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Original Article

Retirement as a Relief? The Role of Physical Job Demands and Psychological Job Stress for Effects of Retirement on Self-Rated Health

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Abstract

This study investigates the relationship between retirement and self-rated health, and how this relationship is moderated by experienced pre-retirement physical job demands and psychological job stress. Two waves of Dutch panel data are analysed, collected between 2003 and 2007, which include information on 819 people who retired between waves and 636 people who remained in employment. It is argued that on the one hand, the time that comes available after retirement is beneficial to health, while on the other hand, retirement can represent a relief from demanding work. Conditional change ordered logistic analyses show that indeed, retirement is beneficial for health, but this is largely relative to those who stay in employment, who experience a decline in health. Further, the largest health gains are for those with psychologically stressful jobs. No such support is found for physically demanding jobs. Strengths, limitations, and implications of the study are discussed.

Introduction

With the aging populations of many Western societies and the accompanying rise in healthcare costs in mind, the question how retirement affects health is becoming more pressing. With many Western countries developing strategies to manage this demographic trend (Cooke, 2006), the matter is of interest to policy makers. If retirement offers people benevolent health outcomes to look forward to, then they are less inclined to retire at a later age. Furthermore, if raising the pension age causes many people to spend their last working years in suboptimum health, then the possible costs of lower productivity and increased healthcare expenditures need to be taken into account. Knowledge about how retirement affects health is thus relevant, and, more specifically, the question who benefits from retirement health-wise and who does not is important.

This study focuses on the effect of retirement on the *self-rated health* of individuals, which is a straightforward and appropriate measure to investigate health outcomes. Other studies looking into how retirement affects self-rated health generally find positive but modest effects (Gall, Evans and Howard, 1997; Neuman, 2008; Rijs, Cozijnsen and Deeg, 2012), which is in line with research on other aspects of health, such as psychological well-being (Kim and Moen, 2002; Pinquart and Schindler, 2007) and physical outcomes (Brockmann *et al.*, 2009; Zhan *et al.*, 2009).

A shortcoming of the literature on this topic is that it often approaches retirement as a uniform event, while basically every life transition can vary from a welcome relief to an unwanted change, largely dependent on the pre-transitional circumstances (Wheaton, 1990). For example, divorce after a violent marriage is likely to be different than a split-up after a relatively easygoing marriage (Kalmijn and Monden, 2006), and while a child moving out of the house can lead to parental distress, this effect is reduced if there was much parent–child conflict before the departure of the child (Wheaton, 1990). Such disparities have been investigated for varying transitions, but less so for retirement. Intuitively, one can imagine that a person who finds his or her daily job an uplifting experience will be inclined to experience retirement as a loss. On the other hand, when someone experiences his or her job as a burdensome, demanding obligation, this may cause health problems. Retirement from such a stressful job can then embody a *relief*.

The relationship between labour and health has been extensively researched from varying perspectives. There is clear evidence that both physical job demand and psychological job stress are harmful for a broad range of well-being outcomes, like cardiovascular disorders (Vrijkotte, Van Doornen and De Geus, 2000), depression (Nieuwenhuijsen, Bruinvels and Frings-Dresen, 2010), and life satisfaction (Hayes and Weathington, 2007). Further, bad health causes people to quit their job sooner (Anderson and Burkhauser, 1985; Dwyer and Mitchell, 1999; McGarry, 2004), and it has been argued that a large part of the negative effects of retirement that are sometimes found (Butterworth *et al.*, 2006) are owing to this endogenous relationship between health and retirement. Studies aimed at controlling for this endogeneity tend to conclude that (early) retirement has modest but positive effects for various outcomes of health and well-being (Coe and Lindeboom, 2008; Lindeboom and Kerkhofs, 2009; Lindeboom and Andersen, 2010; Coe and Zamarro, 2011; Hallberg, Johansson and Josephson, 2014; Insler, 2014). What has remained largely unanswered, however, is the question of whether retirement will lead to better health by alleviating job stress. Recapitulating, there is much research on how retirement influences health and vice versa, and also on how job stress affects health. The current study brings these fields together, by investigating *how retirement affects self-rated health, and how this relationship is influenced by experienced psychological job stress and physical job demand before retirement.*

Only a few recent studies investigated effects of job stress on self-rated health after retirement. Van Solinge (2007) explored a multitude of predictors for three different measures of health in retirement, but found no significant effects of pre-retirement job stress on post-retirement self-rated health. A disadvantage of this study is that the sample consists of only retirees, thus it does not have a 'control group' of comparable working people. Comparing retirees with continuous workers is important, as the potential health benefits of retirement may be relative to those who remained employed. Although Westerlund *et al.* (2009) use up to 14 waves of longitudinal data, they also exclusively look at retirees. They show that for retirees who experienced their job as psychologically and physically demanding, the odds of reporting suboptimum health decreased more after retirement than for those who view their job as less demanding. In doing so they provide evidence for the 'relief hypothesis', but the sample in this study consisted only of former employees from the French national gas and electrical company.

Retirement has also been shown to be particularly beneficial for those with pre-retirement health problems (Westerlund *et al.*, 2009). That is, the poorer the health of a person, the more this burden is alleviated by retirement. This is in line with the finding that people with high job stress benefit more from retirement, because the assumption is that such stress is detrimental for health. These findings have not been combined, however, so an important question that remains is whether the relief from job stress is the only mechanism through which retirement leads to health improvement, or if other factors also play a role. In other words: when job stress is not the cause of lower pre-retirement health, does retirement still have a positive effect on health? This study expands on the literature by taking this question into account.

Data for this study stem from a panel survey among 1,455 older Dutch employees who were interviewed in 2001 and again in 2006/2007, when about 56 per cent had retired. The Dutch situation with regard to retirement does not differ substantially from other western European countries (Euwals, De Mooij and Van Vuuren, 2009). Policies regarding retirement and pensions have been changing or under debate in recent times. While the average age at which people move out of the workforce has been rising, the retirement culture was and remains one of early exit from the labour force (i.e., before age 65 years). The average age at which a person retired in the period between 2001 and 2007 was around 60 years (Siermann and Dirven, 2005). Testimony to the importance of the relationship between health and work at older ages is the fact that more than half of the group that receives a (temporary) disability

benefit in the Netherlands is in the age group of 55–65 years (Statistics Netherlands, 2014).

Theoretical Perspective

There are two basic views of how retirement may affect health. The first, more classical, view is that retirement in itself is a stressful event that leads to disease susceptibility, either directly (Carp, 1967) or indirectly through the loss of support networks (van Tilburg, 1992), an identity providing role, and a structure for daily life (Atchley, 1976), which causes people to experience feelings such as loneliness and uselessness (Bradford, 1979), and perhaps engage in unhealthy behaviour such as smoking and drinking (Henkens, van Solinge and Gallo, 2008). Another general view is that retirement is a health preserving transition, for example, because it relieves people from their job and the stress it brings with it (Ekerdt, Bosse and LoCastro, 1983). Over the years, this view has been modified and expanded by taking people's life histories, their resources, and job circumstances into consideration, leading to a view of retirement adjustment as a resource-based dynamic process (Wang, Henkens and van Solinge, 2011). This article fits into that literature, arguing that the effect of retirement is largely dependent on the job that a person retires from.

There are several important ways in which retirement can ameliorate health. A first mechanism involves the time that becomes available after the cessation of paid work. A newly retired person has (more) time and freedom to engage in hobbies or volunteering, spend quality time with a partner or friends, sometimes sleep in, or pursue other pleasurable leisure activities (van den Bogaard, Henkens and Kalmijn, 2014). Such activities can promote happiness and well-being in a general sense, which in turn improves health (Uchino *et al.*, 1996).

People are also more likely to engage in specific health behaviour after retirement, such as regular exercise or seeking medical care and advice (Cozijnsen, Stevens and Van Tilburg, 2013; Insler, 2014). First, simply because people have more time for such activities. But secondly, because retirement can be characterized as a change in agency. The structure of retirees' life changes so that they are no longer required to 'sell' their time to an employer; their time is their own. This can be characterized as a partial shift from proxy agency, acting on behalf of another, to personal agency, setting goals and pursuing them on individual behalf (Thoits, 2006). When a person retires, the goal of good health may become more important because the benefits of good health are entirely for the retiree. They may realize that they want to spend their remaining years in the best health possible, and this change of frame is an incentive to invest in a healthier lifestyle. It is therefore expected that overall, *retirement will have a positive effect on self-rated health (H1a)*.

There must be 'room to improve', however. That is, this expected effect is likely to exist mostly for those with low initial self-rated health. People with poor health will benefit most from retirement because they have the most potential to improve. For that reason, it is important to not only include initial self-rated health as a control variable, but also to include the interaction of retirement with self-rated health at wave 1 (SRH_{t1}). The expectation is that *the lower pre-retirement self-rated health is, the more it will improve after retirement vis-à-vis those who remain at work (H1b)*.

Another mechanism through which retirement may improve health is centred around that which is no longer a part of everyday life: the job. Certainly, a person's job may represent many positive features, but it may just as well be experienced as a compulsory activity, filled with unpleasant obligations, physical strains, deadlines, and stress. This article looks at both the physical demand and psychological stress that is experienced on the job. Concentrating on the amount of demand or stress that a person *experiences* in his or her work is straightforward and useful, because what one person considers stressful may be stimulating for another (Thoits, 1995, 2006).

Understandably, physically strenuous work can directly cause bodily harm. Such work generally includes features such as moving heavy objects, having to work rapidly, constantly recurring motions (Winwood and Lushington, 2006), or work in a dirty, harmful environment. Work with such physical demands or in such environments has been attested to cause health problems, for example arthritis (Felson *et al.*, 1991) and lower back pain (Waddell and Burton, 2001), but also psychological deprivation (Bromet *et al.*, 1992), even in later, retired life (Wahrendorf *et al.*, 2012). Because self-rated health captures these various health outcomes, it can be expected that physically arduous work can lead to lower self-rated health. Retirement from such a job is hypothesized to be a relief from the causes of health strains, thus improving health. Also when health damage is irreversible, retirement may provide a relief and the opportunity to cope with the issue without the daily demands of work. *The more experienced physical demand on the job, the more self-rated health will improve after retirement vis-à-vis those who remain at work (H2a)*.

Psychological job stress can also undermine health. Stress in itself is not inherently bad—it merely represents

the body preparing for a challenge through elevated levels of stress-related hormones like cortisol and adrenaline and increased heart rate and blood pressure. When this is temporary, it is generally harmless. However, prolonged exposure to stress can lead to sustained activation of the body, causing negative health outcomes, psychological and physical (McEwen, 1998). The body needs time to 'unwind', recuperate from stress, through a stressless period of rest. A person may not be able to adequately unwind when he or she experiences high job stress and feels the next day of work is already calling. Thus, continuous high job stress can cause a person to remain feeling tense, unable to sleep or concentrate. Stress at work then spills over into other domains of life, causing lower levels of life satisfaction (Hayes and Weathington, 2007), more depressive symptoms (Paterniti *et al.*, 2002), and even psychiatric disorders (Stansfeld *et al.*, 1999). See Nieuwenhuijsen, Bruinvels and Frings-Dresen (2010) for a systematic review of how job stress causes psychological health deprivation.

Most likely through the same physiological mechanism, psychological stress on the job can also lead to physical health problems. Psychological work stress has been repeatedly linked with physical problems, like coronary disorders and metabolic risk factors, such as increased blood pressure, abdominal obesity, and unhealthy levels of cholesterol (Marmot *et al.*, 1997; Vrijkotte, Van Doornen and De Geus, 2000; Chandola, Brunner and Marmot, 2006). Another way through which psychological stress can lead to health problems is via harmful health behaviour, like smoking and alcohol consumption (Steptoe, 1991). Thus, when people experience their job as psychologically stressful, they are relatively prone to develop both physical disorders and lower levels of psychological well-being. Escaping such a job via retirement relieves work stress, allowing bodily functions to return to healthier levels, causing people to rate their health more positively. Overall, the expectation is that *the more experienced psychological stress on the job, the more self-rated health will improve after retirement vis-à-vis those who remain at work (H2b)*.

Data and Methods

Sample

This study uses the NIDI Work and Retirement Panel data, collected by the Netherlands Interdisciplinary Demographic Institute (NIDI). Data were collected among (i) all employees aged 50–64 of more than 80 businesses attached to three large Dutch multinational corporations, active in manufacturing, retail, and information technology, as well as among (ii) a random sample of equally aged civil servants of the Dutch government. For the first wave (2001), a total of 3,899 people were mailed a questionnaire, of which 2,403 responded (response rate 62 per cent). A follow-up was conducted in 2006/2007, where some attrition occurred because of company takeovers (N = 122), untraceable participants (N = 11), and mortality (N = 41). For this study, it would be interesting and important to know if people from this latter group retired before retirement, as their exclusion may bias results. This information is unknown, however. A total of 1,678 people responded of the 2,239 who were contacted for wave 2 (response rate 75 per cent). A total of 80 cases (<5 per cent) were removed from the sample because of missing values on one or multiple variables.

Several respondents (N = 69) indicated that they experienced health problems that caused them to involuntarily retire. It is likely that these people experienced severe health complications between wave 1 and retirement, which were enduring at wave 2. For reasons of endogeneity, these people have been left out of the final sample, because they might bias the results (i.e., an underestimation of the effect of retirement). It must be noted, however, that there could be cases in the remaining sample that may not have indicated that they retired because of health reasons, but still let their (bad) health situation play a role in their retirement decision process (Lindeboom and Kerkhofs, 2009; Lindeboom and Andersen, 2010). This would also entail a certain effect of people in relatively bad health selecting themselves into retirement. Several robustness tests in the Supplementary Material are aimed at dealing with this problem.

Following Pinquart and Schindler (2007), respondents still receiving wages after retirement (thus also receiving retirement benefits) were excluded because it is impossible to unambiguously determine the work status of people in such 'bridge employment'. The final sample consists of 1,455 respondents, all working at wave 1, of whom 819 (56 per cent) moved to being fully retired at wave 2, while 636 remained in paid employment.

Measurements

Dependent variable

The widely used variable self-rated health is measured by a single item in both waves, which asked '*how is your health, in general?*'. This direct measure has proven to be highly correlated to physical measures of health (Wallace and Herzog, 1995) and strongly predictive of physical deterioration (Idler and Benyamini, 1997). It

has even been stated that, precisely *because* of the subjective element, self-rated health has added value over 'objective' measurements (Deeg and Bath, 2003). Response categories ranged from 0 (*very bad*) to 4 (*very good*). The distribution of this variable is rightly skewed, with a mean around 3.1 in both waves, corresponding with 'fairly good'. A little <20 per cent reported suboptimum health (very bad; bad; not good; or bad), more than half described their health as fairly good, and 30 per cent as very good. Descriptive statistics and coding properties of self-rated health and other variables can be found in Table 1.

Independent variables

Every respondent was in his or her paid career job at wave 1, and were considered as retired if they indicated that they had made a full exit from their career job and were receiving a pension and/or a retirement benefit at wave 2. People still in their career job at wave 2 were considered as continuously working. The modal age at which people in the sample retired was 60 and the average time since their retirement was around 34 months, or a little under 3 years at wave 2.

The physical demand people experienced on their job was measured in wave 1 by asking respondents to indicate on a 5-point Likert scale (0–4) how much they agreed with the statement '*my work is physically straining*' (see Table 2). Overall, a majority of the respondents (66 per cent) indicated that they (strongly) disagreed with this statement, while 19 per cent did not agree or disagree, and a minority of 15 per cent (strongly) agreed. The mean for this variable is 1.3. Overall it seems only a minority experienced substantial physical strain at work. For the analyses, this variable was standardized.

Table 1. Descriptive statistics of (unstandardized) variables

Variable	Mean	*SD*	Description
Self-rated health t1 (SRH1)	3.12	0.79	Based on question: *How is your health, in general?* 0 = very bad, 4 = very good. Used as standardized (range: −3.75 to 1.12) and dummified versions.
Self-rated health t2	3.09	0.77	See self-rated health t1.
Retired	0.56	0.50	0 = continuously working; 1 = retired (early) between waves.
Physical demand	1.31	1.08	Rating of item *my work is physically straining*. Answer categories: 0 = *completely disagree* to 4 = *completely agree*. Standardized for analyses (range: −1.22 to 2.48).
Psychological stress	1.84	0.92	Scale (mean) of three items: (i) *the amount of work is sometimes too much to do everything right*, (ii) *I have to go to great lengths to do everything right*, (iii) *the work pressure is sometimes so high that it leads to tensions*. Answer categories: 0 = *completely disagree* to 4 = *completely agree*. Standardized for analyses (range −2.02 to 2.33).
Low education	0.40	0.49	Indicator for highest completed level of education. 1 = Elementary school, lower vocational.
Middle education	0.27	0.44	See Low education. 1 = (preparatory) middle-level vocational education; higher secondary education.
High education	0.33	0.47	See Low education. 1 = higher vocational; university or higher.
Occupational status	54.56	13.81	International Socio-Economic Index (ISEI) for occupational status (Ganzeboom, de Graaf and Treiman, 1992; Ganzeboom and Treiman, 1996). Standardized for analyses (range −2.79 to 2.42).
Female	0.26	0.44	0 = male; 1 = female.
No partner	0.13	0.34	Partner status of respondent. 0 = no partner; 1 = partner.
Working partner	0.32	0.47	Partner status of respondent. 0 = no partner / non-working partner; 1 = working partner
Non-working partner	0.54	0.50	Partner status of respondent. 0 = no partner / working partner; 1 = non-working partner
Child(ren) in household	0.33	0.47	Indicator for children living in the household. 1 = yes.
Income	2,896	1,213	Net household income. Log linearized and standardized for analyses (range −2.35 to 3.75).
Age	54.20	2.88	Age at wave 1. Standardized for analyses (range −1.47 to 3.78).

Source: NWRP 2001 & 2006/2007).
N of observations is 1,455 for all variables.

Table 2. Distribution of answers (percentages) on item 'My work is physically straining' and scale for psychological job stress

'My work is physically straining'		Psychological job stress[a]	
Strongly disagree	333 (22.9)	Very low	97 (6.7)
Disagree	626 (43.0)	Low	467 (32.1)
Not agreed / disagreed	271 (18.6)	Not high / low	518 (35.6)
Agree	157 (10.8)	High	320 (22.0)
Strongly agree	68 (4.7)	Very high	53 (3.6)
Total	1,455 (100)		1,455 (100)

[a]For reasons of clarity and brevity, categories of job stress were created for this figure based on indiscrete scale ranging from 0 to 4. Very low: 0–0.5; Low: >0.5–1.5; Not high / low: >1.5–2.5; High: >2.5–3.5; Very high: >3.5.

Psychological job stress was measured through a scale composed of three items (Cronbach's alpha 0.75), all asking respondents their agreement with a statement on a 5-point Likert scale. For example, one statement was '*the amount of work is sometimes too much to do everything right*'. See Table 1 for wording of all statements. The unstandardized scale (mean score of the three items) ranges from 0 to 4, with a mean of 1.8. It is challenging to make substantive statements about what a certain score on this scale precisely means in terms of stress, but a higher score certainly denotes more experienced stress at work. Translated back to the discrete values of the original items, only a minority (26 per cent) seems to experience significant psychological stress at work (see Table 2). The operationalizations of physical job demand and psychological job stress are rather straightforward, asking respondents directly about their perceptions regarding pressure at work. While there are more extensive and differentiated measures of work stress, this approach is similar to those used in prior research (Westerlund *et al.*, 2009).

The mean age at wave 1 was 54. The majority of sample is male (74 per cent), and has a partner (87 per cent). Of all partners, about one third is in paid employment. A little more than one third of the respondents have one or more children living in their household. Other control variables for the analyses include educational level, income level, and the socio-economic status attached to the occupation. Descriptive statistics and coding properties of all variables, before standardization, can be found in Table 1.

Method

To optimally exploit the panel nature of the data, a conditional change method is applied, with self-rated health at wave 2 as the dependent variable and self-rated health at wave 1 as independent variable. This way, the analyses include the baseline level of self-rated health for each individual respondent, which is a control for initial levels of health differing between retirees and those who stayed in the workforce. In the Supplementary Material, it is further explained why this approach is preferred over the fixed-effects approach, and outcomes of this alternative method and further robustness checks are presented.

Self-rated health is measured on a five-point scale and is skewed to the left. Standard Ordinary Least Squares regression with this type of variable can be problematic, as assumptions concerning the distribution and measurement level are violated. This study uses ordered logistic regression to analyse the data, using all variety on the dependent variable while taking its possible heteroscedastic and non-linear nature into account. Thus, the final method applied is a conditional change ordered logistic regression, which has been applied before (Musick *et al.*, 1998).

Results

Model 1 in Table 3 shows the results of the basic model, including retirement and all control variables. This model clearly shows that overall, retirement is positively associated with self-rated health ($B = 0.35$, $P < 0.01$), which provides support for hypothesis 1a. This result has been replicated using additional tests (see the Supplementary Material). The model also includes an interaction between retirement and self-rated health at wave 1. This latter variable (SRH_{t1}) is standardized for the interaction, which means that the coefficient for retirement applies to retirees with average levels of pre-retirement health. The significant interaction term ($B = -0.30$, $P < 0.01$) offers support for the hypothesis that retirement particularly benefits those who report relatively low pre-retirement health (H1b). Translating these findings back to the original distribution of SRH_{t1} means that for those who reported very good health at

Table 3. Ordered logistic conditional change regression coefficients for change in self-rated health (standard errors)

	Model 1	Model 2	Model 3	Model 4
Retired	0.28*	0.27*	0.27*	0.27*
	(0.14)	(0.14)	(0.14)	(0.14)
Retired × Physical demand		0.10		0.04
		(0.11)		(0.11)
Retired × Psychological stress			0.23*	0.22^{+}
			(0.11)	(0.12)
Retired × SRH1	−0.32**	−0.30**	−0.26*	−0.26*
	(0.12)	(0.12)	(0.12)	(0.12)
Physical demand	0.01	−0.05	0.00	−0.02
	(0.06)	(0.09)	(0.06)	(0.09)
Psychological stress	−0.05	−0.05	−0.17*	−0.16^{+}
	(0.06)	(0.06)	(0.08)	(0.08)
Middle education[a]	−0.17	−0.18	−0.18	−0.18
	(0.14)	(0.14)	(0.14)	(0.14)
High education[a]	−0.04	−0.04	−0.05	−0.05
	(0.16)	(0.16)	(0.16)	(0.16)
Occupational status	0.05	0.05	0.05	0.05
	(0.07)	(0.07)	(0.07)	(0.07)
Female	0.23	0.22	0.22	0.22
	(0.15)	(0.15)	(0.15)	(0.15)
Non-working partner[b]	−0.10	−0.09	−0.11	−0.10
	(0.17)	(0.17)	(0.17)	(0.17)
Working partner[b]	−0.19	−0.19	−0.21	−0.20
	(0.19)	(0.19)	(0.19)	(0.19)
Child(ren) in household	−0.22^{+}	−0.21^{+}	−0.21^{+}	−0.21^{+}
	(0.12)	(0.12)	(0.12)	(0.12)
Income	0.27***	0.27***	0.28***	0.28***
	(0.07)	(0.07)	(0.07)	(0.07)
Age	−0.03	−0.03	−0.03	−0.03
	(0.07)	(0.07)	(0.07)	(0.07)
SRH1: very bad[c]	−4.64***	−4.63***	−4.56***	−4.56***
	(0.92)	(0.92)	(0.93)	(0.93)
SRH1: bad[c]	−4.99***	−4.96***	−4.88***	−4.88***
	(0.45)	(0.45)	(0.45)	(0.45)
SRH1: not good / not bad[c]	−3.72***	−3.71***	−3.65***	−3.65***
	(0.25)	(0.25)	(0.25)	(0.25)
SRH1: good[c]	−2.04***	−2.03***	−2.00***	−2.00***
	(0.15)	(0.15)	(0.15)	(0.15)
Cut 1	−7.81***	−7.80***	−7.80***	−7.79***
	(0.44)	(0.44)	(0.44)	(0.44)
Cut 2	−6.02***	−6.00***	−6.00***	−6.00***
	(0.30)	(0.30)	(0.30)	(0.30)
Cut 3	−3.77***	−3.76***	−3.76***	−3.75***
	(0.25)	(0.25)	(0.25)	(0.25)
Cut 4	−0.66**	−0.64**	−0.64**	−0.63**
	(0.23)	(0.23)	(0.23)	(0.23)
Pseudo R^2	0.160	0.160	0.161	0.161
−2 Log Likelihood	−1,348	−1,348	−1,346	−1,346
N of observations	1,455	1,455	1,455	1,455

Note: Levels of significance: $^{+}P < 0.10$, $^{*}P < 0.05$, $^{**}P < 0.01$, $^{***}P < 0.001$. Analyses included dummies for organization.

[a]Reference: low education.

[b]Reference: no partner.

[c]Reference: SRH1: very good.

wave 1 (1.1 standard deviation above the mean) the coefficient for retirement is near zero ($0.35 - (1.1 \times 0.30) = 0.02$).

Model 2 in Table 3 tests the hypothesis that physically demanding work will exacerbate the health-promoting effect of retirement (*H2a*), but offers no support for this hypothesis. The association between retirement and SRH is not stronger for those who experience more physical demand on the job. Although the interaction coefficient is in the expected direction ($B = 0.10$), it is not significant.

In model 3, the significant interaction term ($B = 0.23$, $P < 0.05$) provides support for hypothesis *H2b*: people who experience higher levels of job stress seem to benefit significantly more from retirement in terms of their self-rated health. Job stress is standardized for the analyses (range:−2.02 to 2.33), meaning that the coefficient for retirement ($B = 0.34$, $P < 0.01$) now refers to those with average levels of job stress. For those who report the lowest job stress, the coefficient for retirement is $0.34 + (-2 \times 0.23) = -0.12$, controlling for all other variables. People reporting the highest amount of stress seem to benefit most from retirement, with a coefficient of $0.34 + (2.33 \times 0.23) = 0.88$.

Note that besides the significant job stress interaction, model 3 also includes a significant interaction of retirement with self-rated health at wave 1. This interaction is smaller compared with model 1 ($B = -0.300$ versus $B = -0.244$), but this difference proved statistically insignificant. More importantly, these findings are congruent with the idea that retirement mostly benefits those with relatively poor health, *partly* owing to the relief of job stress, but *also* through other mechanisms, as both interactions in the model achieve statistical significance. This may indicate that retirement not only improves health through alleviating job stress, but can also improve health when lower self-rated health is not related to job stress. However, this line of reasoning does assume that all empirical measures are optimal and that the statistical model is perfectly specified, which are strong assumptions.

Model 4 in Table 3 is an overall model, with all controls and interactions added. The interactions of retirement with SRH_{t1} and psychological job stress remain significant, although the latter has a *P*-value of 0.06. Overall, the models in Table 3 support the notion that retirement is beneficial for self-rated health, especially for people with low self-rated health before retirement and for those who experience higher levels of psychological job stress.

Figures 1–3 give a graphical depiction how self-rated health changed for workers and retirees. Note that these figures are based on the uncontrolled, bivariate mean scores for workers and retirees in wave 1 and 2. Figure 1

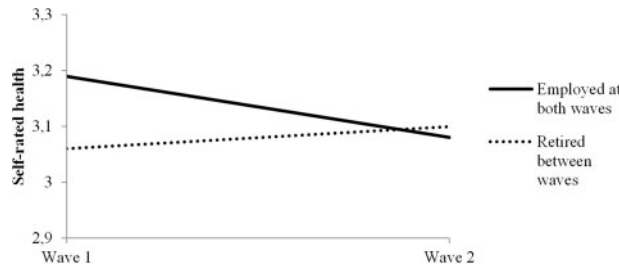

Figure 1. Changes in self-rated health for those who were employed at both waves and those who retired between waves

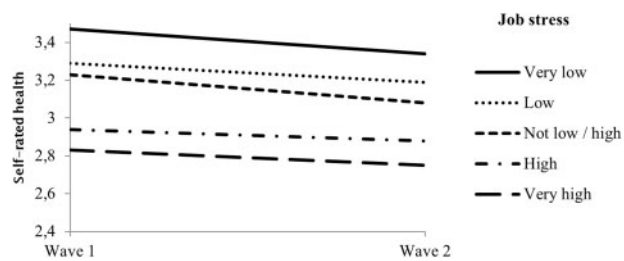

Figure 2. Changes in self-rated health for people who were employed at both waves by levels of psychological job stress (recoded as in Table 2)

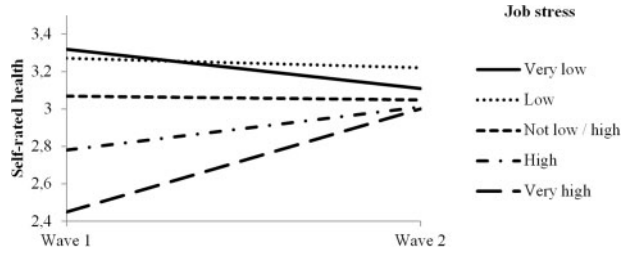

Figure 3. Changes in self-rated health for people who retired between waves by levels of psychological job stress (recoded as in Table 2)

shows that the health benefits associated with retirement are relative to those who remained employed in their career job. Retirees start out with a lower SRH, but retirement seems to largely preserve their health compared with workers, who start out with higher SRH but experience a decline in self-rated health over time. There may be health gains associated with retirement, but it mainly appears to prevent further decline of health. Figure 2 shows the change in self-rated health between wave 1 and wave 2 for those who remained in their career job, broken down for various levels of psychological job stress. In line with Figure 1, SRH can be seen to decline over time for this group, as is clear from the descending lines. Further, psychological job stress is associated with lower levels of self-rated health, which is apparent from the distance between the lines.

The interaction between retirement and psychological job stress is visually represented in Figure 3. While the slopes of the lines in Figure 2 are approximately equal, they are distinctly different in Figure 3, showing that those who experienced low levels of job stress seem to experience a small decline in self-rated health between waves, about equal to those who kept working. On the other hand, those who experienced high levels of job stress appear to benefit considerably from retirement. This is in line with the results of model 3 in Table 3, although this figure essentially shows the combined effect of psychological job stress and poor health at wave 1. These effects are related, but kept apart in model 3.

Discussion

This study has offered evidence that psychological job stress is damaging to health, but that retirement provides relief from this stress. Especially those who experience a lot of job stress seem to profit from retirement health-wise. Job stress is therefore an important factor to take into account when investigating effects of retirement on (self-rated) health. For people without substantial job stress, the benefits of retirement are mostly relative to those who keep working. The latter group experienced a decline in self-rated health over the course of data collection, while retirees largely remained at their pre-retirement levels.

The current study further adds to the literature by showing that the relief of stress does not seem to be the only mechanism at play. Even when controlling for this effect, people in relatively poor health benefited more from retirement, signifying that retirement is more than just a relief from work. It was suggested that retirees pursue pleasurable and otherwise health-promoting activities because of an agency change: retirement represents the beginning of a life-phase in which healthy behaviour may be more of a priority. While there is evidence that retirement is *more* than just a relief from potential job stress, it was not within the scope of this study to investigate what precisely more it *is*, or what aspects of a persons' lifestyle change and cause health improvement. Is it that they engage in healthy behaviour, or refrain from unhealthy behaviour? Alternatively, it could be that expectations about health are lowered, a possibility that self-rated health would be sensitive to. This is an interesting topic for future research.

While evidence was provided for the 'relief hypothesis' as far as psychological job stress goes, no support for the moderating effect of physical job demands was found. Perhaps more elaborate measurements of physical job demands are needed to determine such effects, but the findings of this study suggest that physically demanding work, or at least the perception of it, is not necessarily linked to lower self-rated health. A job may be experienced as physically challenging without it being health damaging, and then retirement is not more of a relief than when no physical demand is experienced. Alternatively, it could be that workers with truly back-breaking jobs are not in the sample. In any case, this study has demonstrated that for health outcomes, psychological job stress is perhaps a more important factor to look at than physical job demands.

While this study has provided evidence that retirement is (relatively) beneficial for self-rated health, especially for those who experience high job stress, the disentanglement of the causal relationships between these variables deserves further scrutiny. The decision to retire is likely the result of a long process, and interconnected with job stress, health, and other, possibly unobserved variables. However, the panel nature of this study, the additional robustness checks, and the comparison with non-retired workers suggest that retirement is a source of (relative) self-rated health improvement. Only two waves of panel data were used, making it impossible to precisely determine trajectories of health before and after retirement. It would be interesting to investigate more specifically how long the relative health benefits associated with retirement last, especially when compared with continuous workers. Further, the selection of respondents for the data was not completely random. It is possible that the non-random nature of the data has influenced the results, making it important to approach them with appropriate caution as regards representativeness. Lastly, this study made use of a number of variables that tapped into the stress and demands that people experienced on their job. While these subjective measures are useful and important to gain insight into the stressful aspects of the work environment, more specific and theoretically substantiated measures have been developed. For example, measures that focus on the combination of work demand and control over work, or measures that emphasize the effort–reward balance (Marmot *et al.*, 1997). Future research can use these measures to identify more specific features of the job that play a role in the health–retirement nexus.

Overall, the current study fits into the broad theoretical notion described by Wheaton (1990) that the outcomes of any life event are largely dependent on the nature of the state *before* the transition. This has been attested for health outcomes of retirement with regard to pre-retirement job stress, but there is room to empirically develop this further. More specific and different measures of the pre-retirement job situation can be used. Related to this is the change in the retirement transition itself, which has become longer and fuzzier. Increasingly, people phase out of work rather than suddenly withdrawing, or pick up paid activities after retirement from their career job (Han and Moen, 1999; Henkens van Dalen and van Solinge, 2009). It is possible that this has confounded the definition of retirement in this contribution, and it would be interesting to investigate how different patterns of retirement are associated with experienced stress and health. Also, retirement from a non-working situation, such as unemployment, can be expected to be different from 'normal' retirement, and deserves further scrutiny. Finally, outcomes other than self-rated health can be investigated to create broader and more detailed knowledge of how retirement outcomes depend on the pre-retirement situation.

The findings of this study are of value to policy makers whose goal it is to keep older workers in the workforce longer. Older workers, especially those with health concerns, might not be inclined to go along with this when they know former colleagues feel significantly better after their retirement. Moreover, while keeping people in the workforce longer may suppress costs on pension benefits, this advantage may be partly offset by a potential rise in healthcare costs. It is important to take this possibility into account and investigate more precisely how retirement and health are interconnected to better understand the full scope of consequences that policies may have.

Supplementary Data

Supplementary data are available at *ESR* online.

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