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Socio-demographic factors, behaviour and personality: associations with psychological distress

Suzanne Helen McKenzie[1,2], Upali W Jayasinghe[1], Mahnaz Fanaian[1], Megan Passey[3], David Lyle[4], Gawaine Powell Davies[1] and Mark Ford Harris[1]

Abstract

Background: Anxiety, psychological distress and personality may not be independent risk factors for cardiovascular disease; however they may contribute via their relationship with unhealthy lifestyle behaviours. This study aimed to examine the association between psychological distress, risk behaviours and patient demographic characteristics in a sample of general practice patients aged 40–65 years with at least one risk factor for cardiovascular disease.

Design: Cross-sectional analytic study.

Methods: Patients, randomly selected from general practice records, completed a questionnaire about their behavioural risk factors and psychological health as part of a cluster randomized controlled trial of a general practice based intervention to prevent chronic vascular disease. The Kessler Psychological Distress Score (K10) was the main outcome measure for the multilevel, multivariate analysis.

Results: Single-level bi-variate analysis demonstrated a significant association between higher K10 and middle age ($p = 0.001$), high neuroticism ($p = 0$), current smoking ($p = 0$), physical inactivity ($p = 0.003$) and low fruit and vegetable consumption ($p = 0.008$). Socioeconomic (SES) indicators of deprivation (employment and accommodation status) were also significantly associated with higher K10 ($p = 0$). No individual behavioural risk factor was associated with K10 on multilevel multivariate analysis; however indicators of low SES remained significant ($p < 0.001$).

Conclusions: When all factors were considered, psychological distress was not associated with behavioural risk factors for cardiovascular disease. Other underlying factors, such as personality type and socioeconomic status, may be associated with both the behaviours and the distress.

Keywords

Lifestyle, behaviour, distress, neuroticism

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Introduction

While there is good evidence that some psychosocial factors such as depression and social isolation are independent risk factors for cardiovascular disease (CVD), the role of anxiety, psychological distress and personality is less clear.[1–3] They may contribute via their relationship with unhealthy lifestyle behaviours as graded associations between anxiety or depression symptoms and unhealthy behaviours have been demonstrated in patients at risk of vascular disease[4,5] and in the general population.[6] If they do contribute via their impact on behavioural choices, there should be strong

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associations between behavior and distress. However, this relationship might be moderated by a range of other factors.

Neurotic personality trait is strongly associated with psychological distress[7] and is an important moderator of the behavioural response to stressors as individuals with high neuroticism demonstrate emotional instability and low self esteem; experience greater distress in response to stress and make poorer choices when dealing with stress.[8] Gender is also strongly associated with psychological distress.[9] External stressors that may impact on psychological distress include markers of socioeconomic status (SES) such as employment, education level, accommodation, language difficulties and location.[10]

The prevalence of moderate to high levels of psychological distress in Australia is 14.2% for men and 20.4% for women.[11] In 2006–2007, 9.35% of general practice encounters in NSW were with patients experiencing psychological problems.[12] General practitioners (GPs) frequently assess psychological disorders in the context of life stressors.[13]

In 2001, 53% of the Australian adult population had two or three and 16% had four or more of the following cardiovascular risk factors: tobacco smoking, physical inactivity, high blood pressure, high blood cholesterol, obesity, low fruit or vegetable consumption, risky alcohol consumption or diabetes; with prevalence increasing with age.[14] General Practitioners frequently identify and provide brief interventions to address these risk factors.[15,16]

The study hypothesis that high psychological distress has significant positive associations with higher neuroticism, risk behaviours, female gender and markers of low SES, was explored in a sample of general practice patients aged 40–65 years with at least one risk factor for cardiovascular disease.

Methods

Participants

This study describes a cohort of primary care patients participating in a cluster randomized controlled trial of a complex general practice-based intervention to prevent chronic vascular disease (Health Improvement and Prevention Study).[17] It was conducted in five Divisions of General Practice (local primary care support organizations) in NSW, Australia that had expressed interest following direct approach by the study team. All practices within these divisions were asked to express interest in the trial, and the first eight in each geographical area – whose principal GP agreed to participate, used electronic medical records and were not involved in similar research – were accepted for the study. In each practice, clinical management software was used to select a random sample of up to 160 patients who did not have pre-existing CVD or diabetes and were aged either 40–55 years with diagnosed hypertension or hyperlipidaemia; or aged 56–64 years. Practices were able to remove patients from the list who were deceased or otherwise unsuitable for the study.[17] Eligible patients were sent a letter from the practice, information about the study, the consent form and a questionnaire to return to the study centre in a reply paid envelope.

Ethics

Ethics approval for the study was obtained from the University of New South Wales (UNSW) Human Research and Ethics Committee. General Practitioners, practice nurses and patients provided written informed consent.

Instruments

The questionnaire completed by the study participants included the Preventive Health Check Survey (PHCS),[18] the Kessler Psychological Distress Scale (K10)[9] and the Neuroticism Scale from the Eysenck Personality Questionnaire Revised, Short form (EPQ-N-RS).[19]

The K-10 (Figure 1) is a ten-item questionnaire measuring negative emotional states in the preceding four weeks. Responses are rated on a five-point scale and summed to produce a score from 10 to 50. High scores (30–50) are strongly associated with a diagnosis of a psychiatric disorder. The instrument has been validated for use in Australia, USA and other countries for population studies and clinical monitoring.[9,20,21]

The EPQ-N-RS (Figure 1) represents an individual's tendency to experience psychological distress or neuroticism. It is a 12-item scale using a dichotomous response format. The 'yes' responses are summed to produce a score from 0 to 12. Scores are high in those with psychiatric disorders, emotional instability and low self esteem.[22] It has been validated for use in Australia[23] and has been used in large population health surveys.[11]

The PHCS is a multi-item self-report questionnaire measuring patients' behavioural risk factors, height, weight and socio-demographic characteristics. The questions are based on those in the NSW Health Survey and have been validated for use in primary care.[18]

Information on the characteristics of the practice (number of GPs, estimated size of practice and location) was collected by a survey completed by the practice manager or principal GP.[17]

Kessler Psychological Distress Scale (K10)	Eysenck Personality Questionnaire, Neuroticism Scale (Revised Short Form EPQ-N-RS)
In the past 4 weeks how often did you feel (five point scale from 1, none of the time, to 5, all of the time):	Yes/ No response to:
• Nervous	• Does your mood often go up and down?
• Hopeless	• Are you a worrier?
• So restless you could not sit still	• Do you often feel lonely?
• Everything was an effort	• Are you an irritable person?
• Depressed	• Do you suffer from 'nerves'?
• Worthless	• Do you often feel 'fed up'?

Figure 1. Examples of Items from K10 and EPQ-N-RS Scales.

Data and variables

The K-10 score is a continuous outcome variable. A score of 10–15 indicates low psychological distress.[9]

Dichotomous patient behavioural risk variables were computed using the original question responses. Higher neuroticism was defined as a score greater than the sample median from the EPQ-N-RS scale. Smokers indicated that they were currently smoking tobacco. Physical activity (PA) scores used frequency of PA per week to compute a score from 0 to 8. A score of less than 4 indicated inadequate PA levels.[24] Number of daily portions of fruit and vegetables consumed was summed to give a score. A score of less than 7 indicated inadequate diet. At-risk alcohol intake was defined as more than two standard drinks consumed on a typical day when drinking. Body Mass Index (BMI) was calculated as self reported body weight in kilograms divided by the square of the reported height in metres. A BMI of $\geq$25 indicated Overweight or Obese.[25]

The socio-demographic characteristics of respondents studied were gender, age, home ownership, education, employment, country of birth and language spoken at home (Table 1). Home ownership and employment status can be considered as markers of SES.[26] Demographic variables were dichotomous with the exception of employment status. 'Unemployed' was used as the reference category as this was considered a marker of lower SES compared with employment or retirement from the workforce.

The number of general practitioners was used as an indicator of practice size. Geographical area was defined by using the Rural, Remote and Metropolitan Area (RRMA) classification for rural centres (populations $<$100,000) and urban (populations $\geq$ 100,000).

Statistical analyses

We calculated Cronbach's alphas for the scales measuring our psychological variables to determine their internal reliability.

A priori sample size calculations on the K-10 score confirmed that after adjustment for clustering (previous studies on mental health in general practice indicated an average cluster effect (ICC = Intra-cluster correlation) of 0.025)[27] an average of 20 patients from each of 30 practices would have sufficient power (1-β = 0.8

Table 1. Unadjusted mean and standard deviation of K10 score by characteristic of patients ($N = 884$) and practices ($N = 30$)

		K10 Score	
Variables	Responses *N* (%)	Mean (SD)	*p*-value
Patient characteristics			
Age (years)			
40–55	369 (40)	16.8 (6.8)	0.001
56–64	509 (60)	15.4 (6.0)	
Gender			
Male	387 (43.8)	15.6 (5.9)	0.53
Female	497 (56.2)	16.4 (6.7)	
Personality			
Lower neuroticism (EPQRS –$N = 0$–3)	387 (50.2)	12.3 (2.6)	0.000
Higher neuroticism (EPQRS –N = 4–12)	384 (49.8)	19.6 (7.1)	
Smoking			
Current smoker	124 (14.3)	18.5 (8.3)	0.000
Ex-smoker/never	743 (85.7)	15.7 (5.9)	
Weight			
Overweight/obese (BMI $\geq$ 25)	558 (67.0)	16.3 (6.5)	0.075
BMI<25	275 (33.0)	15.4 (5.8)	
Physical activity			
Adequate (score 4–8)	357 (42.1)	15.3 (5.6)	0.003
Inadequate (score<4)	490 (57.9)	16.6 (6.9)	
Fruit and vegetable intake			
Adequate ($\geq$7 per day)	161 (18.6)	14.8 (5.9)	0.008
Inadequate (0-7 per day)	705 (81.4)	16.3 (6.4)	
Alcohol intake			
Risky (>2 daily)	281 (41.3)	16.0 (6.2)	0.776
Safe ($\leq$2 daily)	400 (58.7)	15.8 (6.3)	
Country of birth			
Australia	614 (75.8)	15.9 (6.4)	0.361
Other	196 (24.2)	16.3 (6.4)	
Language spoken at home			
English	698 (91.2)	15.8 (6.4)	0.010
Other	67 (8.8)	18.0 (6.7)	
Accommodation			
Rented	183 (21.1)	18.2 (8.2)	0.000
Home owner	686 (78.9)	15.5 (5.7)	
Employment			
Unemployed	180 (20.7)	19.4 (8.9)	0.000
Employed	579 (66.6)	15.3 (5.3)	
Retired	111 (12.7)	14.3 (4.6)	
Education level			
School/other	498 (57.5)	16.4 (6.9)	0.107
Degree/diploma	368 (42.5)	15.7 (5.7)	
Practice characteristics			
Location			
Rural	533 (60.3)	15.7 (6.2)	0.032
Urban	351 (39.7)	16.6 (6.9)	
Size			
>3 GPs	363 (41.1)	15.6 (5.8)	0.109
1–3 GPs	521 (58.9)	16.3 (6.7)	

Unknowns were: personality = 124; age = 7; language spoken at home = 130; country of birth = 80; accommodation = 19; employment = 18; education level = 23; psychological distress = 50; smoking status = 18; weight = 53; physical activity = 41; fruit and vegetable intake = 20; alcohol = 219.

and $\alpha = 0.05$) to detect an effect size of 0.20 between higher and lower neuroticism) assuming that about half the patients had lower neuroticism.

We examined the association between the independent variables and the K-10 score in bivariate, single-level analyses (Table 1) using analysis of variance in SPSS statistical software (version 15; SPSS, Chicago, IL, USA).

Multilevel Models

To account for the potential moderating effect of each of the independent variables on the associations between behaviour and distress, a multilevel, multivariate regression model was used with K10 score as the continuous dependent variable and general practice and patient characteristics including behavioural risk factors as the independent variables (Table 2). Where data sets clearly identify 'patients' and 'practices' in a nested hierarchical structure, multi level analysis has substantive advantages over single-level regression modeling in being a technically correct method to model the patient and practice level associations with K10 score. Multilevel analysis (with MLwiN software[28]) adjusted for clustering of patients (level 1) within practices (level 2).

Initially, we fitted a baseline variance component model (no independent variables) for K-10 followed by the main model. The main multilevel model expands the baseline model by including patient and practice characteristics that were significant in bivariate analyses as fixed effects.

Significance of parameters

The significance of the fixed parameter estimates (Table 2) was tested by the t-value, determined by dividing the estimated coefficients by their standard errors.[26] The significance of the random parameter variance estimates (Table 3) was assessed using the Wald joint χ^2 test statistic.[28] Because the two models were nested, we used –2 log likelihood, known as the 'change in the deviance', which has a χ^2 distribution to test whether the difference between the two models was statistically significant (Table 3). For an independent variable to be significant both the parameter estimate and 'change in the deviance' should be significant.

Variance explained at each level

The level 1 or level 2 variance explained for the main model was estimated as the difference in variance for each level between the baseline model and main model divided by the variance of that level for the baseline model.

Table 2. Estimates of regression coefficients of multilevel regression analysis for patient and practice characteristics (number of patients = 630; number of practices = 30)

Parameters (reference group)	Estimate for the main model
Estimate for the main model	**K10 Score Regression coefficients (standard error)**
Patient main effect	
Intercept	15.830
Age (years)	
56–64 (40–55)	−1.065 (0.450)[a]
Higher neuroticism (lower neuroticism)	6.959 (0.419)[b]
Current smoker (ex-smoker/never)	1.136 (0.597)
Inadequate PA (adequate PA)	0.556 (0.426)
Inadequate fruit and vegetable intake (adequate)	0.757 (0.544)
English spoken at home (other)	−0.543 (0.894)
Owner-occupier (rented)	−1.061 (0.558)
Employed patients (unemployed)	
Retired (unemployed)	−3.149 (0.543)[b]
	−3.086 (0.762)[b]
Practice main effect	
Urban (rural)	0.236 (0.461)

[a]$p < 0.01$; [b]$p < 0.001$.

Results

While completed consent forms and questionnaires were received from 934 patients (19% response rate), adequate data was available for 884 questionnaires from 30 practices and was used for the initial analysis. The multilevel regression included only data from the questionnaires for which information on all the independent variables was available, resulting in a final sample size of 630 patients from 30 practices. Pearson χ^2 tests indicated that proportions of the independent variables were similar between the records used in multilevel analyses and missing data except for patients who spoke a language other than English at home.

The mean K10 score (Cronbach alpha = 0.896) for the sample was 16 (SD 6.3). The mean EPQ-N-RS (Cronbach alpha = 0.844) for men was 3.89 (SD 3.35) and for women 4.19 (SD 3.50).

Table 1 shows the characteristics of the respondents and practices (independent variables): 41.1% were from larger practices and 60.3% were from rural areas. The majority (60%) of the participants were in the older age group and 56.2% were female. Three-quarters were

Table 3. Estimated variances (and standard errors), percent explained variance and intracluster correlations for K10 Score

	Estimated variance		
Random parameters	Baseline model	Full model	% Explained variance
K10 Score			
Level 2, Practice variance	0.053 (0.507)	0.000 (0.000)	100.0
Level 1, Patient variance	43.495 (2.500)[a]	26.788 (1.509)[a]	38.4
Intracluster correlation	0.001	0.000	
Deviance	4164.38	3848.28	
−2 loglikelihood		316.1[a]	

[a]$p < 0.001$.

born in Australia and 91.2% spoke English at home. The majority were home owners (78.9%) and either employed (66.6%) or retired from the workforce (12.7%). Less than half (42.5%) had completed a qualification higher than school level.

The bivariate analysis (Table 1) demonstrated an association between higher K10 score and middle age (40–55 vs older), high neuroticism, current smoking, inadequate physical activity, low fruit and vegetable consumption, speaking a language other than English at home, living in rental accommodation and being unemployed. It was also associated with urban practice but not with practice size.

The multilevel regression analysis (Table 2) shows that psychological distress was higher in the middle-aged group (40–55 years) compared with older patients (56–64 years). It was also higher among those who were unemployed and those with higher EPQ-N-RS score. K10 was not associated with any individual behavioural risk factor nor practice size or location after adjustment for confounding factors.

Variance components

At the patient level (level 1) 38% of the variance among patients for K-10 was explained by the independent variables used in the analysis (Table 3). There was very little variance in K10 at the practice level (level 2) and 100% of the variance among practices was explained by the variables used in the analysis.

Discussion

As expected we found a strong positive association between neuroticism and psychological distress. Neuroticism has been related to emotionality with high neuroticism individuals experiencing greater distress in response to major life stress compared to low neuroticism individuals.[7] Personality traits such as neuroticism are strong predictors of psychological distress and have been found to be more powerful than environmental factors.[29] Our model shows that personality, age and being unemployed explained 38% of the variance of distress.

Age was associated with psychological distress as patients who were middle aged (40–55) were more distressed than those who were older. A previous Australian study showed that K10 scores indicating high distress among those aged between 16 and 49 years were more prevalent than among those aged 50–64 years.[30] Gender may be a risk factor for anxiety and depression[10] with females tending to have higher K10 scores compared to males[9] in some studies but not others.[31] While gender was not a significant predictor of distress in our study, females did have a higher K10 score, although this did not reach statistical significance.

Being unemployed was significantly associated with psychological distress in this study. This is consistent with other studies that have demonstrated that being unemployed is a significant contributor to poor mental health.[10] There are also associations between unemployment and smoking and other behavioural risk factors in the Australian population.[32] However, these associations may not to be mediated by a causal link between psychological distress and the risk behaviours.

While there appeared to be strong associations between behavioural risk factors and psychological distress these were non-significant in the multilevel, multivariate model after adjustment for SES or neuroticism. This is in contrast to other studies that have demonstrated an association between anxiety and depression and unhealthy behaviours in subjects at risk of cardiovascular disease[4,5] but have not included markers of socioeconomic status or personality trait in the analysis, which we found were important predictors of distress.

Bonnet et al.[4] also demonstrated a gradient effect for both anxiety and depression in relation to poor diet, smoking, physical activity, with those participants

with higher anxiety or depression scores being more likely to have unhealthy behaviours. Psychological distress is an indicator of possible anxiety or depression but does not enable a definite diagnosis. It is possible that there is a threshold level of distress that impacts on behaviour choice and our subjects had not reached this level.

This study has a number of limitations. The cross-sectional design does not make it possible to establish a temporal relationship between psychological distress and other factors. Longitudinal data from the trial examining changes in both behavioural risk factors and K10 over time will allow an assessment of the impact of behaviour change on psychological distress as well as examination of the impact of psychological distress on behaviour over time. The selection of participating divisions and general practitioners, while including both urban and rural locations, may not have resulted in a representative sample, as only those practices that were interested responded to the invitation. However the patients were chosen randomly from practice records and their psychological distress levels, personality and behavioural risk factors were typical of the general population[14,11,19] despite the response rate being lower than we had hoped;[17] 100% of the practice level variance was explained by the variables in the final model. Analysis was based on self-reported variables that may reduce the reliability of findings. Audit data from medical records would have been more reliable but were not available for this study.

This study supports the evidence that psychological distress may be an independent risk factor for cardiovascular disease as it does not seem to be associated with behavioural risk factors. However, it may be a causal link between environmental stressors such as unemployment and cardiovascular disease as well as between personality and cardiovascular disease as it is strongly associated with both. More research, especially monitoring change over time, may help clarify these findings.

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Conflict of interest

The authors have no conflicts of interest.

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