 = Highest Alexithymia), Who Report Having Been Diagnosed by a Physician for Coronary Heart Disease (CDH), or for One of Its Subcategories, Angina Pectoris or Myocardial Infarction

	TAS Quartile				
	1	2	3	4	
CHD diagnosis (N = 394)	14.3	15.4	19.2	20.2	$p = .02$
Angina pectoris (N = 347)	12.8	13.2	16.5	18.5	$p < .03$
Myocardial infarction (N = 181)	5.6	7.4	9.0	9.4	$p = .06$

Clinical Measures of CHD

Among the subsample of men who underwent ultrasonography, the alexithymia measure was not related to carotid atherosclerosis ($p = .80$) in a multivariate model controlling for age, smoking, systolic blood pressure, and serum LDL, which are factors known to associate with the progression of atherosclerosis. When this group was stratified by the prior diagnosis status, no relationship was found among

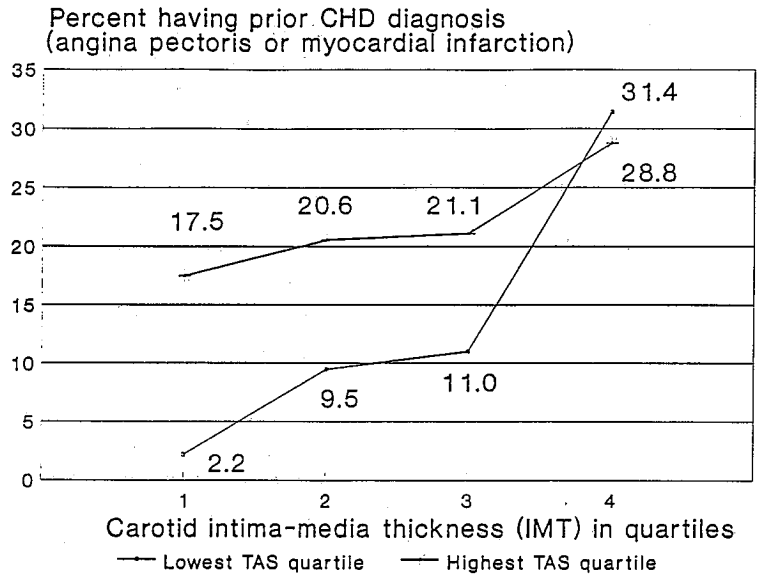

Fig. 1. Percentage of men in the highest and the lowest alexithymia quartile who have been diagnosed as having coronary heart disease, at different levels of carotid atherosclerosis (IMT). Number 1 on the *horizontal axis* marks the least and number 4 the most severe level of atherosclerosis.

TABLE 2. Assessment of Carotid Atherosclerosis in the Subsample That Underwent Ultrasonography[a]

	TAS Quartile				
	1	2	3	4	
Everybody ($N = 1046$)	0.94	0.96	0.92	0.94	$p = .80$
No prior diagnosis ($N = 872$)	0.87	0.94	0.88	0.92	$p = .39$
Prior CHD diagnosis ($N = 174$)	1.35	1.10	1.11	1.07	$p < .03$

[a] Mean intima-media thickness (mm) in TAS quartiles is given for everyone with complete information, as well as in groups stratified by the prior CHD status. The IMT estimates are adjusted for age, smoking (cigarette-years), systolic blood pressure and LDL.

those who had not been diagnosed for CHD ($p = .39$). However, in men with a CHD diagnosis, increasing alexithymia was associated with less severe atherosclerosis ($p = .03$). Table 2 gives the age and risk factor adjusted means of IMT in TAS quartiles separately for those with and without the diagnosis.

Exercise ECG-readings were obtained from 2085 of those who had completed the TAS questionnaire. The missing values (4.9%) were due to occasional and random unavailability of the exercise test facilities or personnel. A total of 508 men (24.4%) were shown to have ischemic changes. Although the TAS was related to prior diagnosis, it did not predict ischemia on exercise test. The prevalence of positive ischemic findings from the lowest to the highest TAS quartile was 21.3%, 25.7%, 24.7%, and 26.2% ($p = 0.25$). Adjustment for age, physical fitness (VO_{2max}), systolic blood pressure, smoking, and LDL in a logistic regression model gave further evidence that there was no linear relationship between the TAS and ischemia on exercise ($p = .69$). Similarly, there was no association, when men with no CHD diagnosis ($p = .92$) and those with the CHD diagnosis ($p = .38$) were analyzed separately. Adding the perceived exertion score to the models made no difference.

Symptom Reporting

The exercise tolerance test showed a linear and statistically significant association between perceived exertion, assessed 2 minutes from the start, and alexithymia; men with high alexithymia score tended to perceive the test as more strenuous. The positive relationship remained highly significant after adjustment for age, aerobic fitness, and smoking ($p < .01$). Because cardiovascular status may be a confounder or effect modifier, the analysis was done separately for those with and without prior CHD diagnosis. The men with the diagnosis scored on average 1.17 points higher, but the positive association remained equally significant in both groups (Figures 2 and 3). The form of the association, however, seemed to be slightly different in these two strata: there seemed to be a threshold that distinguished the highest alexithymia group in the CHD-group (Figure 3). Analyses using assessment of

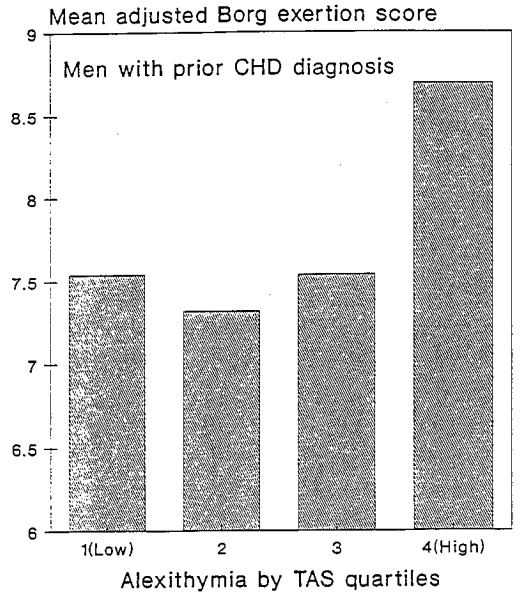

Fig. 2. The association of alexithymia with self-perceived exertion (Borg scale rating) at 2 minutes during the exercise tolerance test, in the group without prior diagnosis of CHD (N = 1640). Group means are adjusted for age, smoking, and physical fitness (maximal oxygen uptake capacity).

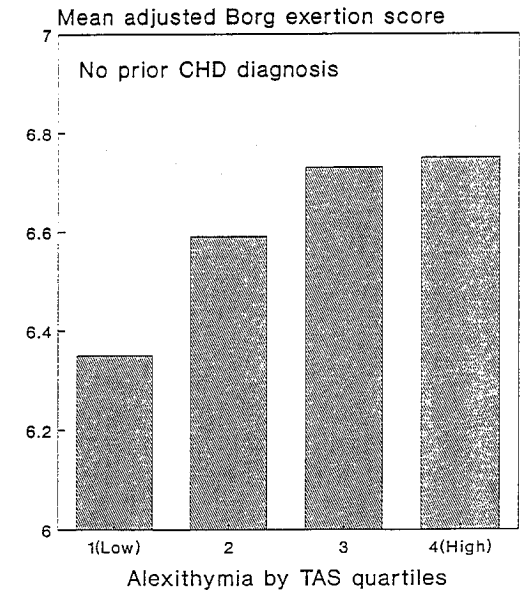

Fig. 3. Adjusted means of self-perceived exertion at 2 minutes during the exercise test, in men who had the CHD diagnosis (N = 300), by alexithymia. The model adjusts for age, smoking, and physical fitness.

perceived exertion at 4 minutes produced similar results ($p < .01$ for the whole sample, $p < .05$ for non-CHD group, and $p < .05$ for those with the diagnosis).

A similar, although less steep, gradient was observed for the sum of perceived symptoms during the exercise; on average, high alexithymic men reported more of these. Controlling for age, aerobic fitness, and smoking, the adjusted mean number of symptoms from lowest to the highest TAS quartile were: 2.28, 2.34, 2.36, and 2.47, respectively (test for linearity: $p < .01$). The same pattern was seen in the stratified analysis in men without prior diagnosis ($p < .01$), but there seemed to be no differences in symptom reporting in those with prior diagnosis of CHD ($p = .80$).

DISCUSSION

Our study in an unselected population sample of middle-aged men showed that alexithymia, a personality construct referring to difficulties in identifying and verbally describing inner feelings, was related to the probability of having a diagnosis for coronary heart disease (CHD). However, in the entire sample, there was no relationship between alexithymia and two clinical measures of the disease. On the other hand, in men with a prior CHD diagnosis, those who scored high on the alexithymia scale actually tended to have less atherosclerosis.

In theoretical discussions alexithymia has been linked to both symptom reporting and to clinical diagnoses (1, 2). There has been, however, a lack of empirical efforts to investigate the assumed associations more closely.

The present study suggests that alexithymia may be associated with higher prevalence of coronary heart disease. However, there was no evidence that alexithymia is associated with clinical or pathophysiological indicators of the disease.

The fact that increasing alexithymia was associated with higher perceived exertion and more symptom reporting lends support to pathways involving illness behavior and symptom reporting. In other words, the higher prevalence of disease may not reflect greater severity of disease, but instead, tendencies of those high on alexithymia to somatize. This would be in line with one of the main assumptions of most formulations of alexithymia theory, which state that individuals with alexithymic characteristics tend to channel their inner feelings into somatic complaints (2, 5).

Multivariate statistical analyses indicated that the

results were unlikely to be because of chance or a variety of possible confounders. Not surprisingly, some differences in results were seen when the analyses were stratified by prior CHD status. Most associations, however, remained the same in both strata.

The diagnosis of coronary heart disease was based on self-report of a physician's diagnosis of either angina pectoris or myocardial infarction, the two major clinical manifestations of the disease. A bias in reporting these prior diagnoses, leading to differential misclassification over TAS categories, is a possibility to be considered. To minimize this kind of self-report error, a research physician checked the answers together with the respondents in the KIHD baseline interview.

It is sometimes difficult to determine the occurrence of myocardial infarction with certainty, even for physicians with full ECG and enzyme data. Therefore, it was considered appropriate to combine angina pectoris and myocardial infarction, when the dependent variable (CHD diagnosis) was defined. But there was also a reason to repeat the analyses for both of these diagnostic categories separately. In most cases the process of reaching the diagnosis for myocardial infarction is very different from the way uncomplicated angina pectoris is diagnosed. Dealing with suspected myocardial infarction usually means fairly extensive use of hospital technology, so less room is left for judgments that are based on nonbiological factors. On the other hand, a physician has to rely more heavily on medical history and patient's own account of symptoms, when he/she faces a suspected case of angina pectoris. This is especially true with the Finnish KIHD sample; during the baseline time period, men in these cohorts had not been routinely subjected to such diagnostic procedures as angiography or thallium stress test when presenting with chest pain symptoms.

A potential validity problem could be indicated by the 194 men who, while reporting neither angina pectoris nor prior myocardial infarction, had positive results for angina pectoris on the Rose questionnaire, or reported current regular nitroglycerine use. Some of these men probably had mistaken their CHD status, and some obviously had coronary heart disease which had not yet been confirmed by the health care systems. When these men were included in the CHD category, the results remained essentially the same, except for the association between the TAS and myocardial infarction. This gives additional support to the hypothesis that factors related to illness behavior rather than pathophysiology may explain the increased CHD morbidity in alexithymia. In other words, alexithymia is not a determinant when diagnostic decisions are made for myocardial infarction, but for angina pectoris it might well be. Adjustment for age, cardiovascular risk factors and severity of atherosclerosis did not abolish the associations, suggesting that these cofactors do not confound or mediate the possible effect of alexithymia on the probability of getting diagnosed.

Alexithymic men with a CHD diagnosis showed significantly lower levels of atherosclerosis than the diagnosed nonalexithymic men, when age and major cardiovascular risk factors were taken into account. There is considerable evidence that carotid atherosclerosis fairly well reflects a common atherosclerotic disease process that affects the walls of coronary arteries as well (25). If this is true, alexithymic men seemed to have obtained the diagnosis earlier during the course of the disease.

The study design also made it possible to check whether the association between alexithymia and CHD would be the same at mild, moderate, or most severe levels of atherosclerotic progression. In concordance with the rest of the findings, the relationship was strongest at the least severe level of atherosclerosis, which biomedically should most likely be symptomless. This association was reduced at higher levels of arterial thickening, and when atherosclerosis was severe (the highest quartile), alexithymia did not seem to enhance the probability of having the diagnosis.

The chance that ischemia or atherosclerosis were systematically assessed erroneously at different levels of alexithymia is remote, since the validity and reproducibility of the ultrasound measure (27), exercise test (28, 30), and other measures (20, 30) were carefully monitored throughout the study.

All evidence also supported the validity of the Toronto Alexithymia Scale. It has been shown to represent the theoretical construct of alexithymia (2, 22), although concerns regarding some items and dimensions of this measure have been raised recently (7). The scale was constructed according to the guidelines of psychometric theory (8, 12, 22), and the validational studies in our Finnish sample (23) converged with the earlier findings about this scale.

The results of a 25-year follow-up of the Western Electric Study (32) were consistent with the results of the present study, although different measurements were used. Tendencies to report somatic complaints, assessed by MMPI, seemed to be associated with the incidence of nonatherosclerotic conditions that clinically resemble coronary heart disease. Somatic complaints did not, however, relate to subse-

quent myocardial infarction or cardiac death, except in the subgroup of men who had already survived an initial myocardial infarction. In earlier analyses Ostfeld et al. (33) had similarily observed a prospective relationship between MMPI Hypochoncriasis and Hysteria scales and uncomplicated angina pectoris (i.e., angina without myocardial infarction). Objective assessments of atherosclerosis, however, were not available at the time of those studies.

Studies using angiography (34) and thallium stress tests (35) have shown that clinical evidence does not always agree with the patient's symptom awareness or subjective reporting of cardiac symptoms. To explain this variation in symptom awareness, a considerable amount of effort has been focused on such constructs as neuroticism (36–38), and negative affectivity (39). For example, in a clinical study of patients referred for coronary angiography because of chest pain, Costa et al. (40) found that those who did not show clinically significant coronary artery disease tended to score higher on measures of neuroticism than those whose clinical disease could be verified by angiography. However, in follow-up no relationship has been shown between neuroticism and biomedically objective CHD events (41).

Little is known about the relationship of alexithymia with these traits and coping styles that are related to variations in symptom awareness. The TAS correlated with the Basic Personality Inventory Hypochondriasis subscale ($r = 0.387$, $p < .001$), in a study of 81 healthy students (42). The same study reported correlation coefficients of 0.466 ($p < .001$) with depression and 0.257 ($p < .01$) with anxiety measures. Another study with 110 college freshmen (7) suggested that depression and anxiety are associated specifically with the alexithymia dimension pertaining to identifying and communicating feelings. Correlation coefficients of 0.315 (before treatment) and 0.449 (after treatment) were observed between the TAS and the Beck Depression Inventory in inpatient alcoholics (43). A separate analysis in the KIHD population sample (18) confirmed that, after adjustment for age, smoking, and socioeconomic status, the TAS was significantly related to MMPI Hypochondriasis subscale ($p < .001$). A fairly strong inverse relationship ($r = -0.45$) has been observed with the MMPI-based Barron's Ego Strength scale (22).

The present study supports the earlier notions that alexithymia is a useful construct in psychosomatic research, especially with respect to illness behavior and symptom awareness. The results suggest that it may even influence the way coronary heart disease, at least in its uncomplicated forms, gets diagnosed in medical care. Direct observations on illness-behavior and further longitudinal studies of alexithymia are still needed.

SUMMARY

Our population study of 2297 middle-aged men suggests that factors associated with getting diagnosed for coronary heart disease (CHD) might depend, to some degree, on the level of alexithymia.

Probability of having a diagnosis for CHD increased significantly with increasing score of the Toronto Alexithymia Scale (TAS), even after adjustment for age, cardiovascular risk factors, and carotid atherosclerosis. When diagnosis of angina pectoris and myocardial infarction were examined separately, only the former was associated with the TAS score. The TAS-CHD association was not seen at the most severe level of atherosclerotic progression; it can be assumed that in these cases biological factors may determine the clinical course of CHD overriding the presumed effects of alexithymia.

The TAS score did not predict ischemic changes on exercise, which suggests that alexithymia is not independently associated with the pathophysiological processes that result in ischemia on exercise. The findings from carotid ultrasonography indicated that alexithymic men may have received their diagnoses earlier at a less advanced stage of atherosclerosis. Perceived exertion and perceived symptoms during the exercise test were also dependent on alexithymia. This might indicate overall increased symptom awareness and symptom reporting in alexithymia.

It is concluded that the assessment of alexithymic characteristics might in some cases provide additional information for clinical decisions concerning the diagnosis and treatment of coronary heart disease.

This study was financially supported by the Finnish Academy, the Gyllenberg Foundation of Finland and the U.S. National Institutes of Health (HL 44199). The authors acknowledge Drs. Rainer Rauramaa, Juha Venäläinen, Esko Taskinen, and Hannu Litmanen for their participation in the supervision of the maximal exercise tests, and Kimmo Ronkainen, MA, and Melien Wu, PhD, for their assistance in data management and analyses.

REFERENCES

1. Taylor GJ, Bagby RM, Parker JDA: The alexithymia construct. A potential paradigm for psychosomatic medicine. Psychosomatics 32:153–164, 1991
2. Sifneos PE: The prevalence of 'alexithymic' characteristics in psychosomatic patients. Psychother Psychosom 22:255–262, 1973
3. Ruesch J: The infantile personality: The core problem of psychosomatic medicine. Psychosom Med 10:134–144, 1948
4. Marty P, M'Uzan M: La "penseé opératoire". Rev Fr Psychanal 27 (Suppl):1345–1356, 1963
5. Nemiah JC, Sifneos PE: Affect and fantasy in patients with psychosomatic disorders. In Hill OW (ed), Modern Trends in Psychosomatic Medicine, Vol 2. London, Butterworths, 1970, 26–34
6. Parker JDA, Taylor GJ, Bagby RM, Thomas S: Problems with measuring alexithymia. Psychosomatics 32:196–202, 1991
7. Hendryx MS, Haviland MG, Shaw DG: Dimensions of alexithymia and their relationships to anxiety and depression. J Pers Assess 56:227–237, 1991
8. Taylor GJ, Ryan D, Bagby RM: Toward development of a new self-report alexithymia scale. Psychother Psychosom 44:191–199, 1985
9. Bagby RM, Taylor GJ, Atkinson L: Alexithymia: A comparative study of three self-report measures. J Psychosom Res 32:107–116, 1988
10. Acklin MW, Alexander G: Alexithymia and somatization. J Nerv Ment Dis 176:343–350, 1988
11. Haviland MG, Shaw DG, MacMurray JP, Cummings MA: Validation of the Toronto Alexithymia Scale with substance abusers. Psychother Psychosom 50:81–87, 1988
12. Bagby RM, Taylor GJ, Parker JDA, et al: Cross-validation of the factor structure of the Toronto Alexithymia Scale. J Psychosom Res 34:47–51, 1990
13. Gage BC, Egan KJ: The effect of alexithymia on morbidity in hypertensives. Psychother Psychosom 41:136–144, 1984
14. Fernandez A, Sriram TG, Rajkumar S, Chandrasekar AN: Alexithymic characteristics in rheumatoid arthritis: A controlled study. Psychother Psychosom 51:45–50, 1989
15. Todarello O, La Pesa MW, Zaka S, et al: Alexithymia and breast cancer: A survey of 200 women undergoing mammography. Psychother Psychosom 51:51–55, 1989
16. Abramson L, McClelland DC, Bfown D, Kelner S: Alexithymic characteristics and metabolic control in diabetic and healthy adults. J Nerv Ment Dis 179:490–494, 1991
17. Papciak AS, Feuerstein M, Belar CD, Pistone L: Alexithymia and pain in an outpatient behavioral medicine clinic. Int J Psychiatry Med 16:347–357, 1986–87
18. Kauhanen J, Julkunen J, Salonen JT: Alexithymia and perceived symptoms: Criterion validity of the Toronto Alexithymia Scale. Psychother Psychosom 56:247–252, 1991
19. Von Rad M: Alexithymia and symptom formation. Psychother Psychosom 42:80–89, 1984
20. Salonen JT: Is there a continuing need for longitudinal epidemiological research? The Kuopio Ischaemic Heart Disease Risk Factor Study. Ann Clin Res 20:46–50, 1988
21. Kaplan GA, Salonen JT: Socioeconomic conditions in childhood and ischaemic heart disease during middle age. Br Med J 301:1121–1123, 1990
22. Bagby RM, Taylor GJ, Parker JDA: Construct validity of the Toronto Alexithymia Scale. Psychother Psychosom 50:29–34, 1988
23. Kauhanen J, Julkunen J, Salonen JT: Validity and reliability of the Toronto Alexithymia Scale (TAS) in a population study. J Psychosom Res 36:687–694, 1992
24. Rose GA, Blackburn H, Gillum FG, Prineas RJ: Cardiovascular Survey Methods, 2nd Edition. Geneva, WHO, 1982
25. Salonen JT, Salonen R: Ultrasonographically assessed carotid morphology and the risk of coronary heart disease. Arterioscler Thromb 11:1245–1249, 1991
26. Salonen R, Salonen JT: Determinants of carotid intima-media thickness: A population-based ultrasonography study in Eastern Finnish men. J Intern Med 229:225–231, 1991
27. Salonen R: Risk factors for ultrasonographically assessed common carotid atherosclerosis: A cross-sectional and longitudinal population-based study in Eastern Finnish men. PhD thesis, Kuopio University, Kuopio, 1991
28. Salonen JT, Lakka T: Assessment of physical activity in population studies—Validity and consistency of the methods in the Kuopio ischaemic heart disease risk factor study. Scand J Sports Sci 9:89–95, 1987
29. Borg GAV, Holmgren A, Lindblad I: Quantitative evaluation of chest pain. Acta Med Scand Suppl 644:43–45, 1981
30. Borg GAV: Psychophysical bases of perceived exertion. Med Sci Sports 14:377–381, 1982
31. Lakka T, Salonen JT: Intra-person variability of various physical activity assessments in the Kuopio Ischaemic Heart Disease Risk Factor Study (KIHD). Int J Epidemiol 21:467–472, 1992
32. Shekelle RB, Vernon SW, Ostfeld AM: Personality and coronary heart disease. Psychosom Med 53:176–184, 1991
33. Ostfeld AM, Lebovits BZ, Shekelle RB, Paul O: A prospective study of the relationship between personality and coronary heart disease. J Chron Dis 17:265–276, 1964
34. Frasure-Smith N: Levels of somatic awareness in relation to angiographic findings. J Psychosom Res 31:545–554, 1987
35. Freedland KE, Carney RM, Krone RJ, et al: Psychological factors in silent myocardial ischemia. Psychosom Med 53:13–24, 1991
36. Costa PT Jr: Influence of the normal personality dimension of neuroticism on chest pain symptoms and coronary artery disease. Am J Cardiol 60:20J–26J, 1987
37. Smith TW, O'Keeffe JL, Allred KD: Neuroticism, symptom reports, and type A behavior: interpretive cautions for the Framingham Scale. J Behav Med 12:1–11, 1989
38. McCrae RR, John OP: An introduction to the five-factor model and its applications. J Personality 60:217–219, 1992
39. Denollet J: Negative affectivity and repressive coping: pervasive influence on self-reported mood, health, and coronary-prone behavior. Psychosom Med 53:538–556, 1991
40. Costa PT Jr, Zonderman AB, Engel BT, et al: The relation of chest pain symptoms to angiographic findings of coronary artery stenosis and neuroticism. Psychosom Med 47:285–293, 1985
41. Almada SJ, Zonderman AB, Shekelle RB, et al: Neuroticism and cynicism and risk of death in middle-aged men: The Western Electric Study. Psychosom Med 253:165–175, 1991
42. Bagby RM, Taylor GJ, Ryan D: Toronto Alexithymia Scale: Relationship with personality and psychopathology measures. Psychother Psychosom 45:207–215, 1986
43. Haviland MG, Shaw DG, Cummings MA, MacMurray JP: Alexithymia: subscales and relationship to depression. Psychother Psychosom 50:164–170, 1988