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Gender, mental health, physical health and retirement: A prospective study of 21,608 Australians aged 55–69 years

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ABSTRACT

Objectives: We examined retirement transitions by gender, and different associations between retirement, physical function and mental health.
Methods: Data for 21,608 participants aged 55–69 from the 45 and Up Study were used. Generalised estimating equations were used to investigate longitudinal associations between retirement with psychological distress (Kessler score, K10) and physical dysfunction across two time points, by gender separately.
Results: Retirement in men was associated with a 25% relative increase in mean physical dysfunction score ($p < 0.001$) and a 2% relative increase in mean K10 score ($p = 0.004$), although men with high physical dysfunction score had a 6% increase in mean K10 score ($p = 0.005$) if retired. For women, retirement was associated with a 17% increase in mean physical dysfunction score ($p < 0.001$), with no association observed with the K10 score. Results were adjusted for demographic and health covariates.
Conclusion: Retirement is associated with physical dysfunction over time. Retirement is not associated with psychological distress among women, but retirement is associated with psychological distress among men who have a high level of physical dysfunction. The findings point to the importance of attending to the physical and mental health needs, around the retirement period, particularly for men with poor physical health.

1. Introduction

Retirement can be seen as a positive life transition, a time of reinvention and greater freedom and choice, or as a negative life event, depending on socio-economic position, life stage, health, and other social and economic circumstances [1–6]. Likewise, retirement may be a period of well being, or a time of poor physical and mental health.

For men, retirement has traditionally represented a gateway between working life and a life of leisure. This traditional construct is closely tied to meanings of work embedded in the male breadwinner model of social organisation [7]. The transition to retirement may have a negative impact on self worth, leading to anxiety and psychological distress [4] particularly for men who leave the workforce prematurely [8]. Many men retire from work before reaching the traditional retirement age. In Australia, the average retirement age for men aged 45 years and over is 58.5 years [9], which is six and a half years earlier than the traditional retirement age of 65.

For women, retirement may have different meanings and arises through different influences [10]. Traditionally, work has had less primacy in the lives and identities of women, with many women leaving the workforce to care for children, and either not returning to paid work, or balancing part-time work and domestic responsibilities [11]. Retired women are engaged in a multitude of social, community, religious, leisure and caring activities, and may not feel that retirement from paid work means retiring from active life [10]. Among the Australian population aged 45 years and over, a

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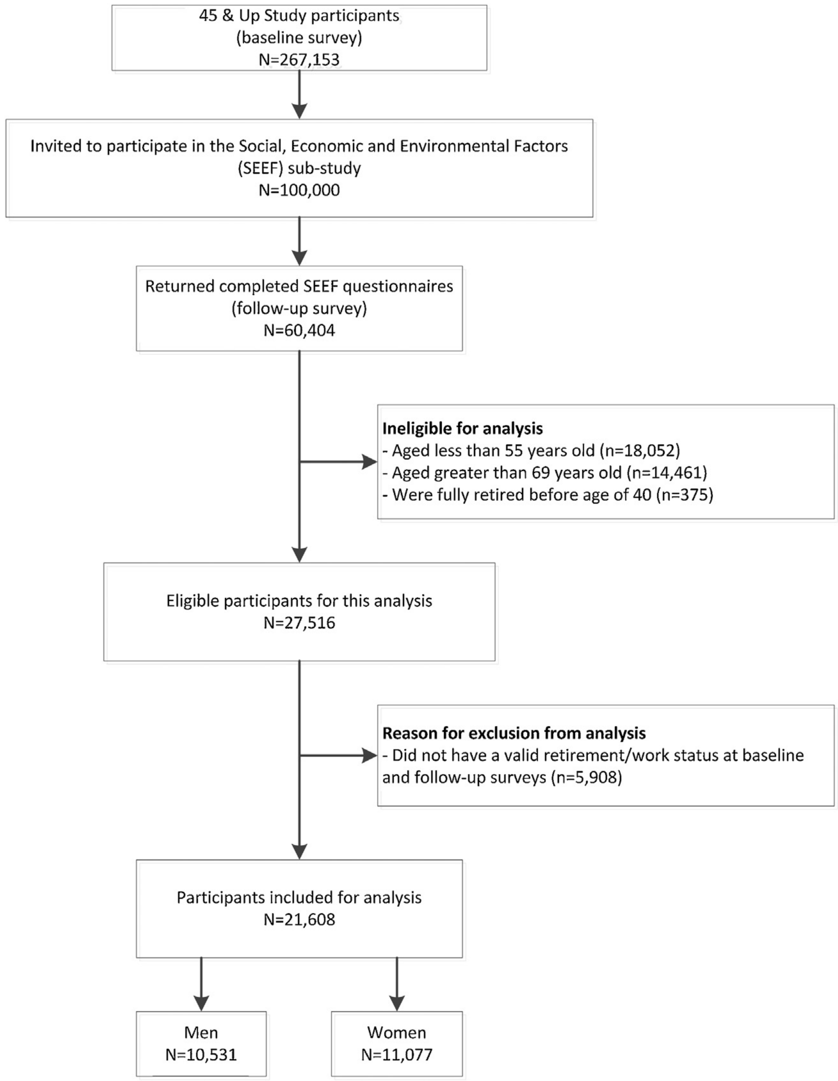

Fig. 1. Derivation of the sample for analysis, as selected from the 45 & Up Study participant group.

Table 1
Distribution of retirement status at baseline and follow up, according to gender and baseline age.

			Retirement status at baseline and follow up			
Gender	Baseline age (years)	N	Not retired-Not retired (%)	Not retired-Retired (%)	Retired-Not retired (%)	Retired-Retired (%)
Men	55–59	3623	76.3	11.0	0.8	11.9
	60–64	3337	39.9	16.8	1.2	42.1
	65–69	3571	17.6	8.7	1.4	72.3
Women	55–59	4151	69.5	10.1	1.4	19.0
	60–64	3730	27.6	14.5	1.4	56.5
	65–69	3196	10.6	7.0	1.5	80.9

smaller percentage of women than men are in the labour force (47% compared to 61%, respectively) [9]. The average retirement age for women aged 45 and over in Australia is 50 years.

Given the gender differences in nature of work and retirement, it is of interest to determine whether retirement is associated with different changes in health for men and women. Longitudinal studies have shown that retirement can have negative effects on mental and physical health (particularly where retirement is involuntary or at younger ages), or positive effects, depending on the timing and circumstances surrounding retirement [1,12–14]. However these findings seem to apply particularly to men, who have a more traditional workforce attachment, and for whom retirement may have a greater negative effect on well being. Few studies have examined the separate effects for men and women. The aims of this analysis were to examine retirement transitions among a large cohort of men and women, and to identify gender differences in associations between retirement status and mental and physical health.

2. Method

2.1. Participants

The 45 and Up Study is a large scale study conducted by the Sax Institute (http://www.45andup.org.au) which recruited 267,151 participants aged 45 years or older in New South Wales, the most populous state of Australia. This study sample equates to approximately 10% of the New South Wales population in this age group, with oversampling of people aged 80-years and over and of people living in rural and remote areas. Participants joined the study by completing a postal questionnaire distributed between February 2006 and October 2008. The study recruitment and overall cohort profile has been described in detail previously [15].

In 2010, the first 100,000 participants who completed the 45 and Up baseline questionnaire were invited to complete a substudy to provide additional data on their social, economic and environmental background. A total of 60,404 (60.4%) participants responded to the Social, Economic and Environmental Factors (SEEF) substudy invitation, with the time between baseline and follow-up ranging between two and four years. The 45 and Up Study and the analyses reported here are covered by ethics approval from the University of New South Wales Human Research Ethics Committee.

2.2. Outcomes

Psychological distress was measured by Kessler psychological distress scale (K10) [16] at baseline and follow-up. The K10 score ranges from 10 to 50; higher scores indicate higher levels of stress [17,18]. Due to some missing values over the 10 items, an imputation approach was conducted where appropriate [20]. After this, for participants whose data remained missing for only one question, the missing value was filled by taking mean score from the other nine questions. The K10 score was then calculated for participants with no missing values over the K10 items. Pairwise correlations between the 10 baseline items ranged from 0.21 to 0.62 with a standardised Cronbach's alpha of 0.85, indicating good internal consistency for this measurement within our sample.

Physical functioning was measured at baseline and follow-up using the Medical Outcomes Study Short Form 36 physical functioning score [21–23], a quality of life measure which assesses health-related limitations on ten different activity items. Response options included 'limited a lot', 'limited a little', or 'not limited at all' and scored one to three respectively. The physical functioning score (SF36 PF) is the total summed score from the ten activity items, scaled to have a range between 0 and 100. Higher scores indicate higher levels of physical functioning. Pairwise correlations between the 10 baseline items ranged from 0.24 to 0.81 with a standardised Cronbach's alpha of 0.93, indicating high internal consistency for this measurement within our sample. Missing data were filled in if questions relating to a more vigorous activity were answered, and for participants with five or more available items, remaining missing responses were imputed by the mean of the available responses [24]. The SF36 PF scores were left skewed for the sample in this study, a transformation was performed to reverse the SF36 PF scores (transformed score = 100 − original score) for modelling purposes. The reversed scores had a right skewed distribution and were denoted as *'physical dysfunction scores'* in this study. For example, SF36 PF scores of 90 and 75 would have corresponding physical dysfunction scores of 10 and 25 respectively.

2.3. Explanatory variables

Retirement status which was assessed from the question 'What is your current work status?' at both baseline and follow-up. Response options were not mutually exclusive and included: full-time paid work; part-time paid work; self-employed; unemployed; partially retired; completely retired; sick/disabled; unpaid work; studying; looking after home/family; and other. Participants were classified as 'retired' or 'not retired' with the 'retired' group including participants who indicated they were "fully retired" and who did not indicate any type of paid work or that they were sick or disabled. The 'not retired' group included participants who reported full time work, part time work, self-employed, partially retired, or unemployed, and not sick or disabled.

Other explanatory variables included: baseline age, gender, educational level at baseline, marital status, smoking status, Body Mass Index (BMI), comorbidities including cancer, heart disease, high blood pressure, stroke, diabetes, asthma, Parkinson's disease and arthritis (doctor diagnosed conditions, self-reported by participants).

2.4. Statistical analyses

The sample was restricted to participants aged 55–69 years at baseline, to those not fully retired prior to age 40 years, and to those who provided valid retirement status at baseline and follow up. People who reported sick and disabled and those who were otherwise unable to be classified with a valid retirement status were excluded from the analyses.

Since we expected differences in associations by gender, and after testing for significant interaction (p-values for the retirement-gender interaction term were 0.0028 and 0.0175 for the K-10 and physical health outcomes respectively), analyses were conducted separately for men and women. Distribution of retirement status at baseline and follow up was presented according to gender and baseline age. The mean K10 score and physical dysfunction score at baseline and follow up, and the differences in respective means over time were assessed according to retirement status, gender, and baseline age.

Generalised estimating equations (GEE) were used to investigate associations between retirement status and the outcomes of (a) psychological distress and (b) physical dysfunction. Since the outcomes were right skewed, negative binomial distribution [25] was used to model K10 and physical dysfunction scores in these analyses. Results were reported as the mean relative change in the score [25] with corresponding 99% confidence intervals. A critical value of $p \leq 0.01$ was used to determine statistical significance for all analyses due to the large sample size. SAS software (version 9.4) was used for the analyses [26]. There were two models examined for each outcome:

Model 1 included: baseline age, time and retirement status.

Model 2 included: predictors in Model 1, and additionally educational level, marital status, smoking status, Body Mass Index (BMI), and comorbidities.

Motivated by a hypothesis that the observed association between psychological distress and retirement status may be different according to level of physical dysfunction, a post hoc subgroup analysis was carried out, separately for men and women. Participants were grouped according to baseline physical dysfunction status, reflecting those with minimal physical dysfunction (score ≤ 25) versus those with noticeable physical dysfunction (score > 25). A GEE analysis was conducted to investigating the association between psychological distress and retirement status according to physical dysfunction status.

3. Results

Of the 60,404 participants who completed the baseline and follow-up surveys, 27,891 were aged 55–69 years at baseline. After excluding participants who retired before age 40 (n = 375), and those who did not have a valid retirement status at both time points (n = 5908), 21,608 participants were included in the analysis (Fig. 1), with a mean of 2.7 years between baseline and follow-up surveys. Of these, 46.1% were fully retired at baseline and 58.9% fully retired at follow up.

Proportionally, more women were retired at both time points than men (49.5% versus 42.0% respectively). Transition to retirement was more likely to occur for participants aged 60–64 years (Table 1). Overall there were 12.0% of men and 10.6% of women who were not retired at baseline and had retired at follow up. Small proportions of men (1.1%) and women (1.4%) were retired at baseline and not retired at follow up, and numbers were too small to draw meaningful conclusions for this group.

There was a small statistically significant increase in K10 scores over time for men and women aged 65–69 who were retired at both time points, and a small decrease in K10 scores for women aged 55–59 who transitioned to retirement at follow up (Table 2).

K10 score did not vary much over time (Table 3). For men, retirement was associated with 3% mean relative difference in the K10 score, after controlling for time and baseline age ($p < 0.001$), such that if the mean K10 score for not retired men was 13 (on the 10 to 50 point scale), the adjusted mean K10 score for retired men was estimated to be 13.39 or 3% higher. In Model 2, this effect was attenuated but remained statistically significant ($p = 0.004$), after adjusting for other covariates. There was no significant association between retirement and psychological distress for women. An increase in mean K10 score was associated with younger age, lower level of education, not having a spouse or partner, smoking, having BMI in the obese range (BMI $\geq$ 30), having heart disease, asthma and arthritis for men and women; and also associated with having cancer and stroke in men.

There was a statistically significant increase in physical dysfunction score over time for men and women in all age groups and for all retirement transitions (except men aged 65–69 in the not retired to the retired group) (Table 4). Men and women who were retired at both time points had higher physical dysfunction score at baseline and follow up compared to those in other retirement transition groups.

Physical dysfunction scores increased over time for men and women in all models (Table 5). In model 1, retirement was associated with 39% mean relative difference in physical dysfunction score in men ($p < 0.001$) and 29% mean relative difference in physical dysfunction score in women ($p < 0.001$), adjusted for time and baseline age. Therefore, if the mean physical dysfunction for not retired men was 10 (on the 0–100 point scale), the adjusted mean physical dysfunction score is estimated to be 13.9 or 39% higher for retired men. This association was attenuated but remained significant after adjustment for other covariates in model 2 ($p < 0.001$ for both men and women). Associations between retirement and the outcomes were around the same magnitude if imputations were not carried out, although statistical significance at the $p < 0.01$ was not always maintained.

In men who had a physical dysfunction score of greater than 25 at baseline, retirement was associated with a 6% difference in mean K10 score (mean relative effect = 1.06; 95% confidence interval = 1.01–1.12; $p = 0.005$), adjusted for time, baseline age, education level, marital status, smoking status, BMI and comorbidities (Fig. 2). There was no significant association between retirement and K10 score for men who had physical dysfunction score of 25 or lower at baseline, or for women.

4. Discussion

This study investigated the association between retirement and mental and physical health over time for 21,608 men and women aged 55–69 years. There was a small statistically significant association between retirement and psychological distress (K10 scores) for men, with around 3% relative decline in mental health. Compared to other factors, the association between retirement and psychological dysfunction for men was less than the association with lower educational, being unpartnered, being a current smoker or having arthritis. Moreover, older age was associated with lower psychological distress. These results are similar to those found on longitudinal analyses of HRS data where retirement was associated with 6–9% decline in mental health relative to the sample mean [13]. In our study, however, most of the association between retirement and mental health was seen among men with higher levels of physical dysfunction at baseline. Other analyses have likewise identified a strong association between retirement due to ill health and psychological depression, compared to retirement for other reasons [27].

Butterworth et al. found that while retired men and women had higher prevalences of mental disorders than non-retired [8,28], those with poor physical health were more likely to have a mental disorder. One potential explanation for these findings is that men who have retired due to poor health may experience different adjustment to retirement lifestyle [1].

The lack of a significant association between retirement and mental health for women may reflect varying workforce attachment for women compared to men, with work having less primacy for women [11]. Barnes and Parry [29] also emphasise the strong gender influence on retirement adaptation. In their qualitative study of older men and women in the United Kingdom, they identified a predominance of traditional gender roles; men were more likely to have strong work attachments and limited networks, and potentially, less successful adaptation to retirement [29]. However, with women's workforce participation increasing [30] and gender roles becoming less distinct in younger generations, we may expect to see some convergence in associations between retirement and mental health for men and women when the younger generations reach retirement age.

Retirement was found to be significantly associated with a large relative increase in physical dysfunction scores for both men and women, even after adjustment for comorbid conditions. This result concurs with Dave et al. [13], who found that retirement was associated with a 5–14% increase in difficulties with mobility and daily activities. In our data, the mean relative change in physical dysfunction scores for retired men was similar to the effect size of a ten year increase in age, and similar to the effects of diabetes and asthma. The only conditions that had significantly larger mean relative changes in physical dysfunction scores were Parkinson's disease and arthritis. For women the effect size was similar to a five year increase in age, and similar to the effects of high blood pressure and diabetes, but less than the effects of heart disease and arthritis. As Dave et al. [13] note, it is not necessarily the effects of retirement as such that leads to these health differences, but rather associated changes in motivations and behaviours that promote good health, with much of the effect on physical health appearing to operate through lifestyle changes, particularly reduced physical activity. Other researchers have classified retirees as "healthier" and "less healthy" according to their diet, physical activity, smoking and alcohol consumption. In this research, around 47% of male retirees and 28% of female retirees were classified as "less healthy". These findings suggest some key targets for health promotion, particularly for retired men [31]. An emphasis on post-retirement health promotion programs may be important to prevent more rapid physical decline in this group, particularly if health problems already exist. However, our findings and those of Dave et al. [13], contrast with other findings on physical functioning and retirement. Mein, et al. [3] identified no significant differences in physical functioning for working and retired participants in the Whitehall II study. Jokela, et al. [1] found that statutory retirement and voluntary early retirement were associated with better physical functioning compared with being in the workforce; and that physical functioning for those who retired due to ill health improved over time [1]. Neuman also

Table 2
Mean of K10 score at each survey and mean change (95% CI) in the score over time, according to gender, baseline age and retirement status.

		Men				Women			
Retirement status at baseline and follow up	Baseline age (years)	N	Baseline (mean score)	Follow up (mean score)	Mean difference[a] (95% confidence interval)	N	Baseline (mean score)	Follow up (mean score)	Mean difference[a] (95% confidence interval)
Not retired-Not retired	55–59	2653	13.1	12.9	−0.2 (−0.4; 0.0)	2684	13.4	13.3	−0.2 (−0.3; 0.0)
	60–64	1242	12.6	12.5	−0.1 (−0.3; 0.1)	942	12.9	13.0	0.0 (−0.2; 0.3)
	65–69	575	12.2	12.3	0.2 (−0.2; 0.5)	293	12.6	13.0	0.4 (−0.1; 1.0)
Not retired-Retired	55–59	384	13.3	13.0	−0.3 (−0.8; 0.2)	392	13.8	13.1	−0.6 (−1.0; −0.2)
	60–64	508	12.8	12.8	−0.1 (−0.4; 0.3)	495	13.1	12.9	−0.2 (−0.5; 0.2)
	65–69	271	12.6	12.6	0.0 (−0.5; 0.5)	195	12.6	13.0	0.4 (−0.2; 1.0)
Retired-Retired	55–59	415	13.6	13.6	0.0 (−0.4; 0.4)	738	13.5	13.6	0.1 (−0.2; 0.4)
	60–64	1334	13.0	13.1	0.0 (−0.2; 0.2)	1884	13.2	13.1	−0.1 (−0.3; 0.1)
	65–69	2331	12.8	13.1	0.3 (0.1; 0.5)	2193	12.7	12.9	0.2 (0.0; 0.3)
Retired-Not retired	55–59	28	12.9	12.4	−0.5 (−1.6;0.6)	55	13.3	13.0	−0.3 (−1.1; 0.5)
	60–64	38	13.0	12.7	−0.3 (−1.5; 0.8)	48	13.1	12.3	−0.8 (−2.1; 0.4)
	65–69	43	12.1	12.2	0.1 (−0.8; 1.0)	40	13.3	12.9	−0.4 (−1.3; 0.4)

N excluded missing data of gender, baseline age, retirement status, and K10 score at baseline or follow up.
[a] Difference = K10 score (follow up-baseline).

Table 3
The effect of retirement status on the mean relative change (99% confidence interval) in K10 score, for men and women separately.

	MEN (N = 9784)		WOMEN (N = 10,072)	
	Model 1	Model 2	Model 1	Model 2
Time				
Baseline	1	1	1	1
Follow up	1.00 (0.99, 1.01)	0.99 (0.98, 1.00)	1.00 (0.99, 1.01)	0.99 (0.98, 1.00)
Retirement status				
Not retired	1	1	1	1
Retired	**1.03 (1.01, 1.05)**	**1.02 (1.00, 1.04)**	1.01 (0.99, 1.03)	1.00 (0.99, 1.02)
Baseline age (years)				
55–59	1	1	1	1
60–64	**0.98 (0.96, 1.00)**	**0.97 (0.95, 0.99)**	**0.97 (0.95, 0.99)**	**0.96 (0.94, 0.98)**
65–69	**0.97 (0.95, 0.99)**	**0.95 (0.93, 0.97)**	**0.96 (0.94, 0.98)**	**0.94 (0.91, 0.96)**
Highest qualification (at baseline)				
University degree or higher		1		1
Trade/certificate/diploma		**1.03 (1.01, 1.05)**		1.01 (0.99, 1.03)
School certificate		**1.03 (1.01, 1.05)**		**1.04 (1.02, 1.06)**
No qualification		**1.10 (1.06, 1.14)**		**1.09 (1.05, 1.13)**
Marital status				
Partnered		1		1
No spouse/partner		**1.06 (1.04, 1.09)**		**1.05 (1.03, 1.07)**
Smoking status				
Never smoked		1		1
Former smoker		**1.02 (1.00, 1.03)**		1.02 (1.00, 1.03)
Current smoker		**1.09 (1.04, 1.14)**		**1.11 (1.06, 1.15)**
Body Mass Index				
Healthy weight (BMI 18.5–24.9)		1		1
Underweight (BMI < 18.5)		1.03 (0.91, 1.17)		1.04 (0.96, 1.13)
Overweight (BMI 25.0–29.9)		1.01 (0.99, 1.03)		1.01 (1.00, 1.03)
Obese (BMI 30.0+)		**1.03 (1.01, 1.06)**		**1.04 (1.02, 1.07)**
Comorbidity				
Cancer		**1.03 (1.01, 1.05)**		1.02 (1.00, 1.04)
Heart disease		**1.05 (1.03, 1.08)**		**1.07 (1.04, 1.10)**
High blood pressure		1.01 (0.99, 1.02)		1.01 (0.99, 1.03)
Stroke		**1.05 (1.00, 1.10)**		1.06 (0.99, 1.13)
Diabetes		1.02 (1.00, 1.05)		1.01 (0.98, 1.05)
Asthma		**1.04 (1.01, 1.06)**		**1.05 (1.03, 1.07)**
Parkinson's disease		1.07 (0.99, 1.14)		0.97 (0.88, 1.08)
Arthritis		**1.09 (1.06, 1.13)**		**1.07 (1.04, 1.09)**

N = Number of participants included in the model.
Results in bold indicate $p < 0.01$.

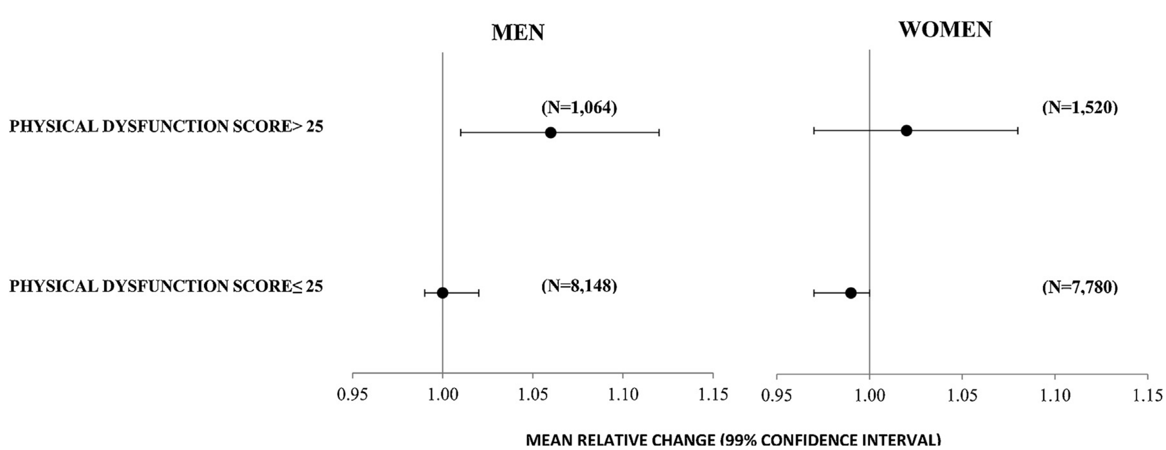

Fig. 2. Mean relative change (99% confidence interval)* of retirement status on K10 score, separately for men and women and by physical dysfunction score (>25 versus ≤25).
Note: Results were adjusted for follow-up time, baseline age, highest qualification, marital status, smoking status, BMI and comorbidities.

concludes that retirement "preserves the health of both men and women" [32].

The other notable finding of our study is that many participants did not consider themselves retired, even those at older ages (65–69 years). These people are working beyond the expected retirement age, (around 65 years for men in Australia), and perhaps exemplify the type of older worker that is encouraged by government policies to increase pension ages and extend working life. In our

Table 4
Mean of physical dysfunction score at each survey and mean change (95% confidence interval) in the score over time, according to gender, baseline age and retirement status.

		MEN				WOMEN			
Retirement status at baseline and follow up	Baseline age (years)	N	Baseline (mean score)	Follow up (mean score)	Mean difference[a] (95% confidence interval)	N	Baseline (mean score)	Follow up (mean score)	Mean difference[a] (95% confidence interval)
Not retired-Not retired	55–59	2544	6.9	9.1	2.3 (1.8; 2.7)	2568	9.3	12.3	3.0 (2.5; 3.5)
	60–64	1197	7.9	10.4	2.5 (1.8; 3.2)	910	10.4	13.8	3.4 (2.5; 4.4)
	65–69	574	10.1	12.1	2.0 (1.0; 3.1)	293	12.4	15.2	2.8 (1.3; 4.4)
Not retired-Retired	55–59	361	8.6	12.5	3.9 (2.4; 5.3)	378	11.7	15.7	3.9 (2.4; 5.5)
	60–64	508	11.8	14.3	2.6 (1.2; 4.0)	477	14.2	17.6	3.4 (2.0; 4.8)
	65–69	266	11.3	12.8	1.6 (−0.1; 3.2)	192	14.1	18.9	4.8 (2.3; 7.3)
Retired-Retired	55–59	403	15.1	16.5	1.4 (0.0; 2.7)	726	13.3	16.5	3.3 (2.2; 4.3)
	60–64	1288	14.7	16.1	1.5 (0.7; 2.3)	1884	16.8	19.5	2.8 (2.1; 3.5)
	65–69	2290	15.9	19.2	3.3 (2.6; 4.0)	2279	18.8	24.0	5.1 (4.5; 5.8)
Retired-Not Retired	55–59	28	12.3	12.5	0.2 (−5.1; 5.4)	52	8.2	10.4	2.2 (-2.1; 6.6)
	60–64	39	12.7	14.7	2.1 (−2.0; 6.1)	48	17.4	15.3	−2.1 (-5.7; 1.5)
	65–69	41	12.3	12.7	0.3 (−4.0;4.6)	46	19.9	21.9	2.0 (-2.4; 6.3)

N excluded missing data of gender, baseline age, retirement status, and physical dysfunction score at baseline and follow up.
[a] Difference = physical dysfunction score (follow up-baseline).

Table 5
The effect of retirement status on the mean relative change (99% confidence interval) on physical dysfunction, for men and women separately.

	MEN (N = 9684)		WOMEN (N = 9966)	
	Model 1	Model 2	Model 1	Model 2
Time				
Baseline	1	1	1	1
Follow up	**1.17 (1.12, 1.21)**	**1.14 (1.10, 1.19)**	**1.27 (1.20, 1.34)**	**1.20 (1.16, 1.25)**
Retirement status				
Not retired	1	1	1	1
Retired	**1.39 (1.29, 1.49)**	**1.25 (1.17, 1.34)**	**1.29 (1.19, 1.40)**	**1.17 (1.09, 1.25)**
Baseline age (years)				
55–59	1	1	1	1
60–64	**1.21 (1.10, 1.32)**	**1.12 (1.03, 1.23)**	**1.20 (1.11, 1.30)**	**1.12 (1.04, 1.21)**
65–69	**1.44 (1.31, 1.58)**	**1.26 (1.15, 1.38)**	**1.48 (1.37, 1.61)**	**1.30 (1.20, 1.41)**
Highest qualification (at baseline)				
University degree or higher		1		1
Trade/certificate/diploma		**1.30 (1.19, 1.41)**		**1.13 (1.04, 1.23)**
School certificate		**1.28 (1.17, 1.41)**		**1.21 (1.12, 1.31)**
No qualification		**1.72 (1.51, 1.95)**		**1.38 (1.23, 1.55)**
Marital status				
Partnered		1		1
No spouse/partner		1.06 (0.97, 1.17)		**1.13 (1.06, 1.20)**
Smoking status				
Never smoked		1		1
Former smoker		**1.15 (1.08, 1.23)**		**1.06 (1.00, 1.13)**
Current smoker		**1.50 (1.30, 1.74)**		**1.25 (1.08, 1.43)**
Body Mass Index				
Healthy weight (BMI 18.5–24.9)		1		1
Underweight (BMI < 18.5)		**1.72 (1.01, 2.95)**		1.26 (0.94, 1.70)
Overweight (BMI 25.0–29.9)		**1.18 (1.08, 1.29)**		**1.31 (1.22, 1.41)**
Obese (BMI 30.0+)		**1.78 (1.62, 1.96)**		**2.01 (1.86, 2.16)**
Comorbidity				
Cancer		**1.20 (1.11, 1.29)**		**1.12 (1.05, 1.20)**
Heart disease		**1.33 (1.24, 1.43)**		**1.36 (1.26, 1.47)**
High blood pressure		**1.14 (1.07, 1.21)**		**1.18 (1.11, 1.25)**
Stroke		**1.36 (1.17, 1.60)**		**1.31 (1.10, 1.55)**
Diabetes		**1.23 (1.13, 1.34)**		**1.16 (1.06, 1.27)**
Asthma		**1.23 (1.13, 1.34)**		**1.26 (1.17, 1.36)**
Parkinson's disease		**1.82 (1.35, 2.45)**		1.08 (0.75, 1.55)
Arthritis		**1.71 (1.51, 1.93)**		**1.66 (1.55, 1.78)**

N = Number of participants included in the model.
Results in bold indicate p < 0.01.

study these people had lower disability scores, even at older ages, and demonstrate a healthy worker effect. Good health in mid to late life is an important individual and societal resource for governments looking towards older workers to improve the sustainability of ageing populations. However, older workers in this study did also experience declining physical health as they aged. Concerns about maintaining older workers' health must therefore be paramount in workforce policies and practices.

While the strengths of this study include the large sample size and longitudinal data, there are some limitations including that there was a limited follow-up time (2–4 years) between baseline and the follow-up survey. This time span may not be long enough to observe changes in mental health or physical function if the emergence of these changes takes longer than 2–4 years. Equally, the time span may miss short term changes that may resolve within 1–2 years. Information about occupation was unavailable; however, we were able to include education level, which is associated with occupation type. Comparison between retired and not retired participants in this study might be confounded by healthy worker effect. To address this problem, we have undertaken stratified analysis based on physical dysfunction level. The results showed a statistically significant effect for men with more physical dysfunction.

In conclusion, retirement was associated with a small statistically significant increase in psychological distress (K10 scores) among men, and particularly among those who had higher levels of physical dysfunction at baseline. In contrast, there were larger increases in physical dysfunction scores. The results point to a need to consider health promotion programs to maintain physical function levels among people who have retired.

Author contributions

Bauman, Rodgers, Banks and Byles were responsible for the study design and data collection for the SEEF sub study. Analysis and interpretation of results was conducted by Vo and Forder, with additional feedback contributed by Thomas, Byles, Bauman, Rodgers and Banks.

The manuscript was a joint collaboration by all authors, led by Byles.

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; were involved in the drafting the manuscript and/or provided critical revision for important intellectual content; and gave approval of the final manuscript.

Conflicts of interest

None declared.

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Ethics

The 45 and Up Study and the analyses reported here are covered by ethics approval from the University of New South Wales Human Research Ethics Committee.

Peer review

This article has undergone peer review.

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