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Abstract

Vitality is the feeling of physical and mental aliveness. Vitality benefits individual, organizational and societal well-being. This study investigates the effects of phased retirement on vitality and how this effect differs for workers dealing with work and home related strain, and by baseline levels of vitality. We used two waves of the NIDI Pension Panel Survey, collected in the Netherlands in 2015 and 2018. Data from 1,247 older workers, of whom 137 (10%) opted for phased retirement between waves, were analyzed. Vitality is assessed in three ways: (1) a composite measure of vitality, and its subcomponents (2) energy and (3) fatigue. Conditional Change OLS Regression models demonstrated that transitioning into phased retirement improved vitality and energy levels and reduced fatigue. Second, partially supporting the baseline vitality hypothesis this study found older workers with low energy levels at baseline to report greater improvements in energy after using phased retirement. The work and family strain hypotheses were largely unsupported. Nevertheless, when looking at the direct effects of work and family strain and phased retirement on vitality, we can infer that workers in demanding situations benefit from phased retirement by being able to prevent a decline in vitality by taking up phased retirement. Older workers with work and family strain are more vulnerable to a decline in vitality as they age at work. Transitioning in to phased retirement can compensate for and perhaps prevent this decline while also providing them with more relief from the burdens of balancing work and family live.

Key words: work-life balance, health, flexible retirement

Does phased retirement increase vitality in older workers? Findings from a 3-year follow-up panel study

Background/Introduction

Everywhere in the Western world, demographic conditions are changing due to the ageing of the population. Concerns regarding the long-term sustainability of the welfare state have urged national governments to redesign their pension systems. Probably one of the bigger and more fundamental changes is the rise in the pension eligibility age (OECD, 2019). There have been many protests across Europe around pension issues, such as large demonstrations and strikes in the France and Italy, as well in the Netherlands (van Solinge & Henkens, 2017). One of the concerns is the feasibility of the increasing public pension ages for employees in heavy and 'unhealthy' occupations and for employees who suffer from poor health. With a further increase of retirement age to be expected, policy makers are challenged to design policies that spare vulnerable groups of older workers in particular. For example, policies that facilitate flexibility in the transition into retirement, such as phased retirement arrangements are seen as a promising instrument in this respect (Fagan, Norman, Smith, & Menéndez, 2014; OECD, 2017). Phased retirement are arrangements that allow employees approaching statutory retirement age to take some of their pension and carry on working on a reduced scheme while staying with the same employer (Hutchens, 2010). The idea behind phased retirement arrangements is that employees can work fewer hours before they retire fully. As a result, there is more time for recovery and a better work-life balance can be achieved. Because of this, it is expected, that these retirement policies will foster older workers' ability to reach the increasing retirement age in good health. This article is among the first to study the effects of the uptake of phased retirement on older workers health.

Phased or phased retirement is a relatively new phenomenon and not much research has been done on its impact on health. The majority of research have looked at the impact of *fulltime retirement* on a broad array of health measures, ranging from general self-rated physical (Westerlund et al., 2009) and mental health (Mein, Martikainen, Hemingway, Stansfeld, & Marmot, 2003) to vitality (Vanajan, Bültmann, & Henkens, 2020) and physical and mental fatigue (Westerlund et al., 2010). The conclusions to be drawn from this literature is that the effect of retirement on health varies between health outcomes. While most studies reveal an effect of retirement on physical health, the direction of this effect is inconclusive (van der Heide, van Rijn, Robroek, Burdorf, & Proper, 2013). However, a majority of studies have found retirement to improve mental health (Midanik, Soghikian, Ransom, & Tekawa, 1995; Sharpley & Layton, 1998; van der Heide et al., 2013). All in all, this literature suggests that the impact of retirement greatly depend on situational factors, such as the characteristics of the job, control over the retirement transition, and personal characteristics such as one's health before retirement. (Calvo, Haverstick, & Sass, 2009; Henning, Lindwall, & Johansson, 2016). There is some research on *flexible retirement* arrangements as well. This literature, however, particularly focused on the impact of phased retirement trajectories (including bridge employment) on post-retirement well-being and mental health (Calvo et al., 2009; De Vaus, Wells, Kendig, & Quine, 2007). Despite its intuitive appeal among public policy makers, the impact of parttime retirement arrangements on health outcomes of older workers still in the workforce remains unexplored. That is unfortunate, since all over the western world pubic pension ages are rising, urging individuals and organizations to adapt to a new reality of extending working lives. There is a need for a better understanding of whether and how certain pension policies facilitate working longer lives through its impact on older workers' health and vitality. This may be particularly relevant for certain sub-groups of older workers, such as workers in physically demanding or stressful jobs and those with heavy care demands - for whom working longer may be more challenging than for others. For them, arrangements such as phased retirement can prevent or compensate for their steeper decline in health and vitality. Therefore this study examines whether taking up phased retirement among older workers who previously had a fulltime job has a positive effect on vitality levels, and whether certain subgroups of older workers (those with stronger work and/or family strain) benefit more than others.

Vitality is defined as the feeling of complete aliveness in the physical (healthy, capable and energetic) and mental (meaning and purpose) sense (Hennekam, 2016). Empirical research has shown that vitality is associated with increased economic, societal and social participation and negatively associated with societal costs (Van Steenbergen, Van Dongen, Wendel-Vos, Hildebrandt, & Strijk, 2016). As such, improving vitality may have potential benefits, not only for individuals, but also for organizations, and societies at large. Older workers with high level of vitality are productive (Carmeli, 2009) and satisfied and successful at their jobs (Hennekam, 2016; van Scheppingen et al., 2014). They are also full of positive energy and are mentally and physically strong (Kark & Carmeli, 2009). On the contrary, older workers with low levels of vitality experience burnout symptoms, especially with emotional exhaustion (Basinska, Wiciak, & Dåderman, 2014).

This study contributes to current literature in three ways. First, this study - to the best of our knowledge - is the first to longitudinally assess the effect of phased retirement on vitality of older workers. Second, we study how effects of phased retirement on vitality might differ for workers dealing with work and home related strain. We assume that in particular older workers strained by demanding work in their organizations or care obligations within the households or for close relatives will benefit from phased retirement. Third, this study is based on 3-year follow-up panel data that offers us the unique opportunity to study the heterogeneity in the effects of phased retirement on vitality based on a sample of older workers aged 60–65 representative for a large part of the Dutch workforce of that age.

In the Netherlands, labor contracts or collective labor agreements have a mandatory retirement applied, and working contracts are usually terminated by default once the older worker has reached the statutory retirement age. Due to pension reforms, retirement age has been gradually rising since 2013, from age 65 and will be 67 by 2024. Early retirement is not common. This is in part due to reforms that have made early retirement undesirable through negative impacts on pension income and restrictions on alternative routes to prematurely exit the workforce such as disability pension (OECD, 2014; Oude Mulders, 2019). As a consequence, the majority of older workers work up to the statutory pension age. Most occupational pension funds offer phased retirement arrangements. Approximately 10 percent of the sample transitioned into phased retirement in between the two study waves.

Conceptual framework

For the foundation of the current study we build on the work-life balance literature. The premise of this literature is that individuals occupy multiple roles. Strong demands in one of these roles, for example non-work (family or personal) demands, may carry over into the working day and adversely influence individual health and performance at work. This multiple demand 'carry over' is bidirectional: home-to work and work-to-home (Greenhaus & Beutell, 1985). The work-life balance literature has shown that disbalance can have negative repercussions for employee performance (Beauregard & Henry, 2009), is associated with adverse health outcomes (Lunau, Bambra, Eikemo, van Der Wel, & Dragano, 2014) and intentions to quit the labor force (Shanafelt et al., 2014). Further, HR instruments such as work hours reduction, work time regulation and flexible work arrangements help improve work-life balance (Haar, Russo, Suñe, & Ollier-Malaterre, 2014). Similarly, phased retirement might provide older workers with the time and space to recover more from work and find a better balance with work and family demands. This may be beneficial for older workers' health in general and vitality in particular. On the basis of the above, the following hypothesis is advanced:

> *Hypothesis 1: The uptake of phased is associated with an increase in vitality among older workers, compared to workers who remain fulltime employed (work-life balance hypothesis)*

Vanajan et al. (2020), in their study on the impact of full-time retirement on vitality, suggest that the mechanisms through which retirement increases vitality may relate to lack of work-related burdens, but also to more rest, more leisure time as well as the opportunities for positive health behavior, which is in line with the premises of the work-life balance literature, as described above. Their study also reveals that the health effects of retirement depended on how healthy older workers are before retirement: older workers experiencing poor vitality before retirement experienced greater surges in vitality after retirement (Vanajan et al., 2020). We assume that this may apply to health effects of phased retirement as well. On that basis, the following hypothesis is advanced:

> *Hypothesis 2: Older workers with lower wave 1 vitality levels benefit more from phased retirement than those with higher vitality levels, in the sense that they have larger increases in wave 2 vitality (baseline vitality hypothesis).*

Previous research increasingly acknowledged that retirement might be more beneficial for some sub-groups than for others. This holds for full retirement where workers in physically and mentally demanding jobs benefit more in terms of health and vitality than workers in jobs with more positive features (van den Bogaard, Henkens, & Kalmijn, 2016; van der Heide et al., 2013; Vanajan et al., 2020). In addition to strain at the workplace many older workers are involved in informal caregiving to dependent spouses, relatives and friends. And this caregiving can generate burden and stress (Mello et al., 2017). Due to increasing public pension ages these caregivers have to continue to combine work and caregiving until much higher ages than earlier cohorts. We posit that in line with the work-life balance literature phased retirement may in particular help to restore the work-life balance of workers with heavy work and/or care demands. On that basis, the following hypotheses are advanced:

> *Hypothesis3a: Phased retirement will be more beneficial for older workers with high work strain (job pressure, physical demanding work, stressful work) than for older workers with lower work strain (work strain hypothesis)*
>
> *Hypothesis 3b: Phased retirement will be more beneficial for older workers with higher family strain (frequent care responsibilities) than for older workers with no caregiving responsibilities (family strain hypothesis)*

Methods

Population

We used data from the NIDI Pension Panel Survey (NPPS), a Dutch prospective cohort study of employed older workers (and retirees) between the ages of 60 and 65 years (Henkens, Van Solinge, Damman, & Dingemans, 2017). The survey was conducted in the Netherlands and administered to all participants over Spring and Summer of 2015 for wave 1 and in the Summer of 2018 for wave 2. The NPPS has a stratified random design. The researchers first drew a stratified sample of organizations from the files of three large pension funds in the Netherlands (ABP, PfZw and BpBouw) along the dimensions of organizational size and sector. These pension funds together represent approximately 49% of the wage employed workers in the Netherlands. This guarantees adequate variation in manual and non-manual labor, job category, educational level and gender (DNB, 2015). Secondly, older workers who were aged between 60 and 65 years at time of sampling (birth cohorts 1950–1955) and who worked for a minimum of 12 hours a week were randomly sampled from the previously selected organizations. A total of 15,470 questionnaires were sent out to selected older workers during the first wave in 2015, of which 6,793 were completed and returned (net response rate of 44%). There was attrition between the first and second waves due to mortality ($N = 86$) and other reasons (e.g. duplication of records, retirement by first wave) ($N = 12$). By the second wave in 2018, questionnaires were sent out to 6,695 older workers who participated in the first wave. Of them, 5,312 responded (net response rate of 79%). We excluded 333 older workers who received a shorter version of the questionnaire that did not include all relevant variables from the sample. Our sample was restricted to workers who were fulltime employed (34 hours a week or more) at wave 1 and still in the workforce at wave 2 (N=*1,312*). Missing information on more than two of the items used to measure vitality led to the exclusion of 65 respondents. The final study sample comprised of 1,247 older workers of whom 137 (10%) made use of a phased retirement arrangement by wave 2, while 1,174 (90%) did not use this arrangement. Phased retirement was assessed by inquiring ‘Do you make use of a phased retirement arrangement ?’at wave 2. Table1 describes characteristics of older workers who opted for phased retirement in between the study waves and older workers who did not.

Measurements

Dependent variables

Vitality at wave 2 was measured using Medical Outcome Study’s Quality of Life Questionnaire, Short Form-36’s (SF-36) vitality scale, a 4-item measure that questions ‘How much of the time during the past 30 days did you feel: (1) full of energy, (2) tired, (3) worn out and (4) full of pep’ (Ware Jr & Sherbourne, 1992). Answers are provided on a six-point scale, ranging from *constantly* (*1*) to *never* (*6*). First, items ‘full of energy’ and ‘full of pep’ were reverse coded. Thereafter, a single continuous measure of vitality at wave 2 was constructed by averaging responses for all four items. Higher values indicated increased vitality at wave 2. This measure of vitality at wave 2 demonstrated high reliability (Cronbach’s alpha = 0.84).

Responses for the two items ‘tired’ and ‘worn out’ were reverse coded and averaged to construct a single continuous measure of fatigue at wave 2 ranging from 1 to 6. Higher values indicated increased fatigue at wave 2. This 2-item measure of fatigue at wave 2 was highly reliable (Cronbach’s alpha = 0.82). A single continuous measure of energy at wave 2 was constructed reverse coding and averaging responses to the two items ‘full of energy’ and ‘full of pep’. Higher values reflected higher levels of energy at wave 2. This 2-item measure showed high reliability (Cronbach’s alpha = 0.76).

Independent variables

All respondents were fulltime employed (34 hours a week or more) at wave 1 and were still in the workforce at wave 2. This was assessed by inquiring ‘Which situation applies to you?’ at wave 2. Responses were expressed by choosing between *I work for pay* and *I am fully retired*. Based on the responses, we considered anyone who was employed in their career job at wave 2 as working. Phased retirement was assessed by inquiring ‘Do you make use of a phased retirement arrangement ?’at wave 2. Responses were expressed by choosing between *No (0)* and *Yes (1)*. We call this parttime retirement status.

Measures of wave 1 vitality, fatigue and energy were constructed using Medical Outcome Study’s Quality of Life Questionnaire, Short Form-36’s (SF-36) 4-item vitality scale, through the same method explained above. This time responses to the vitality scale at wave 1 was used (instead of the responses to the same items at wave 2). Higher values on all three measures indicated higher levels of vitality, fatigue or energy. The wave 1 measures of vitality (Cronbach's alpha = 0.79), fatigue (Cronbach's alpha = 0.83) and energy (Cronbach's alpha = 0.70) demonstrated high reliability.

Work strain-related variables included: job pressure, physically demanding work and stressful work at wave 1. Job pressure was assessed with a 3-item scale at wave 1. Participants were asked to rate to what extend they agreed with the following items: 'My job pressure is so great that it creates tensions'; 'At times there is so much work to be done that I'm unable to do everything'; 'I often have to do my utmost to perform well' (Van Solinge & Henkens, 2014). Ratings for these items were given on a scale from *completely agree (1)* to *completely disagree (5)*. After reverse coding, the three items were used construct a single continuous measure of job pressure at wave 1 which ranged from 1 to 5. Higher values reflected higher levels of job pressure at wave 1 and the scale demonstrated high reliability (Cronbach's alpha = 0.78). Participants' were also asked to rate how physically demanding and how stressful their current jobs were at wave 1. Ratings for both these items were given on a scale from *very (1)* to *not at all (4)*. These measures were subsequently reverse coded for ease of interpretation. Thereafter, they were treated as two separate continuous measures of physically demanding work and stressful work at wave 1 which ranged from 1 to 4. These measures were adopted from the Study on Transitions in Employment, Ability and Motivation (STREAM) survey (Vegchel, Jonge, Söderfeldt, Dormann, & Schaufeli, 2004).

Frequent caregiving responsibilities were assessed using two questions. Based on the responses to the two questions a dichotomized variable of caregiving responsibilities was created. The variable was coded 1 if respondents replied affirmatively to the question 'Do you provide help to family members or friends who are ill or in need of help?' and if affirmed answered the follow up question by stating that they provided this help either '*on a daily basis*', or '*several times a week'*.

Control variables

We controlled for several demographic and health-related factors, all measured at wave 1. Sex was denoted using a dichotomized variable (*1 = male*). First, we measured educational attainment in seven categories: *primary school* (*1*), *lower vocational education* (*2*), *lower general secondary education* (*3*), *intermediate vocational education* (*4*), *upper general secondary education* (*5*), *higher vocational education* (*6*) and *university graduate* (*7*). Thereafter, we grouped categories together to create three dichotomized variables for ease of interpretation: low (1,2,3), moderate (4,5) and high (6,7) educational attainment. Wealth was measured in seven categories ranging from *< 5000 euros* (*1*) to *> 500,000 euros* (*7*). As a health-related control, we adjusted for whether respondents suffered from one or more chronic health condition/s using a dichotomized variable (*1=has a chronic health condition*).

Supplementary Table 1 presents further details on the coding and psychometric properties of all variables (before standardization).

Analyses

To examine the effects of taking up phased retirement on the change in vitality, fatigue and energy between wave 1 and wave 2, three conditional change ordinal least square (OLS) regression analyses were conducted. In conditional change models, we regress the dependent variable measured at wave 2 on the dependent variable measured at wave 1, independent variables and control variables (Aickin, 2009). The inclusion of wave 1 values of the dependent variable as a covariate adjusts for possible ceiling effects. In our conditional change models, the wave 2 scores of vitality, fatigue and energy were the dependent variables. We regressed these dependent variables against their values at wave 1, phased retirement status at wave 2, work strain-related variables at wave 1, the family strain-related variable at wave 1 and controls at wave 1. The effects obtained from this analysis could be interpreted as change effects from wave 1 to wave 2.

In a first step, we examined the effects of phased retirement, work strain, family strain and wave 1 vitality, energy or fatigue on the change in vitality (model 1), fatigue (model 2) or energy (model 3) between wave 1 and wave 2 (Table 2). All models include an interaction term between phased retirement status and wave 1 vitality (model 1), fatigue (model 2) or energy (model 3) on the change in vitality and its subcomponents. In a second step, we examined the interaction effects of phased retirement and work strain- and family strain-related variables on change in vitality, fatigue and energy between wave 1 and wave 2 (Table 3).

In conditional change models, we only observed the change in vitality of older workers who did not retire. Whether older workers younger than public pension age chose to retire fully or parttime or remain fully employed could be caused by a selective process. We estimated Heckman maximum likelihood selection models to prevent this selection bias. First, selection into the sample was estimated based on all independent and control variables (which were originally incorporated in the conditional change models) and three additional variables, age at wave 1 (continuous, *ranging from 60-65 years*), manual labor (dichotomized, *1=manual work*) and subjective health (continuous, *ranging from 1=poor to 5=excellent*). The three additional variables included in the selection equation were assumed to influence the change in vitality and its subcomponents and also older workers' retirement status. Following this analysis, the probability of remaining in the panel, as indicated by Lambda, was calculated using the estimates of parameters in the first model. This value of Lambda was subsequently included in the conditional change OLS models that predicted the change in vitality and its subcomponents. Correcting for selection did not lead to any major changes in our findings. Table 2 presents the results for the conditional change OLS models corrected for sample selection.

We standardized all dependent variables before regression analyses. This permitted the interpretation of dichotomized variables as Cohen's *d* effect sizes (Cohen, 2013). Item non-response was under 5% for any single item in our data. This made using less vigorous missing data imputation methods acceptable (Little, Jorgensen, Lang, & Moore, 2014). Therefore, missing data of all variables, except that of vitality, fatigue and energy were imputed using single stochastic regression (Enders, 2010).

Results

Before we discuss the results of the multivariate analyses on the impact of phased retirement on changes in vitality among older workers, it is important to establish potential difference between older workers who opted for phased retirement and those who did not. Table 1 presents the characteristics of both groups. The table shows that older workers who used phased retirement do not differ much in terms of work characteristics from older workers who remained in fulltime employment. These results suggest that demanding work conditions are not an important driver for the decision to take up phased retirement. With respect to intense caregiving obligations, however, we see clear differences. Older workers who opted for phased retirement are much more likely to be involved in frequent caregiving (20%) than older workers who remained in fulltime work (12.6%).

Table 1 near here

Table 2 presents the results of the conditional change OLS regression analyses. It examines the effects of phased retirement, wave 1 vitality, fatigue, or energy, and the effect of the interaction term between parttime retirement status and wave 1 vitality, fatigue or energy on the change in vitality (model 1), fatigue (model 2) and energy (model 3) from wave 1 to wave 2.

Table 2 near here

Work-life balance hypothesis

Model 1 (Table 2) shows that transitioning into phased retirement increased vitality (Cohen's $d = 0.25$, $p < 0.01$). In model 2 and model 3 we tested the work-life balance hypothesis for fatigue and energy, the two sub-components of vitality. The results mirror to the findings we found for our composite measure of vitality. Transitioning into phased retirement was associated decreased fatigue (Cohen's $d = -0.19$, $p < 0.05$) and increased energy levels (Cohen's $d = 0.27$, $p < 0.001$). As such all models provide support for our work-life balance hypothesis.

Baseline vitality hypothesis

We found partial support for the baseline vitality hypothesis which assumed those with low vitality (high fatigue or low energy) levels at baseline to benefit more from phased retirement. The interaction term between parttime retirement status and wave 1 vitality level on the change in vitality levels from wave 1 to wave 2 was not significant. The interaction term between parttime retirement status and wave 1 fatigue level on the change in fatigue levels from wave 1 to wave 2 was not significant. However, model 3 (Table 2) reveals that the effect of phased retirement on change in energy between wave 1 and wave 2 is dependent on the baseline level of energy at wave 1. Older workers with low levels of energy at wave 1 benefited more from phased retirement than workers with high levels of energy at wave 1 (Cohen's $d = -0.15$, $p < 0.05$), thus supporting the baseline vitality hypothesis for the energy subcomponent.

Work and family strain hypotheses

Table 2 also examines how jobs with high work strain can affect the change in vitality from wave 1 to 2 among all older workers. The results reveal that being engaged in physically demanding work is associated with a decrease in vitality among all older workers (Cohen's $d = -0.07$, $p < 0.05$). The same holds for the components of vitality: physically demanding work is associated with an increase in fatigue (Cohen's $d = 0.06$, $p < 0.05$) and a decrease in energy levels (Cohen's $d = -0.07$, $p < 0.05$) among all workers. Moreover, model 3 (Table 2) also reveals that higher levels of job pressure (Cohen's $d = -0.11$, $p < 0.01$) is associated with a decrease in energy among all older workers.

Additionally, Table 2 describes how having frequent caregiving responsibilities can influence the change in vitality from wave 1 to 2 among all older workers. Having frequent caregiving responsibilities was associated with reduced vitality (Cohen's $d = -0.26$, $p < 0.001$), increased fatigue (Cohen's $d = 0.24$, $p < 0.001$), and reduced energy levels (Cohen's $d = -0.22$, $p < 0.01$) for all older workers.

Looking at the effects sizes for the direct effect of phased retirement on vitality and those of the influence of work and family strain on vitality, our findings suggest that phased retirement might compensate for the losses in vitality associated with caregiving demands, and to a lesser extent this is visible for those in physically demanding jobs.

In Table 3 we tested two interaction hypotheses - the work strain hypothesis and family strain hypothesis - which assumes that older workers in demanding work and/or care situations will particularly benefit from phased retirement by experiencing an increase in vitality, decrease in fatigue and/or an increase in energy levels from wave 1 to wave 2. We constructed Table 3 by extending the baseline models as presented in Table 2 with the interaction terms between job pressure and parttime retirement status, physical demanding work and parttime retirement status, stressful work and parttime retirement status, and care responsibilities and phased retirement.

Table 3 near here

However, our results do not support the two interaction hypotheses for the change in vitality, fatigue and for a large extent the change in energy. The interaction effects between job pressure and parttime retirement status, physical demanding work and parttime retirement status, stressful work and parttime retirement status, and care responsibilities and parttime retirement status were largely not significant. These results suggest that phased retirement is associated with increases in vitality and decreases in fatigue irrespective of the demands of the work or caregiving situation.

We only found one significant interaction effect. Table 3 reveals that workers higher levels of job pressure who opted for phased retirement experienced a greater increase in energy than those with lower levels of job pressure. This is evident from the significant positive interaction between job pressure and phased retirement status on the change in energy between wave 1 and wave 2 in model 3b (Cohen's $d = 0.19$, $p < 0.05$).

Discussion

Our study is the first to date to assess the health effects of taking up phased retirement among older workers who previously had a fulltime job. Our study particularly focused on the impact of parttime retirement arrangements on the vitality of older workers who are still in the workforce. Vitality is the feeling of physical and mental aliveness. Vital employees have been shown to be productive, strong and satisfied with their work and personal lives (Carmeli, 2009; Kark & Carmeli, 2009; van Scheppingen et al., 2014). Building upon the work-life balance literature, we assumed that individuals occupy multiple roles, and that strong demands in one of these roles is associated with adverse health outcomes (Lunau et al., 2014). Phased retirement arrangements may help to restore a disbalance, and as a result may be beneficial for health in general and vitality in particular (*work-life balance hypothesis*). This literature also suggests that parttime retirement may in particular help to restore the work-life balance of workers who experience poor health (*baseline vitality hypothesis*), are involved in heavy workloads (*work strain hypothesis*) and/or have substantial care loads (*family strain hypothesis*).

First, our empirical findings supported the work-life balance hypothesis. Transitioning into phased retirement improved vitality and energy levels and reduced fatigue. Second, partially supporting the baseline vitality hypothesis this study found older workers with low energy levels at baseline to report greater improvements in energy after using phased retirement arrangement. While work (physically demanding work) and family (frequent caregiving responsibilities) strain did have a direct effect in reducing vitality with time, we did not find enough evidence that phased retirement particularly improved the vitality of older workers with work and family strain. Although we did find that workers in high pressure jobs are more likely to experience improved energy levels if they opt for phased retirement options, the work and family strain hypotheses were largely unsupported. Nevertheless, when looking at the direct effects of work strain, family strain and phased retirement on vitality, we can infer that workers in demanding situations (physical demanding work and frequent caregiving) benefit from phased retirement by being able to prevent a decline in vitality by taking up phased retirement. Older workers with work and family strain are more vulnerable to a decline in vitality as they age at work.

Transitioning in to phased retirement can compensate for and perhaps prevent this decline in health while also providing them with more relief from the burdens of balancing their work and family lives.

Interestingly, the positive effects of phased retirement are equally visible among workers that lack adverse working conditions and care giving responsibilities. Apparently phased retirement gives older workers opportunities to improve their work-life balance in general. This fits in with results of earlier studies that show that full retirement is also associated with increasing levels of vitality (Vanajan et al., 2020).

These results offers dilemma's for policy makers. The question is whether phased retirement is an option to be promoted in organizations at large, or that it should primarily be focused on targeted groups of older workers, such as those in physically demanding jobs and those who provide frequent care to relatives or friend. The dilemma is that on the one hand a broad use of phased retirement among older workers improves their vitality to a certain extent. These increases in vitality might also benefit workers productivity. On the other hand, phased retirement may reduce the overall labor supply, which is at odds with governments' goal of increasing the labor supply of older workers. This brings to question on when and to whom phased retirement arrangements should be offered: should this choice be left to the discretion of the individual organization? should it be prioritized based on the need or vulnerability of the individual worker? or should it be a decision made by the worker based on his/her financial, mental and physical capacity? These questions could act as directions for future policy debate.

This article has several noteworthy strengths. The core strength of this study is that it goes beyond existing literature in the health-retirement nexus by studying the impact of phased retirement on vitality and its subcomponents and by examining how this effect may vary for workers experiencing poor health or with heavy work and/or family loads. Using a large and diverse panel study of older workers that have been questioned with a three year time interval, we were able to detect changes in vitality within a group of previously fulltime employed older workers that took up phased retirement in between the study waves, and compare them with a control group of older workers who remained employed full time. As such it contributes to the emerging literature on ways to promote healthy ageing at the workplace.

Our study is, however, not without limitations. First, the number of older workers who used the phased retirement route is relatively small. This limits the statistical power for testing the interaction hypotheses. Second this study is carried out in the Netherlands, which is known for its financially relatively generous retirement system. The Netherlands is also characterized by relatively large shares of workers that work parttime across the life course. We do not know to what extent our findings are generalizable to other countries with less generous retirement systems and where parttime work is uncommon. Future studies, should consider the use of a larger sample with a larger number of transitions into phased retirement, and compare the benefits of phased (flexible) retirement in retirement systems that differ from that of the Netherlands.

Maintaining high vitality levels of their older workers is a key challenge for organizations dealing with an ageing workforce and retirement reforms that induce longer working lives. A recent study by Turek, Oude Mulders, and Henkens (2020) shows an increase in employers strategies implementing a combination of developmental (e.g. training), accommodating (e.g. work time flexibility) and exit measures (e.g. phased retirement). Our study shows that these HR-practices are highly needed for older workers with high work and family loads who experience decreasing levels of vitality with time. This could not only promote the health and well-being of the individual worker, but in extension the wellbeing of their families and the productivity and climate of the organization itself. Moreover, our study provides evidence of the benefits of phased retirement options as a method to sustainably ensure the healthy ageing of not only vulnerable but *all* older workers.

Supplementary table 1 near here

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Table 1.

Descriptive statistics by phased retirement status (N=1,247)

Variables	Makes use of Phased Retirement?			
	No		Yes	
	Mean	SD.	Mean	SD
Vitality at w1	4.27	0.83	4.39	0.73
Vitality at w2	4.21	0.86	4.47	0.77
Fatigue at w1	4.18	0.96	4.33	0.98
Fatigue at w2	4.18	0.96	4.46	0.83
Energy at w1	2.64	0.93	2.53	0.71
Energy at w2	2.75	0.95	2.53	0.90
Job Pressure at w1	2.91	0.83	2.97	0.83
Physical demanding work at w1	1.83	0.98	1.76	0.94
Stressful work at w1	2.69	0.85	2.74	0.79
Caregiving responsibilities at w1 (1 = yes)	0.13	0.33	0.20	0.41
Sex (1 = male)	0.80	0.40	0.80	0.41
Educational attainment at w1	2.28	0.79	2.34	0.74
Wealth at w1	4.06	1.71	3.91	1.72
Having a chronic health condition/s at w1 ((1 = yes)	0.64	0.48	0.63	0.48
N	1,120		127	

Table 2.

Results of multivariate regression analysis (second stage output of a two-step Heckman model) to explain the effects of work-retirement status at wave 2 on change in vitality, fatigue or energy between wave 1 and wave 2

Variables	Model 1 Vitality at w2		Model 2 Fatigue at w2		Model 2 Energy at w2	
	Coef.	SE	Coef.	SE	Coef.	SE
Vitality at w1	0.569***	0.028				
Fatigue at w1			0.557***	0.029		
Energy at w1					0.448***	0.027
Phased retirement between w1-w2 (1 = yes)	0.248**	0.080	-0.190*	0.083	0.267***	0.080
Vitality/fatigue/energy at w1 by parttime retirement	-0.084	0.086	0.022	0.100	-0.154*	0.077
Independent variables						
Job Pressure	-0.067	0.037	0.059	0.038	-0.106**	0.037
Physically demanding work	-0.071*	0.029	0.059*	0.030	-0.069*	0.029
Stressful work	0.019	0.034	-0.001	0.035	0.027	0.034
Frequent caregiving responsibilities (1 = yes)	-0.259***	0.070	0.242***	0.072	-0.223**	0.071
Demographic controls (w1)						
Gender (1 = male)	0.068	0.064	-0.107	0.066	0.011	0.065
Educational attainment (ref. = low)						
Moderate	0.173*	0.076	-0.113	0.079	0.223**	0.079
High	0.224**	0.085	-0.164	0.087	0.299***	0.087
Wealth	0.024	0.015	-0.024	0.015	0.023	0.015
Having a chronic health condition/s (1 = yes)	-0.108*	0.052	0.084	0.053	-0.153**	0.052
Constant	-0.261	0.155	0.276	0.162	-0.065	0.153
Lambda	0.259***	0.067	-0.231***	0.069	0.234***	0.068
N (censored/uncensored)	1,247 / 2,321		1,247 / 2,321		1,247 / 2,321	
Wald X^2	789.23 **		708.13***		544.96***	

Note. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$. Coef. = coefficient, SE = standard error, w1 = wave 1, w2 = wave 2. All models control for employment sector.

Table 3.

Interaction effects of phased retirement and work and care-related variables on change in vitality, fatigue and energy between wave 1 and wave 2 (N=1,247)

Variables	Vitality at w2		Fatigue at w2		Energy at w2	
	Coef.	SE	Coef.	SE	Coef.	SE
Job pressure by phased retirement	0.131	0.093	-0.055	0.096	0.189*	0.095
Physically demanding work by phased retirement	-0.017	0.082	0.035	0.085	-0.048	0.084
Stressful work by phased retirement	0.073	0.097	0.063	0.101	0.182$	0.099
Frequent caregiving responsibilities (1 = yes) by phased retirement	0.167	0.195	-0.176	0.201	0.096	0.199

Note. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$. Coef. = coefficient, SE = standard error. Interaction terms are derived from separate analyses

Supplementary Table 1.

Descriptive statistics and details on the coding and psychometric properties of all variables (N=1,312)

Variables	Mean	*SD*	Alpha	Coding and psychometric properties	Wording of survey question
Dependent variables					
Vitality at w1	4.27	0.82	0.79	Continuous variables, ranging from 1 to 6 (item (i) and (iv) were reverse coded)	How much of the time during the past 30 days did you feel: (i) full of energy (ii) tired (iii) worn out (iv) full of pep (6 answer categories on a Likert scale ranging from 1=constantly to 6=never)
Vitality at w2	4.23	0.86	0.84		
Fatigue at w1	2.64	0.96	0.83	Continuous variables, ranging from 1 to 6 (items were reverse coded)	How much of the time during the past 30 days did you feel: (i) tired (ii) worn out (6 answer categories on a Likert scale ranging from 1=constantly to 6=never)
Fatigue at w2	2.73	0.96	0.82		
Energy at w1	4.18	0.91	0.70	Continuous variables, ranging from 1 to 6 (reverse coded)	How much of the time during the past 30 days did you feel: (i) full of energy (ii) full of pep (6 answer categories on a Likert scale ranging from 1=constantly to 6=never)
Energy at w2	4.19	0.95	0.76		
Independent variables					
Gradual retirement	0.10	0.31		Dichotomized variable: 1 = yes 0 = no	Do you make use of a gradual retirement arrangement ? (2 answer categories: 1 = no, 2 = yes)
Job pressure at w1	2.92	0.93	0.78	Continuous variable, ranging from 1 to 5 (reverse coded)	To what extent do you relate to the following items: (i) My job pressure is so great that it creates tensions (ii) At times there is so much work to be done that I'm unable to do everything (iii) I often have to do my utmost to perform well (Van Solinge & Henkens, 2014)

					(5 answer categories: 1 = completely agree to 5 = completely disagree)
Physically demanding work at w1	1.84	0.99		Continuous variable, ranging from 1 to 4 (reverse coded)	Is your work physically demanding? (4 answer categories: 1 = very to 4 = not at all)
Stressful work at w1	2.70	0.84		Continuous variable, ranging from 1 to 4 (reverse coded)	Is your work stressful? (4 answer categories: 1 = very to 4 = not at all)
Caregiving responsibilities at w1	0.13	0.34		Dichotomized variable: 1= yes, if respondents replied affirmatively to the first question, and stated in a follow up question that they provided this help either '*on a daily basis*' or '*several times a week*'. 0= no, else	Do you provide help to family members or friends who are ill or in need of help? If yes: How frequently do you provide that help? (5 answer categories: 1= daily to 5 = a couple of times a year)
Control variables at w1					
Sex	0.80	0.40	0.40	Dichotomized variable: 1 = male 0 = female	Are you a man or woman? (2 answer categories: 1 = man, 2 = women)
Educational attainment	0.27	0.44		Three dichotomized variables: Low (0,1)	What is the highest level of education you've completed? (7 answer categories: 1=elementary school, 2=lower vocational education, 3=lower general secondary education, 4=intermediate vocational education, 5=upper general secondary education, 6=higher vocational education, 7=university) The answer categories were grouped together to create three dichotomized variables: low (1,2,3), moderate (4,5) and high (6,7) educational attainment.
	0.25	0.43		Moderate (0,1)	
	0.48	0.50		High (0,1)	
Wealth	4.03	1.70		Continuous variable ranging from 1 to 7	How large do you estimate your total wealth (own house, savings, stocks etc. minus debts/mortgage) 7 answer categories: 1 = < 5000 euros to 7 = > 500,000 euros.
Having a chronic health condition/s	0.63	0.48		Dichotomized variable: 1 = yes, if respondents experienced one or more chronic health condition 0 = no	Do you have one or more of the following longstanding diseases, as diagnosed by a doctor? List of 12 chronic health conditions, e.g. arthritis, cardiovascular diseases etc. (answer structure: chose between yes or no)

Note. SD = standard deviation, w1 = wave 1, w2 = wave 2