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Sustaining the Work Ability and Work Motivation of Lower-educated Older Workers: Directions for Work Redesign**

This study examines directions for work redesign which might lead to the creation of sustainable jobs for lower-educated older workers (45 years or over, ISCED 0-2) and thus motivate and enable them to extend their working lives. We use longitudinal data on 1,264 older Dutch workers collected by the Netherlands Working Conditions Cohort Study to analyse the characteristics of the work of lower-educated older workers and how these differ from those of higher-educated older workers. The aim is to determine whether work redesign initiatives directed to these characteristics might have the desired effect of enhancing work ability and/or work motivation. This study is unique in its focus on lower-educated older workers as a target group for active ageing policies at the EU, national and company HR levels, and also in its focus on work redesign rather than the training or improvement of the health of workers. Our findings suggest that redesigning social work characteristics can be a first step in developing sustainable jobs for lower-educated older workers. Moreover, a redesign of contextual work characteristics also seems promising.

Key words: work redesign, older workers, lower educated workers, work ability, job characteristics-(JEL: J24, J28, J81)

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Introduction

Ageing workers and active ageing policies are high on the EU social policy agenda. With the drastic changes in the age structure of the working population in Western Europe and worldwide (European Commission, 2008; United Nations, 2007) the proportion of older employees is increasing, leading to future mass retirement (Vaupel & Loichinger, 2006). Recent projections by Eurostat (2008) show that in the coming decades the proportion of older people (65+) among the total population within the EU-27 will rise from 17% in 2006 to 30% in 2050. At the same time, the proportion of people under 25 years of age is expected to decline from 30% in 2000 to 23% in 2050. These trends combined will result in a reduction in the size of the working-age population (25–64), which from 2040 onwards will represent less than half the total population (Descy, 2006). This will cause an estimated structural labour shortage of 20 million people by the year 2030 in the EU alone (European Commission, 2005).

In order to avert the risk of massive labour shortages and to keep pension and health insurance systems affordable, increasing the participation of older workers in the labour market by preventing early forced pension inflows and thus extending the retirement age is currently one of the main focal points of labour market policies in EU countries (Peterson, 1999; Phillipson & Smith, 2005; Proper et al., 2009). Activation policies which have the goal of increasing lifelong learning and employability are also of significance (Sickles & Taubman, 1986; Hall & Mirvis, 1995; OECD, 2006; European Foundation, 2008). These institutional measures and incentives send a clear message to all employees to start thinking about extending their careers rather than retiring early. At the company level, organizational HR strategies have also begun to focus on the important issue of dealing with future labour shortage risks and enhancing work performance by sustaining the motivation of older workers and their ability to continue working (Rau & Adams, 2005; Armstrong-Stassen, 2008; Kooij, 2010).

In this article we focus on older workers, aged 45 years or over, who have received little or no formal education (ISCED 0-2). Statistics indicate that they are a high-risk group with regard to healthy and productive – or ‘active’ – ageing. Older lower-educated workers have poor health in comparison to both younger and higher-educated workers (Dutch Statistics, 2008) and this has repeatedly been shown to lead to higher exit rates (Nicoletti & Peracchi, 2001; Phillipson & Smith, 2005; Henkens et al., 2009; Ybema et al., 2009). Studies also show that lower-educated workers and older workers more often suffer from chronic illnesses and have higher sickness absence levels in terms of time spent off work (Nauta & Gründemann, 2005; Ybema et al., 2009). Moreover, lower-educated older workers are more likely to have worked in physically demanding jobs for relatively long periods of time. This puts them at risk of ‘wear’, which affects their physical skills and decreases their ability to continue working productively at an older age and without risk to their health (Burdorf & Mackenbach, 2006; Jettinghoff & Smulders, 2008).

Furthermore, according to human capital theory, lower-educated employees face disadvantages in the labour market which might hinder them from pursuing or restoring a favourable person-job fit by finding another job when faced with difficulties in their current job. Research by Armstrong-Stassen (2008) also shows that functional

job growth is more appealing to older workers than hierarchical growth. For lower-educated older workers this is even more relevant as upward career paths are generally limited and better job alternatives in the external labour market are scarce (Salverda, 2011). This implies that the job tenures of lower-educated older workers are often longer and that they more frequently face a so-called ‘job lock’ compared to higher-skilled workers (Gesthuizen & Scheepers, 2010). With lower-educated older workers more or less ‘sentenced’ to remain in their current job, this article focuses on redesigning the work characteristics of such jobs and examines which work characteristics relate to the work ability and work motivation of lower-educated older workers and are thus most promising for active ageing policies.

Central aim of this study

The aim of this study is to answer three research questions: (1) How do the work characteristics of lower-educated older workers differ from older workers with higher levels of education? (2) Which characteristics of the work of lower-educated older workers relate to their work ability and work motivation? and (3) What does this mean with respect to work redesign possibilities for our specific target group of lower-educated older workers?

Theoretical background and hypotheses

As a theoretical starting point we use recent elaborations of the classic Job Characteristics Model (JCM) (Hackman & Lawler, 1971; Hackman & Oldham, 1980). JCM gave rise to a great deal of research in the field of work psychology concerning the evaluation and design of high-quality jobs. During the 1980s, the model’s five structural characteristics concerning job quality – task variety, autonomy, feedback, significance and identity – were extensively tested on their dimensionality and relationship with favourable employee and organizational outcomes.

Over the years, for several reasons, the traditional job characteristics model has been expanded. For example, Karasek (1979) called for the inclusion of job demands, as the relationship between job design and employee wellbeing involves an interplay between such demands and the decision latitude that the job provides. Recent elaborations (e.g., Grant & Parker, 2009) have been fuelled by the changing nature of work, such as increasing levels of social interaction, increased information processing, teamwork and other requirements arising from the need to interact with beneficiaries such as customers, patients and suppliers. The expanded version of JCM developed by Humphrey et al. (2007) includes *social* aspects of work, such as interdependence, feedback from others, social support and interaction outside the organization, as well as *contextual* factors traditionally examined in the literature on human physiology, such as physical demands, working conditions and ergonomics. Their meta-analysis of 259 studies revealed that these additional social and contextual work characteristics have comparable relationships with the work outcomes associated with the traditional job characteristics of the JCM. The authors stress the importance of a focus on work design rather than job design, as a focus on the former emphasizes the important link between a job and the broader work environment (Morgeson & Humphrey, 2006). In

our study, following Morgeson & Humphrey (2006), we distinguish four categories of work characteristics:

- *contextual* work characteristics (e.g., physical demands, dangerous work),
- *cognitive-informational* work characteristics (e.g., job complexity, job demands, time pressure),
- *task-motivational* work characteristics (e.g., autonomy, task variety),
- *social* work characteristics (e.g., social support, emotional demands).

Differences in work characteristics between low, intermediate and higher-educated older workers

According to sociological research on the role of education in the stratification of labour market opportunities (e.g. Warren et al., 2004), education differentiates between job types engaged in by employees. Entry-level blue-collar jobs in manufacturing, construction, agriculture and cleaning traditionally attract a high proportion of lower-educated employees, while white-collar clerical and professional work require higher levels of education. With the exception of the so-called ‘McJobs’, referring to low-paid, low-prestige jobs in the service sector which require few skills (Lindsay, 2005), lower-educated workers often have jobs that involve manual blue-collar work in standardized work processes. This means that there is a differentiated job supply in the labour market, with lower-educated employees more often working in jobs that are more physically demanding but less cognitively demanding. The European Working Conditions Survey (EWCS) (Parent-Thirion et al., 2005), covering about 30,000 employees in 27 EU member states, showed that employees in blue-collar jobs report higher exposure to biological, chemical and ergonomic health risks as opposed to workers in white-collar jobs. Based on these findings, the first hypothesis of this study is:

Hypothesis 1: Lower-educated older workers score higher on contextual work characteristics than higher-educated older workers

In addition, the EWCS survey showed that education has a strong relationship with the level of cognitive demand at work. In this EU survey, *high* cognitive demand involves solving unforeseen problems independently, engaging in complex tasks and learning new skills, while *low* cognitive demand refers to high levels of monotonous and repetitive tasks. Employees with a lower level of education have lower scores on all cognitive work aspects, which would indicate fewer cognitive-informational and task-motivational work characteristics. Moreover, Morgeson and Humphrey (2006), who do not distinguish between levels of education but between occupations, found that employees in non-professional occupations which generally require lower levels of education, such as farming, construction, transportation, installation, repair and production, score lower on cognitive-informational work characteristics than employees in professional jobs which generally require intermediate or higher education (e.g., sales occupations or health care). We expect to replicate these results with our data in this study. Therefore, our second and third hypotheses are:

Hypothesis 2: Lower-educated older workers score lower on cognitive-informational work characteristics than higher-educated workers

Hypothesis 3: Lower-educated older workers score lower on task-motivational work characteristics than higher-educated workers

With regard to social work characteristics that relate to the degree of social interaction a job requires, we expect differences between lower and higher-educated workers. It could be argued that the higher levels of standardization and the highly visible output of the jobs of lower-educated workers require less formal communication about job execution and job results. As such, feedback and social support from colleagues and supervisors gradually become less formalized features of the job. The EWCS survey (Parent-Thirion et al., 2005) showed that blue-collar employees report less social support from colleagues and supervisors. Furthermore, the European survey revealed that in general among blue-collar workers the pace of work is determined less by working with people and colleagues and more by numerical production targets or by the supervisor. This possibly indicates a work setting in which lower-educated workers are functionally less dependent on others. This would mean that their work involves fewer social aspects. Therefore, the fourth hypothesis for this study is:

Hypothesis 4: Lower-educated workers score lower on social work characteristics than higher-educated workers

Relationship between work characteristics, work ability and work motivation

The ability and motivation to continue working are expected to be influenced by different work characteristics. The meta-analysis by Humphrey et al. (2007) demonstrated that task-motivational, knowledge, social and contextual work characteristics have an impact on various behavioural, attitudinal and wellbeing-related work outcomes. For example, contextual physical demands were found to relate to both attitudinal (less job satisfaction) and wellbeing outcomes (more stress and exhaustion). At an older age particularly, it becomes increasingly likely that the health of workers will be damaged by high physical demands because physical skills ‘wear’ and make employees more vulnerable to the effects of heavy labour (Burdorf & Mackenbach, 2006). In line with earlier findings, this leads to the following hypothesis:

Hypothesis 5: Contextual work characteristics relate negatively to the work ability and work motivation of lower-educated older workers

Cognitive-informational work characteristics, reflecting the knowledge demands placed on an individual worker have been shown to affect work motivation as well as work ability. Morgeson and Humphrey (2006) revealed that knowledge characteristics, such as job complexity, are positively correlated with work motivational outcomes such as job satisfaction. In an earlier study, Edwards et al. (2000) also found that work involving complex tasks and requiring high-level skills is considered mentally more demanding and more challenging and thus more motivating than work that involves ‘simple’ tasks. This implies a positive relationship between cognitive-informational work characteristics and work motivation. These findings also relate to literature in which task or emotional demands are considered work characteristics that can be viewed as ‘challenge’ or ‘positive’ stressors (as opposed to ‘hindrance’ or ‘negative’

stressors). Challenge stressors are reported to spark positive work attitudes (e.g., Podsakoff et al., 2007). Thus, our sixth hypothesis is:

Hypothesis 6: Cognitive-informational work characteristics relate positively to the work motivation and work ability of lower-educated older workers

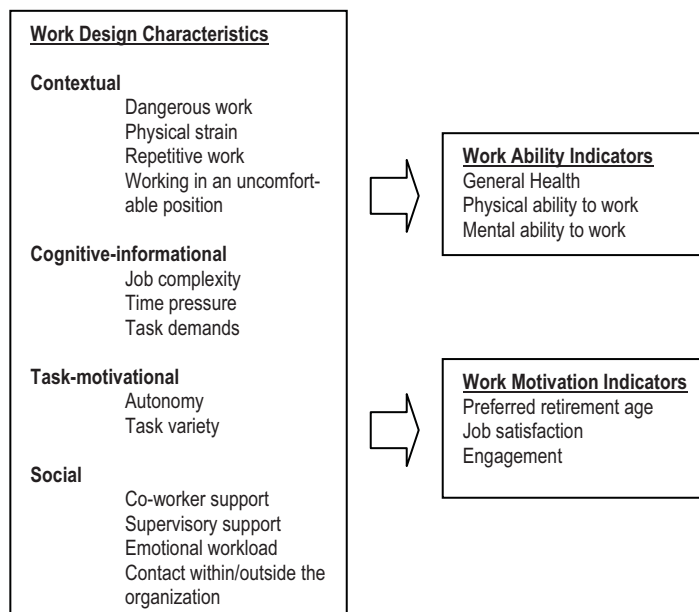
Finally, task-motivational and social work characteristics are considered important work resources which strengthen employee wellbeing and work motivation (e.g., Schaufeli & Bakker, 2004). Task-motivational and social work characteristics support the individual employee's experience of autonomy, competence and relatedness which, in accordance with self-determination theory (Deci & Ryan, 2000), foster intrinsic work motivation, engagement and wellness. Furthermore, they are considered essential resources to buffer aspects of work that impair health and thus theoretically they also strengthen work ability (Karasek & Theorell, 1990). Finally, the meta-analysis by Humphrey et al. (2007) revealed that task-motivational as well as social work characteristics explain a large part of the variance in work motivational outcomes. Thus, the seventh and eighth hypotheses of our study are:

Hypothesis 7: Task-motivational work characteristics relate positively to the work ability and work motivation of lower-educated older workers

Hypothesis 8: Social work characteristics relate positively to the work ability and work motivation of lower-educated older workers

Figure 1 summarizes our conceptual model for hypotheses 5 to 8.

Figure 1: Study research model



Method

Study background

This study uses data from the Netherlands Working Conditions Cohort Study (NWCCS) (see also Koppes et al., forthcoming), a longitudinal dataset containing information on more than 10,000 Dutch employees. The baseline and follow-up questionnaires contained approximately 200 questions on professional and job characteristics, physical and psychological working conditions, as well as company and other policies. Data were gathered through written questionnaires or an identical online version. In 2007 the baseline questionnaire (T1) was presented to a random representative sample of 80,000 Dutch employees. About 19,000 employees responded to this questionnaire and consented to follow-up assessments. In 2008, the first follow-up questionnaire (T2) was completed by over 10,000 employees. The respondents to the T1 and T2 questionnaires were matched using their unique social security numbers.

Sample

For the empirical analyses in this study, we selected workers aged 45 to 65 in the baseline year of 2007. This led to a reduced sample size of 4,985 workers. For the longitudinal analyses of the work-design determinants of work ability and work motivation, the total sample size was further reduced by selecting employees with only a primary or lower secondary education or no education at all (ISCED level 0-2) who participated in both 2007 and in 2008, leaving 1,264 workers to be included in our final sample. In the initially reduced sample of 4,985 workers there were no differences in age or gender between the three educational groups. In all three groups the mean age was just over 52 years and close to 50% were male. Moreover, there were no differences in the type of contract or the number of working hours (based on the contract). For all three groups under study, approximately 95% had a permanent contract and about 55% worked full-time (> 34 hours a week).

Measures

Table 1 presents an overview of the single-item measures used in this study, including sample items, scale reliabilities (when applicable) and response formats. We used several items for the measurement of the independent variables (work characteristics).

Work ability contains single-item measures for three indicators: a self-reported *general health status* (Houtman et al., 1995) and the *physical* and *mental ability* to work (Van den Bossche & Houtman, 2007).

The study included three indicators of *work motivation*: an open question for the *preferred retirement age*, a single-item measure for *job satisfaction* and a 4-item scale for *work engagement* based on the ‘dedication’ subscale of the Utrecht Work Engagement Survey (UWES) (Schaufeli et al., 2002).

Contextual characteristics refer to physical job demands, dangerous work, repetitive tasks and working in an uncomfortable position. Single-item measures of self-reports of these ergonomic work conditions were retrieved from a population survey (EBB) of Statistics Netherlands. Several indicators covering work ability and work motivation were used as the dependent variables in this study.

Table 1: Overview of measures used in this study

Variables	Sample items	Cronbach's α when applicable	Answer categories
Work Ability			
Health status	How would you describe your health in general?	-	1 = Bad 5 = Excellent
Physical ability to work	How would you describe your ability to work, considering the physical demands of your job?	-	1 = Very bad 5 = Very good
Mental ability to work	How would you describe your ability to work, considering the psychological demands of your job?	-	1 = Very bad 5 = Very good
Work Motivation			
Preferred retirement age	To what age do you want to continue working?	-[age] Continuous
Job satisfaction	All in all, to what extent are you satisfied with your job?	-	1 = Very dissatisfied 5 = Very satisfied
Engagement	4-item scale Sample item: I am proud of the work that I do	.89	1 = Never 4 = Always
Contextual work characteristics			
Dangerous work	Do you have to perform dangerous tasks?	-	1 = No 2 = Yes, sometimes 3 = Yes, regularly
Physical strain (using force)	Do you perform tasks that require you to use a lot of force; for example, lifting, pushing, pulling or heaving, or do you use tools that require you to use force?	-	1 = No 2 = Yes, sometimes 3 = Yes, regularly
Repetitive work	Does your job require repetitive movements?	-	1 = No 2 = Yes, sometimes 3 = Yes, regularly
Uncomfortable position	Do you work in uncomfortable working positions?	-	1 = No 2 = Yes, sometimes 3 = Yes, regularly
Cognitive-informational work characteristics			
Job complexity	3-item scale Sample item: Does your work demand intensive thinking?	.81	1 = Never 4 = Always
Time pressure	2-item scale Sample item: Do you have to work at a high pace?	.82	1 = No 2 = Yes, sometimes 3 = Yes, regularly
Task demands	4-item scale Sample item: Do you have to work very quickly?	.86	1 = Never, 4 = Always
Task-motivational work characteristics			
Autonomy	5-item scale Sample item: Can you control your own working pace?	.77	1 = Yes, regularly 2 = Yes, sometimes 3 = No
Task variety	3-item scale Sample item: Is your work varied?	.77	1 = Never 4 = Always
Social work characteristics			
Social support colleagues	4-item scale Sample item: My colleagues are friendly	.84	1 = Strongly disagree 4 = Strongly agree
Social support supervisor	4-item scale Sample item: My supervisor helps to get the work done	.88	1 = Strongly disagree 4 = Strongly agree
Emotional workload	3-item scale Sample item: Is your work emotionally demanding?	.83	1 = Never 2 = Sometimes 3 = Often 4 = Always
Contact with colleagues, colleagues in other teams, customers or suppliers	4 separate items How often are you in contact with: - colleagues in your own team? - colleagues in other teams, departments or at other sites? - customers (or patients, students, passengers)? - suppliers, subcontractors?	-	1 = Never 5 = Daily

Cognitive-informational work characteristics are measured with the scales of *job complexity* (Houtman et al., 1995), *task demands* and *time pressure*, both taken from the Job Content Questionnaire (JCQ) (Karasek, 1985), which indicate the extent to which the work requires intensive thinking and fast information processing.

Task-motivational work characteristics in our model refer to autonomy and task variety, traditional core motivational job factors in the Job Characteristics Model. Scales for *task variety* and *task autonomy* were retrieved from the JCQ (Karasek, 1985).

Social characteristics or social support are measured with scales for social support by *colleagues*, social support by *supervisor*, both taken from the JCQ (Karasek, 1985), *emotional demands* (Houtman et al., 1995) and the *frequency* of social interaction within and outside the team/organization (based on items in the Community Innovation Survey, Eurostat, 2004).

Analysis of the data

First, in order to test hypotheses 1, 2, 3 and 4, we conducted a *descriptive* test of the differences between *lower* (= ISCED 0-2), *intermediate* (ISCED 3-4) and *higher* (ISCED 5-6) educated older workers (45 years and older) on the variables in our sample. To test all of the differences between the work characteristics of lower, intermediate and higher-educated older workers, we estimated multinomial logit models with the educational group being the dependent variable and work characteristics being the independent variables. Workers with an intermediate educational level served as the reference group. However, in order to also determine whether differences between higher-educated older workers and lower-educated older workers were statistically significant, we estimated these models using higher-educated older workers as a reference category. Every model controlled for age, gender and educational level. We estimated separate models for each of the independent variables (e.g., dangerous work, time pressure).

Predictive analyses: effects of work characteristics on work ability and work motivation

Second, to test hypotheses 5, 6, 7 and 8, we conducted a multiple regression analysis and thus examined which specific work characteristics have an effect on the work ability and work motivation of lower-educated older workers. We estimated six multiple regression analyses with the work characteristics added stepwise per dimension. For example, to find predictors for general health, we estimated a five-stage multiple regression model. In the first step we added the two task-motivational characteristics, in the second step the cognitive-informational characteristics, and so on. In the fifth and final stage we entered the control variables of age, gender and education level. We then calculated the betas for the full model and included the ΔR^2 to determine the explanatory power of the work characteristics per dimension. The longitudinal data of 1,264 lower-educated older workers was analysed to determine to what extent the work ability and motivation indicators (at T2) were affected by the work characteristics (at T1). Since we were solely interested in ways of redesigning the work characteristics of the jobs of lower-educated older workers we performed these latter analyses

within the group of lower-educated older workers only. We used SPSS version 17 to perform all our analyses.

Results

Differences in work characteristics

Table 2 presents the results of our descriptive analysis of the differences between lower, intermediate and higher-educated older workers in terms of their current job characteristics (hypotheses 1 to 4).

Table 2: Multinomial regression analyses for differences in the work characteristics of older workers by educational level (reference category: intermediate education)

	Lower education (ISCED 0-2) ≥ 45 yrs Beta	Higher education (ISCED 5,6) ≥ 45 yrs Beta	N
Contextual work characteristics 2007			
Dangerous work	.125	-.816**	4.850
Physical strain (using force)	.386**	-.978**	4.830
Repetitive work	.337**	-.486**	4.723
Uncomfortable position	.226**	-.666**	4.662
Cognitive-informational work characteristics 2007			
Job complexity	-.432**	.711**	4.871
Time pressure	-.385**	.489**	4.839
Task demands	-.337**	.400**	4.866
Task-motivational work characteristics 2007			
Autonomy	-.300**	.374**	4.873
Task variety	-.607**	.640**	4.879
Social work characteristics 2007			
Social support colleagues	-.320**	.253**	4.708
Social support supervisor	-.152**	.115**	4.614
Emotional workload	-.419**	.704**	4.866
In contact with:			
- colleagues	-.177**	.043	4.845
- colleagues other teams	-.168**	-.023	4.816
- customers	-.095**	.056*	4.810
- suppliers	-.025	-.140**	4.754

Source: Netherlands Working Conditions Cohort Study 2007/2008

** = $p < .01$

* = $p < .05$

Control variables are age, gender and educational attainment

With regard to *contextual characteristics*, table 2 shows that lower-educated older workers have to use force, perform repetitive tasks and work in an uncomfortable position more often than intermediate or higher-educated older workers. Also, lower-educated older workers report dangerous work more often than higher-educated older workers. We do not find significant differences in the levels of dangerous work between workers with lower and intermediate education. In general, from table 2 we can conclude that hypothesis 1 is supported insofar as lower-educated older workers score higher than higher-educated older workers on all contextual characteristics.

For *cognitive-informational work characteristics*, table 2 shows that, compared to intermediate and higher-educated older workers, lower-educated older workers find their jobs less complex, experience less time pressure and find their tasks less demanding. From table 2 we can conclude that hypothesis 2 is fully supported insofar as lower-educated older workers score lower than higher-educated older workers on cognitive-informational work characteristics.

On the *task-motivational work characteristics*, compared to intermediate and higher-educated older workers, lower-educated older workers have jobs with less autonomy and less task variance. From table 2 we can therefore conclude that hypothesis 3 is fully supported insofar as lower-educated older workers score lower than higher-educated older workers on task-motivational work characteristics.

With regard to the *social work characteristics dimension* (hypothesis 4) it is apparent that lower-educated older workers experience less social support from managers and colleagues. Also, lower-educated older workers appear to have jobs that are emotionally less demanding than intermediate and higher-educated older workers. Moreover, the frequency of social interaction with customers and colleagues, either from their own or another team, is lower for lower-educated workers. These results partially support the hypothesis that lower-educated older workers generally score lower on social work characteristics than higher-educated older workers.

Relationship between work characteristics and work ability and work motivation

Table 3 presents the results of the longitudinal tests on the outcomes of those work characteristics which differed significantly across educational levels. To test hypotheses 5 to 8, we analysed which type of work characteristic had either a positive or negative effect on the work ability and work motivation of a lower-educated older worker, with the aim of determining new directions for work redesign.

First, we looked at *contextual work characteristics*. As expected, table 3 shows that working in an uncomfortable position on a regular basis has a negative effect on both general health and physical ability (work ability) as well as on job satisfaction (work motivation). Also, physical strain, in the sense of using force while working, has a negative effect on lower-educated older workers' physical ability to work. We find no evidence of significant negative effects of dangerous work or repetitive work on either the work ability or the work motivation of lower-educated older workers. From table 3 we therefore conclude that hypothesis 5 is only partly confirmed, with two out of four contextual work characteristics in our analyses having a negative effect on the work ability and work motivation of lower-educated older workers.

Table 3: Regression analyses for predicting the ability and work motivation of lower-educated older workers, 2007–2008

	Work Ability 2008			Work Motivation 2008		
	General Health	Physical ability to work	Mental ability to work	Preferred retirement age	Job Satisfaction	Engagement
	β	β	β	β	β	β
Contextual characteristics 2007						
Dangerous work	-.056	-.044	-.040	-.037	-.027	-.049
Physical strain (using force)	.023	-.070*	-.024	.019	.031	.002
Repetitive work	.009	.025	-.002	.041	.026	.007
Uncomfortable position	-.081*	-.163**	-.073	-.007	-.094**	.000
ΔR^2	.009	.050	.016	.005	.007	.004
Cognitive-informational characteristics 2007						
Job complexity	.020	.017	.031	-.030	.040	.065*
Time pressure	.044	.049	.052	-.002	-.038	-.013
Task demands	.021	-.004	-.037	-.075	-.069	-.062
ΔR^2	.001	.004	.008	.019	.019	.011
Task-motivational characteristics 2007						
Autonomy	.059*	.129**	.043	-.063*	.003	.062**
Task variety	.022	.072**	.061	.031	.138**	.276**
ΔR^2	.012	.040	.013	.001	.029	.130
Social characteristics 2007						
Social support colleagues	.060*	.030	.070**	.050	.076**	.100**
Social support supervisor	.081**	.055	.061*	.062	.180**	.184**
Emotional workload	-.147**	-.147**	-.194**	-.086**	-.018	-.041
In contact with customers	.045	.086**	.058*	-.017	-.055	.061*
ΔR^2	.041	.045	.056	.017	.053	.066
Control variables						
Age	-.028	-.048	-.023	.221**	-.003	.044
Gender	.000	.050	.077**	.066*	.026	.062*
Education level	.067**	.036	.052	.018	-.007	.016
ΔR^2	.005	.005	.007	.050	.001	.005
<i>Model fit</i>						
R^2	.068	.144	.100	.092	.109	.216
N	967	927	926	753	930	928

Source: Netherlands Working Conditions Cohort Study 2007/2008

** = $p < .01$ * = $p < .05$

Second, table 3 shows that *cognitive-informational work characteristics* have little effect on the work ability and work motivation of lower-educated older workers. Time pressure

and task demands show no relationship with the indicators for work ability and work motivation. Job complexity only has a positive effect on the engagement of lower-educated older workers, but no effect on the three work ability indicators or the two other work motivation indicators of preferred retirement age and job satisfaction. From table 3 we can conclude that hypothesis 6 is supported only insofar as the cognitive-informational work characteristic of job complexity shows a positive relationship with engagement as an indicator of work motivation. The other cognitive-informational work characteristics show no relationship with work ability or work motivation.

Third, we looked at the relationships between *task-motivational work characteristics* on the one hand and the work ability and work motivation of lower-educated older workers on the other. Table 3 shows that the level of autonomy experienced by a lower-educated older worker has positive effects on general health, the physical ability to work and engagement. Contrary to what we expected, we found a negative effect of the level of autonomy on preferred retirement age. The level of task variety reported by lower-educated older workers shows the expected positive effects on physical ability to work, job satisfaction and engagement. There is no effect on general health, mental ability to work and preferred retirement age. From table 3 we can conclude that hypothesis 7 is only partly supported insofar as only task-motivational characteristics seem to positively influence the work ability and work motivation of lower-educated older workers. There is, however, one exception – more autonomy appears to lead to a preference for earlier retirement.

To a large extent, *social work characteristics* have the expected effects on the work ability and work motivation of lower-educated older workers. Colleague and supervisor support, for example, have positive effects on both general health as well as on the mental ability to work. Furthermore, the frequency of social interaction with customers shows positive effects on both the physical and mental ability to work and on engagement. The level of emotional work has a negative effect on lower-educated older workers' general health, their physical and mental ability to work (work ability) and on their preferred retirement age (work motivation). We conclude that hypothesis 8 is partly confirmed insofar as more support from management and co-workers, more client contact and less emotional workload positively influence work ability and work motivation.

Overall, task-motivational work characteristics explain the largest amount of variance in work engagement ($R^2 = .13$), while contextual work characteristics have the largest impact on the variance in physical ability to work ($R^2 = .05$). On average, social work characteristics explain between 4% and 6% of all variance in work ability and work motivation (except preferred retirement age).

Discussion

This study empirically examined directions for effective work redesign interventions aimed at lower-educated older workers. These interventions appear necessary because the age structure of the working population is changing and the number of older workers is rapidly increasing. This means that an increase in the labour participation of older people is needed, as well as an extension of the average worker's productive

working life. This study focused on lower-educated older workers (45 years or over and ISCED 0-2) because of their relatively weak labour market position. We focused on work redesign because lower-educated older workers have been shown to be 'sentenced' to remain in their current job (Gesthuizen & Scheepers, 2010; Salverda, 2011) and because functional growth has been shown to be particularly appealing to older workers (e.g., Armstrong-Stassen, 2008).

This study tested eight hypotheses: four on the relationship between educational attainment and the work characteristics of older workers and four on the relationship between the work characteristics and the work ability and work motivation of lower-educated older workers. The results of these tests present EU and national policymakers as well as HR and company professionals with some general directions for redesigning the work of lower-educated older workers, thereby assisting them to extend their working lives and potentially age actively.

First, we found that lower-educated older workers score higher on most contextual work characteristics (dangerous work, physical strain, repetitive work and working in an uncomfortable position) than intermediate and higher-educated older workers. These results are in line with earlier findings (Parent-Thirion et al., 2005). We also found that contextual work characteristics such as physical strain and working in an uncomfortable position have negative effects on the work ability and job satisfaction of lower-educated older workers, with the latter variable being an indicator of work motivation. These results lead us to conclude that in order to improve the work ability and work motivation of lower-educated older workers, redesigning contextual work characteristics through a decrease in the level of physical strain, the use of force and the amount of time spent in an uncomfortable position seems promising in relation to extending their working life. A decrease in the number of hours spent working in an uncomfortable position also leads to higher levels of job satisfaction which, according to recent analyses of our data by Ybema and Geuskens (2011), decreases older workers' risk of becoming unemployed.

Second, with respect to the cognitive-informational work characteristics dimension (job complexity, time pressure and task demands) we found support for our hypothesis that lower-educated older workers score lower than intermediate and higher-educated workers. These findings roughly confirm those of Morgeson and Humphrey (2006). However, we found that cognitive-informational work characteristics have no effect on the work ability of lower-educated older workers. There was only a weak positive effect of job complexity on engagement as an indicator of work motivation. From these results we conclude that when redesigning the work of lower-educated workers with the aim of stimulating work ability or motivation, there is no reason to focus on cognitive-informational work characteristics such as a decrease or an increase in job complexity, time pressure or task demands.

Third, in relation to the task-motivational work characteristics dimension (level of autonomy and task variety), we found some empirical support for our hypothesis that lower-educated older workers score lower than intermediate and higher-educated older workers. These results roughly confirm earlier findings by Morgeson and Humphrey (2006). For lower-educated older workers, we also found that higher scores on task-motivational work characteristics generally have positive effects on their work

ability and work motivation. The level of autonomy, however, has a negative effect on lower-educated older workers' preferred retirement age. On the basis of these findings, we suggest that redesigning task-motivational characteristics, more specifically, an increase in task variety, could be one direction for work redesign aimed at the extension of working life. More specific intervention studies are required to test whether redesigning work in these suggested directions is indeed successful.

Finally, with respect to the social work characteristics dimension (social support by colleagues or supervisor, emotional work and contact with customers), we found some empirical support for our hypothesis that lower-educated older workers score lower than intermediate and higher-educated older workers. The results confirm earlier findings by Parent-Thirion et al. (2005). We also found that support by colleagues and supervisors has a positive effect on work ability as well as work motivation. Emotional workload has the expected negative effects on both work ability and work motivation. We therefore conclude that the benefits of redesigning the work of lower-educated older workers through increasing support by colleagues and supervisors, as well as through a decrease in emotional workload, should be investigated in further intervention studies.

Conclusion and practical implications

With the labour force ageing and structural labour shortages approaching, the extension of working life is of great importance to both EU and national policymakers as well as to HR professionals at the company level. Based on our findings we advise those developing active ageing policies to include work redesign as a promising avenue, especially when an extension of the working lives of lower-educated older workers is the aim. We stress, however, that work redesign should be undertaken carefully and with a focus on those work characteristics that are shown to actually affect work ability and/or work motivation. We therefore end this article with a summary and prioritizing of our results in table 4.

Table 4: Promising redesign strategies aimed at increasing the work ability and motivation of lower-educated older workers

	Only ability	Only motivation	Ability and motivation
Desirable effect	<ul style="list-style-type: none"> Physical strain (1) 	<ul style="list-style-type: none"> Job complexity (1) 	<ul style="list-style-type: none"> Social support colleagues (4) Social support supervisor (4) Emotional work (4) Customer contact (3) Autonomy (3) Task variety (3) Uncomfortable position (3)
No effect	<ul style="list-style-type: none"> Job complexity 	<ul style="list-style-type: none"> Physical strain 	<ul style="list-style-type: none"> Time pressure Task demands Dangerous work Repetitive work
Undesirable effect	None	<ul style="list-style-type: none"> Autonomy (1) 	None

Table 4 contains only those work characteristics that lower-educated older workers scored less favourably on compared to higher-educated older workers (based on table 2). The number of indicators that a certain work characteristic has a desirable effect upon are also shown between brackets. The upper right cell in table 4 shows those work characteristics which would have desirable effects on both work ability and work motivation if addressed through redesign. We view these as the most promising directions for redesign, which both policymakers and HR professionals interested in stimulating active ageing and the extension of working life should consider.

The upper right cell in table 4 also shows that redesign strategies aimed at increasing social support from either colleagues or supervisors is an especially promising direction for policymakers and HR professionals to pursue. Improving support shows desirable effects on work ability and work motivation. In addition, a decrease in the emotional workload of lower-educated older workers would possibly have desirable effects on their work ability and motivation. Since support from both supervisors and colleagues as well as emotional workload are on the *social work characteristics dimension* and since an increase in customer contact also has desirable effects on both the work ability and motivation of lower-educated older workers, we conclude that 'social work redesigns' are likely to lead to an increase in the ability and motivation of lower-educated older workers and thus extend their working lives.

Addressing the benefits of social work characteristics in lower-skilled jobs, Leana et al. (2009) focused on the outcomes of collaborative *job crafting* in American childcare centres where teachers collectively made adjustments to their work in order to meet their shared objectives. They demonstrated that the extent to which employees jointly crafted or made adjustments to their work design contributed to their job satisfaction and organizational commitment as well as to the quality of childcare. Organizations could therefore experiment with involving lower-educated workers in crafting their own work characteristics to match their needs, aspirations and the circumstances of the work. In addition to these findings, Borghans et al. (2009) have demonstrated that human capital is mainly built through interaction with colleagues and supervisors. An increase in support from colleagues and supervisors might therefore also lead to a higher level of knowledge and skill-building on the job, enhancing the work ability of lower-educated older workers. These latter relationships, however, need to be studied more closely.

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