

Age group differences in psychological distress: the role of psychosocial risk factors that vary with age

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ABSTRACT

Background. There is continuing controversy about how age affects depression and anxiety, with a lack of consistent results across studies. Two reasons for this inconsistency are age bias in measures and different patterns of exposure to risk factors across age groups in various studies.

Method. Data on anxiety and depression symptoms were collected in a community survey of 7485 persons aged 20–24, 40–44 or 60–64 years. These measures were investigated for factorial invariance across age groups. Data were also collected on a wide range of potential risk factors, including social, physical health and personal factors, with the aim of determining whether these factors might partly or wholly account for age group differences.

Results. The invariance of correlated latent factors representing anxiety and depression was examined across age groups, and a generalized measure of psychological distress was computed. Depression, anxiety and psychological distress showed a decline across age groups for females and a decline from 40–44 to 60–64 years for males. Some of these age differences were accounted for by other risk factors, with the most important being recent crises at work and negative social relationships with family and friends.

Conclusion. Psychological distress generally declined across the age range 20–64 years and this was not attributable to measurement bias. Differential exposure to risk factors explained some, but not all, of the age group difference. Therefore other mechanisms that explain the lower level of distress in older age groups remain to be identified.

INTRODUCTION

There is continuing controversy about age differences in depression during adulthood, whether measured as depressive disorders or depressive symptoms. Various authorities have argued that old age is protective for depression (Henderson, 1994; Ernst & Angst, 1995), that old age increases risk (Levitt *et al.* 1983), and that there are two peaks in prevalence, one in middle age or earlier and one in late old age (Snowdon, 2001). Although most of the literature has focused on depression, similar

confusion occurs for age differences in anxiety (which is highly co-morbid with depression) and for general psychological distress. A review of the epidemiological studies published up to 1999 showed a wide variety of age trends across adulthood (Jorm, 2000). It was concluded that: ‘The most common trend is for an increase across age groups, followed by a drop. However, there are other studies showing U-shaped trends, linear increases or decreases, or no differences across age groups’ (Jorm, 2000: 15). More recently published studies of depression or psychological distress add to this confusion, with reports of a rise in prevalence between 20 and 89 years (Stordahl *et al.* 2003), stability from 54–70 years followed by a rise (Rothermund & Brandtstädter, 2003), a rise in

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incidence from 70 to 85 years (Palsson *et al.* 2001), a peak in middle age followed by a fall thereafter (Melzer *et al.* 2004), and an improvement over the young adult years (Sacker & Wiggins, 2002).

Jorm's (2000) review identified two major factors that might account for these inconsistent findings. The first was age bias in the measurement of depression and anxiety. If depression and anxiety differ in how they manifest with ageing, or if non-psychiatric factors have greater effects on symptoms at some ages, then it is possible to get artefactual age group differences. For example, in a psychometric analysis of item bias in one of the most commonly used measures, the Center for Epidemiologic Studies Depression Scale, Grayson *et al.* (2000) showed that a range of physical disorders have effects on items independent of depression. Thus, if this scale is used to compare age groups with a varying prevalence of physical disorders, artefactual age differences can easily result. Other potential causes of age bias would be differences in the interpretation of questions to assess depression and anxiety, or differences in the willingness to report particular symptoms. Most research in the area assumes that methods of assessing depression and anxiety can be applied with equal validity across a wide age span without checking that this is the case.

The second factor that Jorm (2000) identified to account for the inconsistent findings was differential exposure to risk factors across age groups. The distribution of risk and protective factors across age groups might differ from study to study, giving rise to different age trends. For example, in some communities risk factors like poverty or poor social support might be more common in older adults, whereas in other communities they might be more common in younger adults. Jorm (2000) found that when these risk factors were statistically controlled, a much more consistent pattern of age differences was found, with most (but not all) studies showing a decrease across age groups. This residual age difference might reflect some intrinsic ageing effect not measured in most epidemiological studies, such as a change in emotional responsiveness or in coping strategies.

In the present study we aim to further investigate age group differences, examining the role

of measurement bias and differential exposure to risk factors. The study was carried out in Canberra, Australia, a community that we have previously investigated and found to have a declining prevalence of depressive and anxiety symptoms across age groups (Henderson *et al.* 1998). Our aim was to investigate whether depression and anxiety symptoms showed consistent age group differences in the current sample and whether these symptoms could be validly combined across age groups to give a generalized measure of psychological distress. We used a measure of depression and anxiety symptoms that has previously been shown to be relatively free of age bias (Christensen *et al.* 1999).

We investigated a wide range of potential risk factors, including social, physical health and personal factors, with the aim of determining whether these factors might partly or wholly account for age group differences. The potential risk factors we investigated covered a broader range than most previous studies and included education, marital status, physical ill health, adverse life events, employment, social support, childhood adversity and mastery beliefs. We also included ruminative style, a type of emotion-focused coping strategy which involves 'chronic, passive focus on one's negative emotions and the meaning of these emotions' (Nolen-Hoeksema *et al.* 1994: 92). Because of the possibility that rumination is, at least in part, a consequence of depression, we carried out the analysis both including and excluding ruminative style.

METHOD

Study sample and design

The PATH Through Life Project is a large community-based survey of people aged 20–24, 40–44 and 60–64 years, living in Canberra and the neighbouring town of Queanbeyan. Each cohort is to be followed up every 4 years over a period of 20 years. Results presented here concern the first wave of interviews conducted for each age cohort. Sampling details have been described in detail previously (Jorm *et al.* 2004).

The PATH interview incorporated various measures including sociodemographic characteristics, anxiety and depression, substance use, cognitive function, physical health, health

habits, use of health services, personality, coping, life events, psychosocial risk factors and nutrition. Only those measures pertinent to the present study are described below. The study was approved by the Australian National University Human Research Ethics Committee.

Measures of psychological distress

Goldberg's depression and anxiety scales (Goldberg *et al.* 1988) were used to assess levels of depressive and anxiety symptoms experienced in the past month. These scales each consist of nine items with higher scores indicating higher levels of depression and anxiety.

Measures of risk factors

Sociodemographic factors

Participants were asked a series of questions related to demographic characteristics that were used to create measures of married or *de facto* status (0 = No, 1 = Yes), divorced or separated status (0 = No, 1 = Yes), unemployment (0 = No, 1 = Yes), not being in the labour force (0 = No, 1 = Yes) and years of education. Participants who reported having one or more children under the age of 18 who lived at home on a full-time basis were classified as having dependent children (0 = No, 1 = Yes).

Negative life events

Participants were asked about their experience of negative life events within the past 6 months. Six items taken from Brugha & Cragg's (1990) 12-item List of Threatening Experiences were used. These included items related to participants' experiences of a personal serious illness, injury or assault, or a close relative's experience of a serious illness, injury or assault, death of a parent, child or partner, the death of another close family friend or relative, the end of a steady relationship, and the experience of a serious problem with a close friend, neighbour or relative. Two further items were taken from the British National Survey of Health and Development (Rodgers, 1996) and referred to a recent work- or career-related crisis or serious disappointment, and a perceived threat of soon losing one's job. Responses to these items were coded 1 = Yes (had experienced the event), 0 = No.

Social support

Positive social support (e.g. feeling cared for) and negative social interactions (e.g. being criticized, having tension or arguments) with family and friends were assessed using two corresponding sets of five items developed by Schuster *et al.* (1990). Higher scores represented either greater positive support or a greater degree of negative interactions.

Personal coping styles

Ruminative style was assessed using a 10-item short scale as advised by the authors (Nolen-Hoeksema, personal communication) drawn from Nolen-Hoeksema and colleagues' (1994) 21-item Ruminative Responses Scale. Higher scores indicate a greater tendency to ruminate about negative events and feelings. Mastery, reflecting the sense of control over one's personal destiny, was assessed using Pearlman and colleagues' (1981) 7-item mastery scale. Higher scores represent a greater sense of mastery.

Childhood adversity

Participants were asked a series of questions related to the experience of adverse events in childhood, for example emotional trouble or substance use among parents, physical or sexual abuse, neglect and financial hardship (Rosenman & Rodgers, 2004). A total score for childhood adversity was computed by adding responses to 17 items that each reflected an adverse childhood experience.

Physical health

Self-rated health was measured using the first item of the SF-12 (Ware *et al.* 1996) which asks participants to rate their general health on a 5-point scale ranging from poor to excellent. Because previous studies have shown increased mortality in people rating their health as poor or fair (Idler & Benyamini, 1997), scores were dichotomized, grouping those reporting poor or fair health (1) and those reporting good, very good or excellent health (0).

Statistical analyses

Structural equation modelling procedures in AMOS 4.01 were used to produce a measurement model of psychological distress comprised of the Goldberg anxiety and depression items. In order

to compare validly anxiety and depression across age groups, it was necessary to establish the extent to which factor loadings of items contributing to a measure of psychological distress were consistent across age groups, a condition referred to as 'weak' factorial invariance (Hofer *et al.* 1997). Weak invariance was assessed by conducting simultaneous factor analysis for 20- to 24-, 40- to 44- and 60- to 64-year-olds, with the model structure held constant across age groups, and other parameters left unconstrained. Assessment of model fit was based on the Goodness of Fit Index (GFI), Non-Normed Fit Index (NNFI) and Root Mean Square Error of Approximation (RMSEA). Values greater than 0.9 for the GFI and NNFI indicate a well-fitting model. RMSEA values less 0.05 indicate good model fit, while RMSEA values less than 0.08 indicate reasonable fit (Christensen *et al.* 1999).

Multiple linear regression and analysis of co-variance were used to adjust for risk factors and details of the specific procedures are outlined where applicable in each phase of the analyses described below. In carrying out these adjustments, the variables we adjust for could be either mediators or confounders (Kraemer *et al.* 2001). With cross-sectional data, the causal status of the risk factors cannot be determined and the adjustment methods are identical whether they are mediators or confounders. SPSS 12.0.1, STATA 8.0 and AMOS 4.01 were used for data analysis.

Cases with missing values on more than half of the variables used in the current study were deleted listwise ($n=37$). After deletion of these cases, missing values on all variables ranged from 0.0 to 0.5%. The remaining missing data were then imputed using the SPSS EM algorithm, including all variables except age.

RESULTS

Factor analysis of psychological distress items

A structural model was constructed in AMOS, consisting of two separate, correlated latent variables representing depression and anxiety, with each predicting the corresponding nine depression and nine anxiety items from Goldberg and co-workers' (1988) scales. Each item represents a depression or anxiety symptom, requiring a dichotomous Yes/No response.

Consequently assumptions for Maximum Likelihood (ML) estimation (e.g. multivariate normality) were not met. Therefore to reduce bias in the estimation of model fit asymptotically distribution-free (ADF) estimation (Browne, 1984) was used. ADF estimation provides an alternative to ML estimation that is appropriate for use with categorical data and is free of distributional assumptions (Byrne, 2001).

Model fit was initially assessed separately for the three age groups. The results indicated reasonable fit according to the GFI and RMSEA indices for 20- to 24-year-olds [χ^2 (134)=1019.524, $p<0.001$, GFI=0.999, NNFI=0.793, RMSEA=0.053], 40- to 44-year-olds [χ^2 (134)=1208.326, $p<0.001$, GFI=1.00, NNFI=0.756, RMSEA=0.056], and 60- to 64-year-olds [χ^2 (134)=907.552, $p<0.001$, GFI=0.998, NNFI=0.583, RMSEA=0.048]. However, values for the NNFI were unacceptably low, particularly for the oldest age group.

Modification indices associated with the analyses revealed that substantial improvement to model fit for each age group could be achieved by allowing the residual terms for two items in the anxiety scale, Goldberg 5 (sleeping poorly) and Goldberg 9 (difficulty falling asleep), to correlate. Given the similarity of the items, and that the correlation of residuals recognizes that some items may be more closely related than can be accounted for by the identified underlying factor (Christensen *et al.* 1999), the residuals for the items were allowed to correlate in the model.

Inspection of the squared multiple correlations for the items produced by the factor analysis also revealed uniformly low loadings across the age groups for Goldberg 15 (lost weight) and Goldberg 16 (waking early). Consequently these items were each removed from the depression factor in the model. These modifications resulted in substantial improvements to model fit for each of the 20- to 24-year-old [χ^2 (102)=682.956, $p<0.001$, GFI=1.00, NNFI=0.855, RMSEA=0.049], 40- to 44-year-old [χ^2 (102)=810.542, $p<0.001$, GFI=1.00, NNFI=0.822, RMSEA=0.053], and 60- to 64-year-old [χ^2 (102)=533.844, $p<0.001$, GFI=0.931, NNFI=0.727, RMSEA=0.041] groups. While values for NNFI fell short of the standard criterion of 0.9, GFI and RMSEA

indices were each consistent in indicating good fit across the age groups. Consequently the modified model was accepted, and the invariance of the factor structure was assessed across the age groups.

Factor analysis conducted simultaneously for the three age groups (Arbuckle & Wothke, 1999) was undertaken in order to assess the configural and weak factorial invariance of the two-factor model. An initial model was run simultaneously for the three age groups without constraints placed on the model parameters. The GFI and RMSEA statistics indicated good fit, and the NNFI approached acceptability, supporting the configural invariance of the model [$\chi^2(306) = 2027.344$, $p < 0.001$, GFI = 1.00, NNFI = 0.820, RMSEA = 0.027]. Constraining the factor loadings to be equal across the three age groups provided a test of weak factorial invariance. With these restrictions imposed, the GFI and RMSEA reflected acceptable fit [$\chi^2(338) = 2658.837$, $p < 0.001$, GFI = 1.00, NNFI = 0.78, RMSEA = 0.030]. Consequently, weak factorial invariance for the two-factor model across age was accepted.

The results of the modelling procedure also revealed strong associations between the depression and anxiety factors in the modified model, producing correlation coefficients of 0.86 for 20- to 24-year-olds, 0.85 for 40- to 44-year-olds and 0.81 for 60- to 64-year-olds. Similarly, tests of a model that included a single factor for psychological distress, retaining the items included in the final two-factor model approached acceptable fit, with GFI values ranging from 0.938 to 1.00, NNFI values ranging from 0.664 to 0.815 and RMSEA values ranging from 0.045 to 0.058 across the age groups.

Standardized factor loadings within age groups ranged from 0.46 to 0.74 for 20- to 24-year-olds, 0.39 to 0.78 for 40- to 44-year-olds, and 0.37 to 0.74 for 60- to 64-year-olds. All but one of the items from the Goldberg depression and anxiety scales retained in the final two-factor model were summed to form a single measure of psychological distress. The item excluded was Goldberg 9 (difficulty falling asleep), due to its conceptual similarity to Goldberg 5 (sleeping poorly), as indicated by the improvement to model fit that resulted from the correlation of the two items' residual terms.

Table 1. Mean scores on Goldberg anxiety, Goldberg depression, and composite psychological distress scale by age group and gender

Measure	Males		Females		All	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Goldberg Anxiety Scale						
Age group (years)						
20-24	3.20	2.60	4.44	2.67	3.84	2.71
40-44	3.29	2.67	3.72	2.73	3.52	2.71
60-64	2.00	2.25	2.50	2.38	2.24	2.33
All	2.80	2.58	3.56	2.72		
Goldberg Depression Scale						
Age group (years)						
20-24	2.58	2.28	3.18	2.44	2.89	2.38
40-44	2.28	2.31	2.55	2.43	2.42	2.38
60-64	1.58	1.83	1.78	1.93	1.67	1.88
All	2.12	2.18	2.50	2.35		
Psychological distress						
Age group (years)						
20-24	4.97	4.03	6.67	4.29	5.85	4.25
40-44	4.80	4.20	5.51	4.32	5.17	4.28
60-64	2.92	3.39	3.52	3.54	3.21	3.48
All	4.17	3.98	5.24	4.27		

Age differences in psychological distress

Table 1 shows the mean scores by age and gender for Goldberg's depression and anxiety scales, and for the composite measure described above. It can be seen that distress declined with age for each measure.

A three (age group) by two (gender) analysis of variance was conducted in order to determine whether psychological distress significantly differed across the three age cohorts. The analysis revealed a significant main effect for age [$F(2, 7442) = 287.503$, $p < 0.001$, partial $\eta^2 = 0.072$], with this effect accounting for 7.2% of the variance in psychological distress. As shown in Table 1, distress levels showed a consistent decrease with increasing age. *Post-hoc* Tukey's HSD tests confirmed that the three age group means were each significantly different from one another.

The analysis of variance also revealed a significant main effect for gender [$F(1, 7442) = 118.818$, $p < 0.001$, partial $\eta^2 = 0.016$]. As shown in Table 1, females reported significantly higher levels of distress relative to males. A significant age by gender interaction effect was also observed [$F(2, 7442) = 14.106$, $p < 0.001$, partial $\eta^2 = 0.004$], with females showing a consistent decrease across age groups, while males showed a plateau from 20-24 to 40-44 years and then a decrease.

Table 2. Descriptive statistics: risk factors for age differences in psychological distress

Variable	Male			Female		
	20-24 years (n=1157)	40-44 years (n=1186)	60-64 years (n=1316)	20-24 years (n=1230)	40-44 years (n=1332)	60-64 years (n=1227)
Married or <i>de facto</i> (%)	18.6*	81.7*	86.7*	28.0*	77.5*	68.7*
Divorced or separated (%)	0.3*	8.9*	9.3*	1.6*	14.8*	15.2*
Recent personal illness/injury (%)	10.9*	7.8	8.7	7.4	6.5	8.1
Recent family illness/injury (%)	19.2	21.5*	14.6*	23.6*	22.3	17.1*
Recent close family death (%)	1.0*	2.6	3.0*	1.1*	3.2	3.5*
Recent other close death (%)	20.6*	15.0*	18.8	20.2	19.3	20.3
Recent end of relationship (%)	16.6*	3.4*	1.1*	20.0*	3.5*	0.9*
Recent problem with someone (%)	16.9*	11.2*	6.1*	23.7*	16.2*	10.9*
Recent crisis at work (%)	19.9*	21.7*	6.5*	21.9*	18.3*	2.5*
Recent threat to job (%)	15.3*	13.4*	3.0*	11.6*	8.6*	1.2*
Unemployed (%)	6.7*	2.0*	1.3*	4.8*	2.6	0.6*
Not in the labour force (%)	7.4*	3.2*	49.5*	10.9*	11.6*	67.4*
Dependent children (%)	4.3*	69.1*	4.5*	13.3*	71.9*	0.3*
Self-rated health: fair/poor	9.7	8.9	12.1*	9.6	10.3	12.7*
Mastery (mean/s.d.)	23.11 (3.41)*	22.23 (3.58)	22.22 (3.65)	22.53 (3.46)*	21.83 (3.58)	21.51 (3.46)
Childhood adversity (mean/s.d.)	1.35 (1.94)*	1.74 (2.32)	1.41 (1.90)*	1.79 (2.39)*	2.14 (2.59)	1.66 (2.16)*
Education (mean/s.d.)	14.49 (1.54)*	14.82 (2.32)	14.21 (2.79)*	14.74 (1.61)*	14.47 (2.30)	13.30 (2.72)*
Friends: positive support (mean/s.d.)	4.84 (1.33)*	4.46 (1.34)	4.96 (1.31)*	5.26 (1.09)*	5.09 (1.16)	5.40 (1.03)*
Friends: negative interactions (mean/s.d.)	3.47 (1.81)*	2.99 (1.60)	2.54 (1.64)*	3.23 (1.68)*	2.78 (1.68)	2.30 (1.67)*
Family: positive support (mean/s.d.)	5.32 (1.12)	5.21 (1.18)	5.43 (1.06)*	5.43 (1.01)*	5.16 (1.25)	5.46 (1.07)*
Family: negative interactions (mean/s.d.)	3.97 (2.04)*	4.24 (2.00)	3.35 (1.87)*	4.23 (2.21)*	4.62 (2.13)	3.37 (1.93)*
Ruminative style (mean/s.d.)	8.70 (5.07)*	8.04 (4.46)	6.35 (3.88)*	10.81 (5.33)*	9.21 (4.52)	7.68 (3.75)*

* For dichotomous variables, indicates cells with adjusted standardized residual greater than or equal to 2 and $p < 0.05$ for associated χ^2 test. For quantitative variables, indicates that the mean is significantly different to 40- to 44-year-olds (*post hoc* Bonferroni test, $p < 0.05$).

Identification of risk factors that account for the relationship between age and psychological distress

As a first step in investigating which risk factors are important in explaining age differences in distress, the extent to which risk factors differed across the three age groups was examined. Table 2 shows the percentages for males and females within each age group reporting the presence of discrete risk factors, and means across age groups for continuous risk factors.

As shown in Table 2, several risk factors showed an increase or decrease across age groups. The proportion of participants experiencing the recent end of a relationship, a recent problem with someone, a recent job threat, and being unemployed, all showed a decline with increasing age. Similarly, ruminative style and the experience of negative interactions with friends decreased with increasing age.

Other age differences in risk factors were found between 20- to 24- and 40- to 44-year-olds, or between 40- to 44- and 60- to 64-year-olds. The proportion of 20- to 24-year-olds who reported being married or *de facto*, separated or divorced, and having had a recent close family

death was lower relative to the other age groups, while 20- to 24-year-olds also reported higher levels of mastery relative to 40- to 44- and 60- to 64-year-olds. The oldest group was less likely to report having had a recent illness or injury in the family or a recent crisis at work. The 60- to 64-year-old group also reported lower levels of education and worse self-rated health relative to the younger groups.

Several non-monotonic patterns of risk and protective factors across age groups were also observed. Childhood adversity, negative support from family, and having dependent children were higher among 40- to 44-year-olds relative to both the youngest and oldest groups, while positive support from both friends and family were rated lower by the 40- to 44-year-olds relative to the 20- to 24- and 60- to 64-year-olds.

Analysis of confounding or mediating effects of risk factors on the relationship between age and psychological distress

In order to determine which risk factors were important in accounting for the relationship

Table 3. Males: regression models with psychological distress as the dependent variable, and age and risk factors as predictors

Predictor	Model 1			Model 2			% age effect explained
	<i>B</i>	S.E.	β	<i>B</i>	S.E.	β	
Age 1 (20s)	0.17	0.16	0.02	0.17	0.20	0.02	
Age 2 (60s)	-1.88*	0.16	-0.23	-1.65*	0.19	-0.20	
Married or <i>de facto</i>				-0.00	0.19	-0.00	4.83
Divorced or separated				0.29	0.27	0.02	5.35
Recent personal illness/injury				1.15*	0.18	0.08	0.75
Recent family illness/injury				0.66*	0.14	0.06	2.53
Recent close family death				0.16	0.35	0.01	-0.46
Recent other close death				0.19	0.14	0.02	-0.14
Recent end of relationship				0.34	0.22	0.02	8.00
Recent problem with someone				0.86*	0.17	0.07	10.34
Recent crisis at work				1.36*	0.16	0.12	16.31
Recent threat to job				0.47*	0.19	0.04	10.79
Unemployed				0.24	0.30	0.01	3.21
Not in the labour force				0.40*	0.15	0.04	-25.39
Dependent children				-0.37*	0.18	-0.04	-7.57
Self-rated health: fair/poor				2.47*	0.18	0.19	-3.05
Mastery				-0.30*	0.02	-0.27	-13.50
Childhood adversity				0.23*	0.03	0.12	1.56
Education				-0.06*	0.02	-0.04	-2.69
Friends: positive support				-0.21*	0.04	-0.07	5.45
Friends: negative interactions				0.19*	0.04	0.08	18.00
Family: positive support				-0.05	0.05	-0.02	4.73
Family: negative interactions				0.19*	0.03	0.10	16.68
<i>R</i> ²	0.06			0.40			

Unstandardized coefficients (*B*) with standard errors (S.E.) and standardized coefficients (β). For dummy coded age, reference group = 40- to 44-year-olds.

* $p < 0.05$.

between age and psychological distress, regression models were constructed with age, risk factors and cross-products representing the interactions of age and risk factors as predictors of distress. When significant interactions were identified, the risk factors involved were selected for further analyses only if they were significantly associated with distress in at least two age groups. For the analyses involving males, all risk factors were retained, including several that showed significant interactions with age in predicting distress. These included physical health, mastery, positive support from friends and negative interactions with family. For females, divorced/separated status, and positive social support from friends and family were excluded because they showed no independent relationship with distress. Unemployment status was excluded for females because it showed a significant relationship with distress only in the 40–44 years age group. No other risk factors significantly interacted with age in predicting distress.

Regression coefficients produced by age and the risk factors are presented in Tables 3 and 4. For males, five of the eight negative life events were significantly and positively associated with distress, as were not being in the labour force, fair/poor health, childhood adversity, and negative social interactions with friends and family. Higher levels of mastery, education and positive social support from friends were associated with lower distress levels. The results were similar in females. Six of the eight negative life events were associated with distress, as were not being in the labour force, fair/poor health, childhood adversity, and negative interactions with family. As with males, mastery and education were protective.

Further analyses were undertaken in order to calculate the varying degrees to which the effect of age on distress could be accounted for by the identified risk factors. Estimates of the total, unadjusted effect of age on psychological distress for males and females were calculated by taking the standard deviation of the three age

Table 4. Females: regression models with psychological distress as the dependent variable, and age and risk factors as predictors

Predictor	Model 1			Model 2			% age effect explained
	<i>B</i>	S.E.	β	<i>B</i>	S.E.	β	
Age 1 (20s)	1.16*	0.16	0.13	1.18*	0.17	0.13	
Age 2 (60s)	-1.99*	0.16	-0.22	-1.89*	0.20	-0.21	
Married or <i>de facto</i>				-0.11	0.13	-0.01	2.43
Recent personal illness/injury				0.74*	0.21	0.05	-0.52
Recent family illness/injury				0.35*	0.14	0.03	1.55
Recent close family death				1.07*	0.34	0.04	-1.11
Recent other close death				0.08	0.14	0.01	0.05
Recent end of relationship				0.74*	0.21	0.05	5.70
Recent problem with someone				0.66*	0.15	0.06	8.38
Recent crisis at work				1.36*	0.17	0.11	16.71
Recent threat to job				0.31	0.22	0.02	1.46
Not in the labour force				0.33*	0.15	0.04	-17.06
Dependent children				-0.15	0.17	-0.02	5.97
Self-rated health				2.81*	0.18	0.20	-4.10
Mastery				-0.40*	0.02	-0.33	-16.36
Childhood adversity				0.18*	0.02	0.10	1.72
Education				-0.06*	0.02	-0.03	-10.02
Friends: negative interactions				0.15*	0.04	0.06	14.14
Family: negative interactions				0.17*	0.03	0.09	14.19
<i>R</i> ²	0.09			0.42			

Unstandardized coefficients (*B*) with standard errors (S.E.) and standardized coefficients (β). For dummy coded age, reference group = 40- to 44-year-olds.

* $p < 0.05$.

group sample means by gender (as shown in Table 1). This produced values of 0.930 for males and 1.302 for females. The extent to which the effects were reduced for males and females by controlling for a given risk factor were then assessed by calculating the standard deviation of the estimated marginal means of psychological distress across age groups after adjusting for the effects of a given risk factor and the interaction between age and the risk factor, using analysis of co-variance. For example, for males, the standard deviation of the three estimated marginal means of psychological distress (one mean per age group) after adjusting for participants' married or *de facto* status was 0.885. By subtracting this value from the estimated total age effect (0.930) we obtain a value of 0.045, which constitutes 4.83% of the total effect. In other words, 4.83% of the total effect of age on distress was accounted for by age differences in marital status. Analyses of this type were conducted for each risk factor and results are presented in the final columns of Tables 3 and 4.

Negative interactions with family and friends and crises at work accounted for substantial

proportions of the effect of age on distress for both males and females. For males, having had a recent problem with someone or a recent job threat also explained more than 10% of the effect of age on distress.

The analyses used to determine the individual effects of risk factors in confounding or mediating the relationship between age and distress produced negative percentage values for several risk factors. The most notable of these were not being in the labour force, mastery, and education (females only). The negative values reflect that older age involves greater exposure to a risk factor, so that adjusting for this factor magnifies the age differences in distress levels.

It was of additional interest to examine the possible effects of ruminative style in accounting for the association between age and distress. However, given the conceptual similarity of ruminative tendencies to the experience of depression, the explanatory effect of ruminative style was assessed separately to the main analyses. Regression models that included ruminative style as a predictor in addition to the other risk factors confirmed an association between ruminative style and psychological distress for both

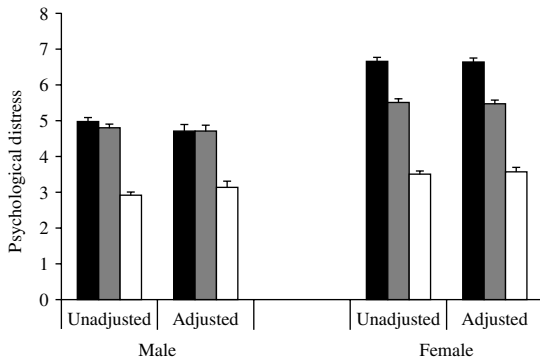


Fig. 1. Males' and females' mean psychological distress (with standard errors) by age group, unadjusted and adjusted for risk factors. ■, 20–24 years; ▒, 40–44 years; □, 60–64 years.

males ($B=0.38$, $\beta=0.44$, $p<0.05$) and females ($B=0.37$, $\beta=0.41$, $p<0.05$). The analyses of co-variance also showed that ruminative style accounted for 54.8% and 51.4% of the effect of age on psychological distress for males and females respectively.

Impact of risk factors on age differences

To show the impact of the risk factors on age group differences, Fig. 1 gives the mean psychological distress scores across age groups for males and females, (a) unadjusted, and (b) adjusted for risk factors. The age group differences were reduced after adjustment, but still remained.

DISCUSSION

The present results confirm previous research on the same population showing that depression and anxiety symptoms decline across age groups (Christensen *et al.* 1999). This finding is strengthened by the fact that the measures used here were found to have weak factorial invariance across age groups. The issue of bias in measurement continues to be neglected by researchers in this area. Most simply assume that a diagnosis or scale can be applied with equal validity across a wide age range. The issue becomes most serious in the very elderly where there is a high prevalence of physical disorders which can produce changes in some depression and anxiety symptoms. Although the factors underlying the measures used here demonstrated a reasonable fit to the data across the age

range 20–64 years, we do not know whether this would be the case at more advanced ages. Snowdon (2001) has suggested that there may be a second peak in depression prevalence in late old age. Given the high prevalence of physical ill health, which is a risk factor for depression, such a peak is plausible. However, as shown by the work of Grayson and co-workers (2000), it could also easily be an artefact of the measures used. This issue merits more attention.

We assessed the role of a wide range of risk factors in the age group differences we observed. The results indicated that adjusting for these factors reduced some but not all of the relationship between age and distress. The most important factors producing age differences were negative interactions from family and friends and work-related stressors. Ruminative style was also important, but its status as a risk factor is ambiguous because it correlated so highly with psychological distress that it could be part of the same construct.

While most of the risk factors were associated with greater psychological distress in younger adults, there were several that had important effects in the opposite direction, being associated with greater distress in older adults. The most important of these were mastery and not being in the labour force. The Mastery scale involves beliefs about control over life and its problems and was found to decline across age groups. Similar findings have been reported by Schieman and colleagues (2002) who found that the decline in depressive symptoms with age would have been even greater had it not been for a lower sense of mastery in older adults. However, unlike Schieman and co-workers, we found that mastery decreased from 20–24 to 40–44 years, but there was no difference from 40–44 to 60–64 years, implying that the effect of mastery is more relevant to age differences in younger adults. The findings on labour force participation may reflect a trend for people in the 60–64 years age group to retire if they are not in good health.

Given that the risk factors could not explain all of the age group differences, we must ask what accounts for the residual age group differences. One possibility is that there are psychosocial risk factors that we omitted. For example, Rothermund & Brandtstädter (2003: 87) found that 'reduced openness, concreteness, and

controllability of future time perspective and associated feelings of obsolescence' was an important factor. This variable involves a shrinking of the available lifespan to pursue goals, with a consequent loss of purpose to life.

Another possibility is that ageing of the brain affects emotional responsiveness. There is evidence for age differences in the way emotional information is initially processed and later remembered. Older adults are less likely to attend to and remember negative compared with positive emotional material (Charles *et al.* 2003; Mather *et al.* 2004). Predisposition to negative emotion can be measured by personality scales covering traits like neuroticism. Such traits were measured in the current study and showed declines across age groups. However, we decided not to use them as potential risk factors because of their causal ambiguity. It can be argued that neuroticism and related personality traits are simply measuring chronic psychological distress (Duncan-Jones *et al.* 1990), in which case it would be circular to include them as risk factors.

Some potential limitations of the present study warrant consideration. Adjusting for risk factors using cross-sectional data requires conceptual assumptions to be made regarding the direction of causal relationships between these factors and psychological distress. The analysis was carried out with and without the inclusion of ruminative style on account of its potentially circular relationship with distress. However it is possible that other factors, such as negative interactions with friends and family, and perceived mastery, that are not as clearly identifiable as potential symptoms of negative affect as ruminative style, may be outcomes as well as potential causes of distress.

It is also possible that additional variance in the relationship between age and distress might have been explained by considering effects of interactions between risk and protective factors. For example, the extent to which a risk factor such as unemployment predicts distress levels may be moderated by sense of mastery. Another limitation concerns the assumption that the associations between risk factors and distress within age groups can be generalized to between-group differences. Comparing age group means that are adjusted for risk factors across the entire sample may have obscured differential relationships between risk factors and distress

between each age group. It was further necessary to include some risk factors in final models that showed significant interactions with age group in predicting distress, i.e. physical health, mastery, positive social support from friends, and negative interactions with family for men, and mastery for women. This necessarily makes an adjustment for each of these risk factors that is an average of its statistical effects within the three separate age groups. There is no ideal way of making such adjustments for factors that show differential associations with distress across the age groups.

Other limitations of the study are that it did not include people older than 64 years, the inability to distinguish ageing from cohort effects, the relatively high non-response rate, the retrospective measurement of childhood events, the inability to correct for measurement error in the risk factors, the possibility of unknown or unmeasured risk factors that vary with age, and the use of self-report measures of psychological distress.

On the other hand, the strengths of the study are the large epidemiological sample and the range of risk factors covered. Furthermore, the PATH Through Life Project is designed to be a 20-year longitudinal study and will eventually produce data relevant to ageing and cohort effects in psychological distress.

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DECLARATION OF INTEREST

None.

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