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The association between psychosocial factors at work and health outcomes after retirement: a protocol for a systematic review and meta-analysis

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Keywords:	psychosocial factors at work, retirement, health status, mobility, cognitive function

Title: The association between psychosocial factors at work and health outcomes after retirement: a protocol for a systematic review and meta-analysis

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ABSTRACT (300 words)

Introduction: The world's population is rapidly aging, and health among older people is thus an important issue. Several previous studies reported an association between adverse psychosocial factors at work before retirement and post-retirement health. The objective of this systematic review and meta-analysis is to examine the association between psychosocial factors at work and health outcomes after retirement, based on a synthesis of well-designed prospective studies.

Methods and analysis: The participants, exposures, comparisons and outcomes (PECO) of the studies in this systematic review and meta-analysis are defined as follows: (P) People who have retired from their job, (E) Presence of adverse psychosocial factors at work before retirement, (C) Absence of adverse psychosocial factors at work before retirement, and (O) Any physical and mental health outcomes after retirement. Published studies will be searched using the following electronic databases: MEDLINE, EMBASE, PsycINFO, PsycARTICLES and Japan Medical Abstracts Society. The included studies will be statistically synthesized in a meta-analysis to estimate pooled coefficients and 95% CIs. The quality of each included study will be assessed using the Risk Of Bias In Non-randomised Studies – of Interventions (ROBINS-I). For the assessment of meta-bias, publication bias will be assessed by using Egger's test, as well as visually on a funnel plot. Heterogeneity will be assessed using the chi-square test with Cochran's Q statistic and I^2.

Ethics and dissemination: Results and findings will be submitted and published in a scientific peer-reviewed journal and will be disseminated broadly to researchers and policymakers interested in the translatability of scientific evidence into good practices.

Trial registration: The study protocol is registered at the PROSPERO (registration number: CRD42018099043). Registration date is 31st July 2018.

URL: https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=99043

Keywords: psychosocial factors at work, retirement, health status, mobility, cognitive function

STRENGTHS AND LIMITATION OF THIS STUDY

- This will be the first systematic review and meta-analysis to show integrated evidence for associations between psychosocial factors at work before retirement and post-retirement health conditions.
- The findings would contribute to prevention of chronic conditions and promotion of health and well-being of older adults after retirement and to achieve active

aging.

- One major limitation is that this study will include mostly observational studies and the findings may be biased by potential confounds.

INTRODUCTION

The population of the world is rapidly aging. The United Nations reported that the population of those aged 60 or above in the world is growing at a rate of 3.26% per year, and the number of persons in this age group is projected to be 2.1 billion (21.5%) by 2050 [1]. The prevalence of non-communicable diseases, including heart disease, stroke, chronic respiratory diseases, cancer, and dementia [2], and particularly multi-comorbidity of diseases, increases with age [3]. Physical functioning, such as hearing, vision, movement, and cognitive functioning, deteriorates with age [4], with a greater risk of frailty in older age [5]. Poor health affects well-being among the elderly [6]. The rapid increase in the number of older persons results in increasing demands on the health care system and the welfare pension system [7]. To respond to this global challenge, the World Health Organization has developed a policy framework of "Active Aging" which optimizes opportunities for health, participation and security in order to enhance quality of life of older people [7]. Health among older people is also important to achieve Sustainable Development Goal (SDG) 3: Ensure healthy lives and promote well-being for all at all ages, because older people have become a much larger share of the population recently.

The life course approach adopted in the WHO Active Aging policy framework [7] is an approach intended to maintain and prevent the deterioration of functional capacity of older people from a life course perspective [8]. Determinants of health in older age are being established in early childhood, even before birth. It is important to apply the life course perspective to considering the dynamic process and multidimensional nature of health and well-being in adults and elderly [9]. Some reviews reported that the risk factors for functional decline and mortality increased in the elderly [10-12]. A systematic review of longitudinal studies reported that some sociodemographic factors (income and education, among others), poor mental health (depression and cognitive impairment), chronic physical disease burden, and adverse lifestyle habits and behaviors (smoking, alcohol consumption, physical activity, obesity, and lack of social contacts) were associated with functional status decline in community-living elderly people [10]. The other literature review reported that lifestyle behaviors were associated with mortality among elderly people caused by heart disease, cancer, stroke, and diabetes, among other diseases [12]. These risk factors are important targets for health promotion. Especially, it is strategically important to reduce potentially modifiable risk factors in early life and across the life course [11].

Work may be a life course determinant of health at an older age. While

studies on the association of retirement (including early or voluntary retirement) and health have reported inconsistent findings or only weak associations [13], some studies showed a moderating effect of occupational socioeconomic status (SES) before retirement on the association between early retirement and health in the elderly, with higher SES at work being associated with better health after retirement [14]. It is suggested that the quality of employment affects not only health in working populations, but also health after retirement.

Several previous studies reported an association between adverse psychosocial factors at work and post-retirement health. A longitudinal study reported that work-related stress (job strain) as defined in the job demand-control model [15] was associated with self-reported health problems in old age [16]. Another longitudinal study reported that high job demands, lack of control at work and biomechanical stress (e.g., carrying heavy loads) during working life were associated with deteriorated physical functional health, as assessed by the SF-36 [17]. For mental health, a prospective cohort study reported a significant association between job strain at work and depressive symptoms after retirement [18]; another retrospective study also showed that several adverse psychosocial factors at work (i.e., high demand, low control, low reward, and low support) during mid-life were associated with depressive symptoms after retirement [19]. In addition, a longitudinal study reported that lack of job control was associated with poorer levels of episodic memory at and following retirement [20]. However, there is no systematic review or meta-analysis which has gathered evidence from well-designed prospective cohort studies on the impact of adverse psychosocial factors at work on health outcomes after the retirement.

Objectives

The objective of this systematic review and meta-analysis is to examine the association between psychosocial factors at work and health outcomes after retirement, based on a synthesis of well-designed prospective studies. The results of this study would expand the current evidence regarding the effect of psychosocial factors at work on worker health [21 22] to include their impact on health in older age after retirement. It could contribute to better understanding of the quality of employment on health in later life, and development of a new perspective on the life-course strategy for promoting active aging [7].

METHODS AND ANALYSIS

Study design

This is a systematic review and meta-analysis protocol of prospective studies, according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis protocols (PRISMA-P) guideline [23]. The systematic review and meta-analysis will be reported according to the Meta-analysis Of Observational Studies in Epidemiology (MOOSE) guideline [24]. The study protocol has been registered at PROSPERO (CRD42018099043).

PECO and Eligibility criteria of this study

The participants, exposures, comparisons and outcomes (PECO) of the studies in this systematic review and meta-analysis are defined as follows:

(P) People who have retired from their job.

(E) Presence of adverse psychosocial factors at work before retirement.

(C) Absence of adverse psychosocial factors at work before retirement.

(O) Any physical and mental health outcomes after retirement.

The adverse psychosocial factors at work include a wide range of task and organizational characteristics, work conditions, and workplace interactions, such as job strain, effort-reward imbalance, working hours, shift work, low social support and other organizational-level factors.

Inclusion criteria are as follows;

(1) studies which included participants who were working as of the baseline survey period.

(2) studies which assessed adverse psychosocial factors at work before retirement as exposure variables at baseline survey.

(3) studies which assessed any health outcomes as outcome variables after retirement at baseline and follow-up surveys.

(4) studies which used a prospective cohort design

(5) studies published in English or Japanese.

(6) studies which have been published in peer-reviewed journals (including advanced online publication).

Exclusion criteria are as follows;

(1) studies targeting participants who have any specific disorder.

(2) studies targeting participants who experienced early retirement due to any problem with their own health, family caregiving responsibilities, or other issues compelling participants to retire early.

(3) studies targeting participants who have been fired or laid off by their employer.

Information sources and search strategy

Published studies will be searched using the following electronic databases: MEDLINE, EMBASE, PsycINFO, PsycARTICLES and Japan Medical Abstracts Society. The search terms will include words related to the PECO of the studies (see online supplementary appendix for the details of the search strategy). The search terms are defined based on the previous meta-analysis [25 26]. In order to conduct the literature search comprehensively, a wide range of search terms related to exposure were selected.

The following search terms will be used:

(1) psychosocial factors at work (stress, sedentary, workload, demand, control, effort, reward, support, social capital, working hours, shift work, among others);

(2) retirement (retire, step down, resign, leave, quit, withdraw, among others);

(3) study design (longitudinal, prospective, cohort, follow up, among others)

Study records

Data management

Study records will be managed by using a standardized form in a Microsoft Excel (Washington, USA) file. Prior to screening the studies, deduplication within this Excel file will be conducted by KI.

Selection process

Fifteen investigators (KI, YA, HA, EA, AI, RI, MI, HE, YO, YK, ASa, NS, KT, AH, and KW) will independently conduct the screening of studies according to the eligibility criteria. After excluding duplicated records, the remained articles will be shared by 15 investigators, and pairs of investigators will independently screen the title and abstract of each article to identify eligible studies according to the eligibility criteria (sifting phase). In this phase, the full texts of all eligible studies will be obtained. In the full text review phase, two investigators will independently review the full texts. When resolution cannot be accomplished, the disagreements will be settled by consensus with discussion among all authors. The reasons for excluding studies will be recorded. A flow chart will be provided to show the entire review process.

Data collection process

Data will be extracted independently from the included studies by 15 investigators (KI, YA, HA, EA, AI, RI, MI, HE, YO, YK, ASa, NS, KT, AH, and KW) using a standardized data extraction form. Any disagreements or inconsistencies will be solved by consultation and consensus among all authors. Investigators will extract data on publication year, study design, country where the study was conducted, the number of participants included in the baseline survey and in the statistical analysis, demographic characteristics of participants (i.e., age, sex and occupational status), length of follow-up and attrition rate, exposure variables before retirement (i.e., adverse psychosocial factors at work), outcome variables after retirement (i.e., any physical or mental health indicator), and sufficient data for calculating the coefficients (ß, γ), odds ratios (ORs), relative risks (RRs) or hazard ratios (HRs) with standard errors (SEs) or 95% confidence intervals (CIs) for the association between adverse work-related psychosocial factors before retirement, and health outcomes after retirement. If necessary, the authors of the included studies will be contacted to obtain additional relevant information.

Data synthesis

The included studies will be statistically synthesized in a meta-analysis to estimate pooled coefficients and 95% CIs, stratified by types of measures of association (ß, γ, OR, RR, and HR). If the included studies report ORs, RRs, or HRs, we will calculate log-transformed ORs, RRs, or HRs and determine SEs based on 95% CIs. These parameters will be used in the meta-analysis and for examining publication bias by means of a funnel plot and Egger's test.

Risk of bias in individual studies and assessment of meta-bias

Fifteen investigators (KI, YA, HA, EA, AI, RI, MI, HE, YO, YK, ASa, NS, KT, AH, and KW) will independently assess in pairs the quality of each included study using the internationally recognized tool for evaluating risk of bias (Risk Of Bias In Non-randomised Studies – of Interventions; ROBINS-I) [27]. The risk of bias is classified as low, high, or unclear risk. Any discrepancies in quality assessment among the investigators will be recorded and discussed among all authors until consensus is reached. For the assessment of meta-bias, publication bias will be assessed by using Egger's test, as well as visually on a funnel plot.

Statistical methods

Primary analyses

For the main analysis, we will synthesize all types of psychosocial factors at work and all types of health outcomes. In this review, it is expected that most of the outcomes of studies which will be included are assessed as dichotomous variable. If the outcomes are assessed by continuous variables, we will apply the appropriate cut-off point and convert to dichotomous variables. If we cannot use the appropriate cut-off point, dichotomous variables and continuous variables will be analyzed separately.

Meta-analysis will be conducted when at least three eligible studies can be collected. If a meta-analysis is not appropriate (i.e., only two or fewer studies are eligible and included), the results will be presented in a narrative format. A fixed-effect model will be used if heterogeneity is not observed; otherwise, a random-effects model will be used. Heterogeneity will be assessed using the chi-square test with Cochran's Q statistic and I^2. Usually, I^2 Values of 25%, 50%, and 75% indicate low, medium, and high heterogeneity, respectively.

Subgroup and sensitivity analyses

Subgroup analyses will be conducted to compare the results under specific outcomes or conditions. Major possible grouping characteristics will include types of exposure (i.e., job strain, support from supervisors/colleagues, and effort-reword imbalance) and outcome (diseases/symptoms, mobility/physical function, and cognitive function). Any subgroup differences will be reported, and our findings will be explained by considering these differences. If trends are observed between pooled associations and any grouping characteristics, meta-regression will be conducted. A sensitivity analysis will be conducted for included studies where the ROBINS-I is classified as low risk [27]

Patient and Public Involvement

There is no direct patient or public involvement in the design of this study.

ETHICS AND DISEMINATION

Ethical approval will not be needed to apply this review protocol because data will be extracted from published studies and there will be no concerns about privacy. Results and findings will be submitted and published in a scientific peer-reviewed journal and will be disseminated broadly to researchers and policymakers interested in the translatability of scientific evidence into good practices.

Strengths and limitations

To our knowledge, this will be the first systematic review and meta-analysis to show the integrated evidence for the associations between psychosocial factors at work and post-retirement health conditions. The findings of this study will establish a link between psychosocial factors at work in working age and health problems after the retirement. Then it would contribute to prevention of chronic conditions and promotion of health and well-being of older adults after retirement, that is, to achieve active aging in our rapidly aging society, through proposing an innovative life-course strategy to improve psychosocial factors at work in working age.

This systematic review and meta-analysis may have some limitations. A major limitation is that this study will include mostly observational studies, not limiting to randomized controlled trials, while we will focus on well-designed prospective cohort studies. The findings may be biased by potential confounders. In addition, the generalization of the findings may be limited by participants' characteristics depending on included studies.

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Author's contribution

KI, AT, YA, HA, EA, AI, RI, MI, HE, YO, YK, ASa, NS, KT, AH, KW, ASh and NK have made substantial contributions to the conception and design, writing of the protocol and revising it critically for important intellectual content, and approving the final version to be published.

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Competing interest

All authors declare that they have no competing interests.

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Supplementary Appendix

Search terms for PubMed

(("Stress, Mechanical"[Mesh] OR "Lifting"[Mesh] OR "Moving and Lifting Patients"[Mesh] OR "Weight-Bearing"[Mesh] OR "Biomechanics" OR "Physical Exertion"[Mesh] OR "Torsion, Mechanical"[Mesh] OR "Postural Balance"[Mesh] OR "Walking"[Mesh] OR "Recovery of Function"[Mesh] OR "Relaxation"[Mesh] OR (static[Title/Abstract] AND posture) OR (awkward[Title/Abstract] AND posture) OR (dynamic[Title/Abstract] AND posture) OR static work[Title/Abstract] OR dynamic load*[Title/Abstract] OR lift*[Title/Abstract] OR carry*[Title/Abstract] OR hold*[Title/Abstract] OR pull*[Title/Abstract] OR drag*[Title/Abstract] OR push*[Title/Abstract] OR manual handling[Title/Abstract] OR force*[Title/Abstract] OR biomechanic*[Title/Abstract] OR walking*[Title/Abstract] OR postural balance[Title/Abstract] OR flexion*[Title/Abstract] OR extension*[Title/Abstract] OR turning[Title/Abstract] OR sitting[Title/Abstract] OR kneeling[Title/Abstract] OR squatting[Title/Abstract] OR twisting[Title/Abstract] OR bending[Title/Abstract] OR reaching[Title/Abstract] OR standing[Title/Abstract] OR sedentary[Title/Abstract] OR repetitive movement*[Title/Abstract] OR monotonous work[Title/Abstract] OR relaxation[Title/Abstract] OR recovery of function[Title/Abstract] OR physical demand*[Title/Abstract] OR physically demand*[Title/Abstract]) OR ("Stress, Psychological"[Majr] OR "Social Support"[Majr] OR "Job Satisfaction"[Mesh] OR "Work Schedule Tolerance"[Mesh] OR "Employee Performance Appraisal"[Mesh] OR "Employee Grievances"[Mesh] OR "Social Justice/psychology"[Mesh] OR "Personnel Downsizing"[Mesh] OR "Staff Development"[Mesh] OR "Organizational Culture"[Mesh] OR "Bullying"[Mesh] OR "Prejudice"[Mesh] OR "Social Discrimination"[Mesh] OR "Interpersonal Relations"[Mesh] OR "Communication/psychology"[Mesh]) OR (psychosocial[Title/Abstract] OR job strain[Title/Abstract] OR work strain[Title/Abstract] OR work demand*[Title/Abstract] OR job demand*[Title/Abstract] OR high demand*[Title/Abstract] OR low control[Title/Abstract] OR lack of control[Title/Abstract] OR work control[Title/Abstract] OR job control[Title/Abstract] OR decision latitude[Title/Abstract] OR work influence*[Title/Abstract] OR demand resource*[Title/Abstract] OR effort reward*[Title/Abstract] OR time pressure*[Title/Abstract] OR recuperation*[Title/Abstract] OR work overload*[Title/Abstract] OR work over-load*[Title/Abstract] OR recovery[Title/Abstract] OR coping[Title/Abstract] OR work ability[Title/Abstract] OR social support[Title/Abstract] OR support system*[Title/Abstract] OR social

network*[Title/Abstract] OR emotional support[Title/Abstract] OR interpersonal relation*[Title/Abstract] OR interaction*[Title/Abstract] OR justice*[Title/Abstract] OR injustice*[Title/Abstract] OR job satisfaction[Title/Abstract] OR work satisfaction[Title/Abstract] OR boredom[Title/Abstract] OR skill discretion*[Title/Abstract] OR staff development[Title/Abstract] OR discrimination[Title/Abstract] OR harass*[Title/Abstract] OR work-place conflict*[Title/Abstract] OR workplace violen*[Title/Abstract] OR work-place violen*[Title/Abstract] OR bullying[Title/Abstract] OR ageism[Title/Abstract] OR homophobia[Title/Abstract] OR racism[Title/Abstract] OR sexism[Title/Abstract] OR victimization*[Title/Abstract] OR silent workplace*[Title/Abstract] OR role ambiguity[Title/Abstract] OR role-conflict*[Title/Abstract] OR work-role*[Title/Abstract] OR working hour*[Title/Abstract] OR working time[Title/Abstract] OR day-time[Title/Abstract] OR night-time[Title/Abstract] OR shift work*[Title/Abstract] OR work shift*[Title/Abstract] OR temporary work[Title/Abstract] OR full-time[Title/Abstract] OR part-time[Title/Abstract] OR flexible work*[Title/Abstract] OR organizational change[Title/Abstract] OR organisational change[Title/Abstract] OR lean production[Title/Abstract] OR job security[Title/Abstract] OR job insecurity[Title/Abstract])) AND (retire OR (step AND down) OR (((work AND exit) OR resign OR leave OR quit OR withdraw) AND (office OR job OR employment OR work)) OR superannuate OR (bow AND out)) AND (longitudinal OR prospective OR cohort OR (follow AND up) OR observational)

PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item	Page
ADMINISTRATIVE INFORMATION			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	p.1
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	N/A
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	
Authors:			p.3
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	pp.1-2
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	pp.1-2
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	N/A
Support:			
Sources	5a	Indicate sources of financial or other support for the review	p.12
Sponsor	5b	Provide name for the review funder and/or sponsor	p.12
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	p.12
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	pp.5-6
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	pp.6-7
METHODS			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	pp.7-8
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	p.8
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	p.8
Study records:			
Data	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	p.8

management			
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	p.8
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	pp.8-9
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	p.9
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	p.9
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	p.9
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	p.9
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2, Kendall's τ)	pp.9-10
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	pp.10
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	pp.10
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	p.9
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	p.9

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

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The association between psychosocial factors at work and health outcomes after retirement: a protocol for a systematic review and meta-analysis

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ABSTRACT (300 words)

Introduction: The world's population is rapidly aging, and health among older people is thus an important issue. Several previous studies have reported an association between adverse psychosocial factors at work before retirement and post-retirement health. The objective of this systematic review and meta-analysis is to examine the association between psychosocial factors at work and health outcomes after retirement, based on a synthesis of well-designed prospective studies.

Methods and analysis: The participants, exposures, comparisons and outcomes (PECO) of the studies in this systematic review and meta-analysis are defined as follows: (P) People who have retired from their job, (E) Presence of adverse psychosocial factors at work before retirement, (C) Absence of adverse psychosocial factors at work before retirement, and (O) Any physical and mental health outcomes after retirement. Published studies will be searched using the following electronic databases: MEDLINE, EMBASE, PsycINFO, PsycARTICLES and Japan Medical Abstracts Society. The included studies will be statistically synthesized in a meta-analysis to estimate pooled coefficients and 95% CIs. The quality of each included study will be assessed using the Risk Of Bias In Non-randomised Studies – of Interventions (ROBINS-I). For the assessment of meta-bias, publication bias will be assessed by using Egger's test, as well as visually on a funnel plot. Heterogeneity will be assessed using the chi-square test with Cochran's Q statistic and I^2.

Ethics and dissemination: Results and findings will be submitted and published in a scientific peer-reviewed journal and will be disseminated broadly to researchers and policymakers interested in the translatability of scientific evidence into good practices.

Trial registration: The study protocol is registered at the PROSPERO (registration number: CRD42018099043). The registration date is 31 July 2018.

URL: https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=99043

Keywords: psychosocial factors at work, retirement, health status, mobility, cognitive function

STRENGTHS AND LIMITATION OF THIS STUDY

- This will be the first systematic review and meta-analysis to show integrated evidence for associations between psychosocial factors at work before retirement and post-retirement health conditions.
- The findings would contribute to prevention of chronic conditions and promotion of health and well-being of older adults after retirement and to achieve active

aging.

- Practically, the results of this study could facilitate implementation of appropriate intervention for workers who have been exposed to specific adverse psychosocial factors at work.
- One major limitation is that this study will include mostly observational studies and the findings may be biased by potential confounds.

INTRODUCTION

The population of the world is rapidly aging. The United Nations reported that the global population of those aged 60 or above is growing at a rate of 3.26% per year, and the number of persons in this age group is projected to be 2.1 billion (21.5%) by 2050 [1]. Within this context, health and well-being among older people is focused on important issues [2-6]. To respond to this global challenge, the World Health Organization (WHO) has developed a policy framework of "Active Aging," which optimizes opportunities for health, participation, and security in order to enhance the quality of life of older people [7]. The life course approach adopted in the WHO Active Aging policy framework [7] is an approach intended to maintain and prevent the deterioration of functional capacity of older people [8]. Determinants of health in older age are established in early childhood, even before birth, and influenced by conditions experienced throughout life. Therefore, it is important to apply the life course perspective to considering the dynamic process and multidimensional nature of health and well-being in adults and elderly [9]. Some reviews have reported that the risk factors including some sociodemographic factors, poor mental health, chronic physical disease burden, and adverse lifestyle habits and behaviors for functional decline and mortality increased in the elderly [10-12]. These risk factors are important targets for health promotion. Especially, it is strategically important to reduce potentially modifiable risk factors in early life and across the life course [11].

Work, including employment and working conditions, has been recognized as an important social determinant of health in the working age population [13 14]. However, work also may be an important life course determinant of health as a person ages. Recently, association of working conditions and employment has received attention as a social determinant of health status for older people (i.e., after retirement). For instance, while the overall impact of retirement (including early or voluntary retirement) and health have been reported small and inconsistent [15], people who worked in white-collar jobs have tended to have a more beneficial health effect after retirement than those who worked in blue-collar jobs [16]. There is a possibility that employment status and working conditions at the working age could affect health at an older age after retirement.

Psychosocial factors at work are well known determinants of health on working population. The Joint ILO/WHO (International Labor Organization/World Health Organization) Committee on Occupational Health has defined psychosocial factors at work as "interactions between and among work environment, job content,

organizational conditions and workers' capacities, needs, culture, personal extra-job considerations that may, through perceptions and experience, influence health, work performance and job satisfaction" [17]. Several previous studies reported an association between adverse psychosocial factors at work and post-retirement health. Some longitudinal studies reported that work-related stress (i.e., high job strain or high job demands and lack of control) as defined in the job demand-control model [18] was associated with self-reported health problems in old age [19 20]. For mental health, previous longitudinal studies reported a significant association between several adverse psychosocial factors at work (i.e., high job strain, high demand, low control, low reward, and low support) and depressive symptoms after retirement [21 22]. In addition, a longitudinal study reported that lack of job control was associated with poorer levels of episodic memory at and following retirement [23]. To reduce potentially modifiable risk factors across the life course, an effective strategy might be to target on improving psychosocial factors at work before retirement. However, there is no systematic review or meta-analysis that has gathered evidence from well-designed prospective cohort studies on the impact of adverse psychosocial factors at work on health outcomes after the retirement.

Objectives

The objective of this systematic review and meta-analysis is to examine the association between psychosocial factors at work and health outcomes after retirement, based on a synthesis of well-designed prospective studies. The results of this study could expand the current evidence regarding the effect of psychosocial factors at work on worker health [24 25] to include their impact on health in older people after retirement. In addition, the results of this study could contribute to a better understanding of the quality of employment on health in later life, and the development of a new perspective on the life-course strategy for promoting active aging [7].

METHODS AND ANALYSIS

Study design

This is a systematic review and meta-analysis protocol of prospective studies, according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis protocols (PRISMA-P) guideline [26]. The systematic review and meta-analysis will be reported according to the Meta-analysis Of Observational Studies in Epidemiology (MOOSE) guideline [27]. The study protocol has been registered at PROSPERO (CRD42018099043).

PECO and eligibility criteria of this study

The participants, exposures, comparisons and outcomes (PECO) of the studies in this systematic review and meta-analysis are defined as follows:

(P) People who have retired from their job.

(E) Presence of adverse psychosocial factors at work before retirement.

(C) Absence of adverse psychosocial factors at work before retirement.

(O) Any physical and mental health outcomes after retirement.

The adverse psychosocial factors at work include a wide range of task and organizational characteristics, working conditions, and workplace interactions, such as job strain, effort-reward imbalance, working hours, shift work, low social support and other organizational-level factors.

Inclusion criteria are as follows:

(1) studies that included participants who were working as of the baseline survey period;

(2) studies that assessed adverse psychosocial factors at work before retirement as exposure variables at baseline survey;

(3) studies that assessed any health outcomes as outcome variables after retirement at baseline and follow-up surveys;

(4) studies that used a prospective cohort design;

(5) studies published in English or Japanese; and

(6) studies published in peer-reviewed journals (including advanced online publication).

Exclusion criteria are as follows:

(1) studies targeting participants who have any specific disorder;

(2) studies targeting participants who experienced early retirement due to any problem with their own health, family caregiving responsibilities, or other issues compelling participants to retire early; and

(3) studies targeting participants who have been fired or laid off by their employer.

Information sources and search strategy

Published studies will be searched using the following electronic databases: MEDLINE, EMBASE, PsycINFO, PsycARTICLES and Japan Medical Abstracts Society. The search terms will include words related to the PECO of the studies (see online supplementary appendix for the details of the search strategy). The search terms are determined based on our previous meta-analyses on the association of psychosocial factors at work with metabolic syndrome [28 29] and inflammation [30]), which was an extensive set of terms covering a broad range of psychosocial factors at work (see details of search terms elsewhere [28-30]). In order to conduct the literature search comprehensively, a wide range of search terms related to exposure were selected.

The following search terms will be used:

(1) psychosocial factors at work (stress, sedentary, workload, demand, control, effort, reward, support, social capital, working hours, and shift work, among others);

(2) retirement (retire, step down, resign, leave, quit, and withdraw, among others);

(3) study design (longitudinal, prospective, cohort, and follow up, among others)

Study records

Data management

Study records will be managed by using a standardized form in a Microsoft Excel (Washington, USA) file. Prior to screening the studies, deduplication within this Excel file will be conducted by KI.

Selection process

Fifteen investigators (KI, YA, HA, EA, AI, RI, MI, HE, YO, YK, ASa, NS, KT, AH, and KW) will independently assess the studies according to the eligibility criteria through the following steps (i.e., sifting phase and full text review phase). After excluding duplicated records, the remained articles will be shared by 15 investigators, and pairs of investigators will independently assess the title and abstract of each article to identify eligible studies according to the eligibility criteria (sifting phase). In the full text review phase, pairs of investigators will independently review the full texts that will be included as eligible studies after the sifting phase. When the results (i.e., include or exclude) between the pairs of investigators are inconsistent at this phase, the disagreements will be settled by consensus among all

authors. The results of the assessment by a pair of the two independent reviewers (i.e., consistent or inconsistent) and reasons for excluding studies will be recorded. A flow chart will be provided to show the entire review process. Before starting the sifting phase, a brief session will be held to monitor quality of assessment by each investigator.

Data collection process

Data will be extracted independently from the included studies by 15 investigators (KI, YA, HA, EA, AI, RI, MI, HE, YO, YK, ASa, NS, KT, AH, and KW) using a standardized data extraction form. Any disagreements or inconsistencies will be solved by consultation and consensus among all authors. Investigators will extract data on publication year, study design, country where the study was conducted, the number of participants included in the baseline survey and in the statistical analysis, demographic characteristics of participants (i.e., age, sex and occupational status), the number of years from baseline survey to retirement, the number of years from retirement to follow-up surveys, length of follow-up and attrition rate, exposure variables before retirement (i.e., adverse psychosocial factors at work), outcome variables after retirement (i.e., any physical or mental health indicator), and sufficient data for calculating the coefficients (ß, γ), odds ratios (ORs), relative risks (RRs) or hazard ratios (HRs) with standard errors (SEs) or 95% confidence intervals (CIs) for the association between adverse work-related psychosocial factors before retirement, and health outcomes after retirement. If necessary, the authors of the included studies will be contacted to obtain additional relevant information.

Data synthesis

The included studies will be statistically synthesized in a meta-analysis to estimate pooled coefficients and 95% CIs, stratified by types of measures of association (ß, γ, OR, RR, and HR). If the included studies report ORs, RRs, or HRs, we will calculate log-transformed ORs, RRs, or HRs and determine SEs based on 95% CIs. These parameters will be used in the meta-analysis and for examining publication bias by means of a funnel plot and Egger's test.

Risk of bias in individual studies and assessment of meta-bias

Fifteen investigators (KI, YA, HA, EA, AI, RI, MI, HE, YO, YK, ASa, NS, KT, AH, and KW) will independently assess in pairs the quality of each included study using the internationally recognized tool for evaluating risk of bias (Risk Of Bias In Non-

randomised Studies – of Interventions; ROBINS-I) [31]. The ROBINS-I is a newly developed tool for evaluating risk of bias in estimates of the comparative effectiveness (harm or benefit) of interventions (or specific exposures) from studies that did not use randomization to allocate units (individuals or clusters of individuals) to comparison groups, including observational studies such as cohort studies and case-control studies [31]. The risk of bias is classified as low, high, or unclear risk. Any discrepancies in quality assessment among the investigators will be recorded and discussed among all authors until consensus is reached. For the assessment of meta-bias, publication bias will be assessed by using Egger's test, as well as visually on a funnel plot.

Statistical methods

Primary analyses

For the main analysis, we will synthesize all types of psychosocial factors at work and all types of health outcomes. In this review, it is expected that most of the outcomes of studies that will be included are assessed as dichotomous variables [19-22]. If the outcomes are assessed by continuous variables, we will apply the appropriate cut-off points and convert to dichotomous variables. If we cannot use the appropriate cut-off point, dichotomous variables and continuous variables will be analyzed separately.

Meta-analysis will be conducted when at least three eligible studies can be collected. If a meta-analysis is not appropriate (i.e., only two or fewer studies are eligible and included), the results will be presented in a narrative format. A fixed-effect model will be used if heterogeneity is not observed (e.g., types of exposures, and populations, among others); otherwise, a random-effects model will be used [32]. Heterogeneity will be assessed using the chi-square test with Cochran's Q statistic and I^2 [33]. Usually, I^2 Values of 25%, 50%, and 75% indicate low, medium, and high heterogeneity, respectively [34].

Subgroup and sensitivity analyses

Subgroup analyses will be conducted to compare the results under specific outcomes or conditions. Major possible grouping characteristics will include types of exposure according to some specific work-related stress models (i.e., job strain and support from supervisors/colleagues based on the job demand control support model [18 35], and effort-reward imbalance based on the effort reward imbalance model [36]) and outcome (diseases/symptoms, mobility/physical function, and cognitive function).

Any subgroup differences will be reported, and our findings will be explained by considering these differences. If trends are observed between pooled associations and any grouping characteristics, meta-regression will be conducted [37]. A sensitivity analysis will be conducted for included studies where the ROBINS-I is classified as low risk [31]

Patient and Public Involvement

There is no direct patient or public involvement in the design of this study.

ETHICS AND DISEMINATION

Ethical approval will not be needed to apply this review protocol because data will be extracted from published studies and there will be no concerns about privacy. Results and findings will be submitted and published in a scientific peer-reviewed journal and will be disseminated broadly to researchers and policymakers interested in the translatability of scientific evidence into good practices.

Strengths and limitations

To our knowledge, this will be the first systematic review and meta-analysis to show integrated evidence for the associations between psychosocial factors at work and post-retirement health conditions. The findings of this study will establish a link between psychosocial factors at work in working age and health problems after retirement. Then it would contribute to prevention of chronic conditions and promotion of health and well-being of older adults after retirement, that is, to achieve active aging in our rapidly aging society through proposing an innovative life-course strategy to improve psychosocial factors at work in working age. Practically, the results of this study could facilitate implementation of appropriate intervention for workers who have been exposed to specific adverse psychosocial factors at work.

This systematic review and meta-analysis may have some limitations. A major limitation is that this study will include mostly observational studies and will not be limited to randomized controlled trials, although we will focus on well-designed prospective cohort studies. In addition, the findings may be biased by potential confounders. Moreover, generalization of the findings may be limited by participants' characteristics, depending on the included studies.

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Author's contribution

KI, AT, YA, HA, EA, AI, RI, MI, HE, YO, YK, ASa, NS, KT, AH, KW, ASh and NK have made substantial contributions to the conception and design, writing the protocol and revising it critically for important intellectual content, and approving the final version to be published.

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Competing interest

All authors declare that they have no competing interests.

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Supplementary Appendix

Search terms for PubMed

(("Stress, Mechanical"[Mesh] OR "Lifting"[Mesh] OR "Moving and Lifting Patients"[Mesh] OR "Weight-Bearing"[Mesh] OR "Biomechanics" OR "Physical Exertion"[Mesh] OR "Torsion, Mechanical"[Mesh] OR "Postural Balance"[Mesh] OR "Walking"[Mesh] OR "Recovery of Function"[Mesh] OR "Relaxation"[Mesh] OR (static[Title/Abstract] AND posture) OR (awkward[Title/Abstract] AND posture) OR (dynamic[Title/Abstract] AND posture) OR static work[Title/Abstract] OR dynamic load*[Title/Abstract] OR lift*[Title/Abstract] OR carry*[Title/Abstract] OR hold*[Title/Abstract] OR pull*[Title/Abstract] OR drag*[Title/Abstract] OR push*[Title/Abstract] OR manual handling[Title/Abstract] OR force*[Title/Abstract] OR biomechanic*[Title/Abstract] OR walking*[Title/Abstract] OR postural balance[Title/Abstract] OR flexion*[Title/Abstract] OR extension*[Title/Abstract] OR turning[Title/Abstract] OR sitting[Title/Abstract] OR kneeling[Title/Abstract] OR squatting[Title/Abstract] OR twisting[Title/Abstract] OR bending[Title/Abstract] OR reaching[Title/Abstract] OR standing[Title/Abstract] OR sedentary[Title/Abstract] OR repetitive movement*[Title/Abstract] OR monotonous work[Title/Abstract] OR relaxation[Title/Abstract] OR recovery of function[Title/Abstract] OR physical demand*[Title/Abstract] OR physically demand*[Title/Abstract]) OR ("Stress, Psychological"[Majr] OR "Social Support"[Majr] OR "Job Satisfaction"[Mesh] OR "Work Schedule Tolerance"[Mesh] OR "Employee Performance Appraisal"[Mesh] OR "Employee Grievances"[Mesh] OR "Social Justice/psychology"[Mesh] OR "Personnel Downsizing"[Mesh] OR "Staff Development"[Mesh] OR "Organizational Culture"[Mesh] OR "Bullying"[Mesh] OR "Prejudice"[Mesh] OR "Social Discrimination"[Mesh] OR "Interpersonal Relations"[Mesh] OR "Communication/psychology"[Mesh]) OR (psychosocial[Title/Abstract] OR job strain[Title/Abstract] OR work strain[Title/Abstract] OR work demand*[Title/Abstract] OR job demand*[Title/Abstract] OR high demand*[Title/Abstract] OR low control[Title/Abstract] OR lack of control[Title/Abstract] OR work control[Title/Abstract] OR job control[Title/Abstract] OR decision latitude[Title/Abstract] OR work influence*[Title/Abstract] OR demand resource*[Title/Abstract] OR effort reward*[Title/Abstract] OR time pressure*[Title/Abstract] OR recuperation*[Title/Abstract] OR work overload*[Title/Abstract] OR work over-load*[Title/Abstract] OR recovery[Title/Abstract] OR coping[Title/Abstract] OR work ability[Title/Abstract] OR social support[Title/Abstract] OR support system*[Title/Abstract] OR social

network*[Title/Abstract] OR emotional support[Title/Abstract] OR interpersonal relation*[Title/Abstract] OR interaction*[Title/Abstract] OR justice*[Title/Abstract] OR injustice*[Title/Abstract] OR job satisfaction[Title/Abstract] OR work satisfaction[Title/Abstract] OR boredom[Title/Abstract] OR skill discretion*[Title/Abstract] OR staff development[Title/Abstract] OR discrimination[Title/Abstract] OR harass*[Title/Abstract] OR work-place conflict*[Title/Abstract] OR workplace violen*[Title/Abstract] OR work-place violen*[Title/Abstract] OR bullying[Title/Abstract] OR ageism[Title/Abstract] OR homophobia[Title/Abstract] OR racism[Title/Abstract] OR sexism[Title/Abstract] OR victimization*[Title/Abstract] OR silent workplace*[Title/Abstract] OR role ambiguity[Title/Abstract] OR role-conflict*[Title/Abstract] OR work-role*[Title/Abstract] OR working hour*[Title/Abstract] OR working time[Title/Abstract] OR day-time[Title/Abstract] OR night-time[Title/Abstract] OR shift work*[Title/Abstract] OR work shift*[Title/Abstract] OR temporary work[Title/Abstract] OR full-time[Title/Abstract] OR part-time[Title/Abstract] OR flexible work*[Title/Abstract] OR organizational change[Title/Abstract] OR organisational change[Title/Abstract] OR lean production[Title/Abstract] OR job security[Title/Abstract] OR job insecurity[Title/Abstract])) AND (retire OR (step AND down) OR (((work AND exit) OR resign OR leave OR quit OR withdraw) AND (office OR job OR employment OR work)) OR superannuate OR (bow AND out)) AND (longitudinal OR prospective OR cohort OR (follow AND up) OR observational)

PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item	Page
ADMINISTRATIVE INFORMATION			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	p.1
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	N/A
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	
Authors:			p.3
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	pp.1-2
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	pp.1-2
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	N/A
Support:			
Sources	5a	Indicate sources of financial or other support for the review	p.12
Sponsor	5b	Provide name for the review funder and/or sponsor	p.12
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	p.12
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	pp.5-6
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	pp.6-7
METHODS			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	pp.7-8
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	p.8
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	p.8
Study records:			
Data	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	p.8

management			
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	p.8
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	pp.8-9
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	p.9
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	p.9
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	p.9
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	p.9
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2, Kendall's τ)	pp.9-10
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	pp.10
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	pp.10
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	p.9
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	p.9

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

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The association between psychosocial factors at work and health outcomes after retirement: a protocol for a systematic review and meta-analysis

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Keywords:	psychosocial factors at work, retirement, health status, mobility, cognitive function

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ABSTRACT (300 words)

Introduction: The world's population is rapidly aging, and health among older people is thus an important issue. Several previous studies have reported an association between adverse psychosocial factors at work before retirement and post-retirement health. The objective of this systematic review and meta-analysis is to examine the association between psychosocial factors at work and health outcomes after retirement, based on a synthesis of well-designed prospective studies.

Methods and analysis: The participants, exposures, comparisons and outcomes (PECO) of the studies in this systematic review and meta-analysis are defined as follows: (P) People who have retired from their job, (E) Presence of adverse psychosocial factors at work before retirement, (C) Absence of adverse psychosocial factors at work before retirement, and (O) Any physical and mental health outcomes after retirement. Published studies will be searched using the following electronic databases: MEDLINE, EMBASE, PsycINFO, PsycARTICLES and Japan Medical Abstracts Society. The included studies will be statistically synthesized in a meta-analysis to estimate pooled coefficients and 95% CIs. The quality of each included study will be assessed using the Risk Of Bias In Non-randomised Studies – of Interventions (ROBINS-I). For the assessment of meta-bias, publication bias will be assessed by using Egger's test, as well as visually on a funnel plot. Heterogeneity will be assessed using the chi-square test with Cochran's Q statistic and I^2.

Ethics and dissemination: Results and findings will be submitted and published in a scientific peer-reviewed journal and will be disseminated broadly to researchers and policymakers interested in the translatability of scientific evidence into good practices.

Trial registration: The study protocol is registered at the PROSPERO (registration number: CRD42018099043). The registration date is 31 July 2018.

URL: https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=99043

Keywords: psychosocial factors at work, retirement, health status, mobility, cognitive function

STRENGTHS AND LIMITATION OF THIS STUDY

- This will be the first systematic review and meta-analysis to show integrated evidence for associations between psychosocial factors at work before retirement and post-retirement health conditions.
- The findings would contribute to prevention of chronic conditions and promotion of health and well-being of older adults after retirement and to achieve active

aging.

- Practically, the results of this study could facilitate implementation of appropriate intervention for workers who have been exposed to specific adverse psychosocial factors at work.
- One major limitation is that this study will include mostly observational studies and the findings may be biased by potential confounds.

INTRODUCTION

The population of the world is rapidly aging. The United Nations reported that the global population of those aged 60 or above is growing at a rate of 3.26% per year, and the number of persons in this age group is projected to be 2.1 billion (21.5%) by 2050 [1]. Within this context, health and well-being among older people is focused on important issues [2-6]. To respond to this global challenge, the World Health Organization (WHO) has developed a policy framework of "Active Aging," which optimizes opportunities for health, participation, and security in order to enhance the quality of life of older people [7]. The life course approach adopted in the WHO Active Aging policy framework [7] is an approach intended to maintain and prevent the deterioration of functional capacity of older people [8]. Determinants of health in older age are established in early childhood, even before birth, and influenced by conditions experienced throughout life. Therefore, it is important to apply the life course perspective to considering the dynamic process and multidimensional nature of health and well-being in adults and elderly [9]. Some reviews have reported that the risk factors including some sociodemographic factors, poor mental health, chronic physical disease burden, and adverse lifestyle habits and behaviors for functional decline and mortality increased in the elderly [10-12]. These risk factors are important targets for health promotion. Especially, it is strategically important to reduce potentially modifiable risk factors in early life and across the life course [11].

Work, including employment and working conditions, has been recognized as an important social determinant of health in the working age population [13 14]. However, work also may be an important life course determinant of health as a person ages. Recently, association of working conditions and employment has received attention as a social determinant of health status for older people (i.e., after retirement). For instance, while the overall impact of retirement (including early or voluntary retirement) and health have been reported small and inconsistent [15], people who worked in white-collar jobs have tended to have a more beneficial health effect after retirement than those who worked in blue-collar jobs [16]. There is a possibility that employment status and working conditions at the working age could affect health at an older age after retirement.

Psychosocial factors at work are well known determinants of health on working population. The Joint ILO/WHO (International Labor Organization/World Health Organization) Committee on Occupational Health has defined psychosocial factors at work as "interactions between and among work environment, job content,

organizational conditions and workers' capacities, needs, culture, personal extra-job considerations that may, through perceptions and experience, influence health, work performance and job satisfaction" [17]. Several previous studies reported an association between adverse psychosocial factors at work and post-retirement health. Some longitudinal studies reported that work-related stress (i.e., high job strain or high job demands and lack of control) as defined in the job demand-control model [18] was associated with self-reported health problems in old age [19 20]. For mental health, previous longitudinal studies reported a significant association between several adverse psychosocial factors at work (i.e., high job strain, high demand, low control, low reward, and low support) and depressive symptoms after retirement [21 22]. In addition, a longitudinal study reported that lack of job control was associated with poorer levels of episodic memory at and following retirement [23]. To reduce potentially modifiable risk factors across the life course, an effective strategy might be to target on improving psychosocial factors at work before retirement. However, there is no systematic review or meta-analysis that has gathered evidence from well-designed prospective cohort studies on the impact of adverse psychosocial factors at work on health outcomes after the retirement.

Objectives

The objective of this systematic review and meta-analysis is to examine the association between psychosocial factors at work and health outcomes after retirement, based on a synthesis of well-designed prospective studies. The results of this study could expand the current evidence regarding the effect of psychosocial factors at work on worker health [24 25] to include their impact on health in older people after retirement. In addition, the results of this study could contribute to a better understanding of the quality of employment on health in later life, and the development of a new perspective on the life-course strategy for promoting active aging [7].

METHODS AND ANALYSIS

Study design

This is a systematic review and meta-analysis protocol of prospective studies, according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis protocols (PRISMA-P) guideline [26]. The systematic review and meta-analysis will be reported according to the Meta-analysis Of Observational Studies in Epidemiology (MOOSE) guideline [27]. The study protocol has been registered at PROSPERO (CRD42018099043).

PECO and eligibility criteria of this study

The participants, exposures, comparisons and outcomes (PECO) of the studies in this systematic review and meta-analysis are defined as follows:

(P) People who have retired from their job.

(E) Presence of adverse psychosocial factors at work before retirement.

(C) Absence of adverse psychosocial factors at work before retirement.

(O) Any physical and mental health outcomes after retirement.

The adverse psychosocial factors at work include a wide range of task and organizational characteristics, working conditions, and workplace interactions, such as job strain, effort-reward imbalance, working hours, shift work, low social support and other organizational-level factors.

Inclusion criteria are as follows:

(1) studies that included participants who were working as of the baseline survey period;

(2) studies that assessed adverse psychosocial factors at work before retirement as exposure variables at baseline survey;

(3) studies that assessed any health outcomes as outcome variables after retirement at baseline and follow-up surveys;

(4) studies that used a prospective cohort design;

(5) studies published in English or Japanese; and

(6) studies published in peer-reviewed journals (including advanced online publication).

Exclusion criteria are as follows:

(1) studies targeting participants who have any specific disorder;

(2) studies targeting participants who experienced early retirement due to any problem with their own health, family caregiving responsibilities, or other issues compelling participants to retire early; and

(3) studies targeting participants who have been fired or laid off by their employer.

Information sources and search strategy

A systematic search was conducted on 15 April 2019. Published studies were searched using the following electronic databases: MEDLINE, EMBASE, PsycINFO, PsycARTICLES and Japan Medical Abstracts Society. The search terms included words related to the PECO of the studies (see online supplementary appendix for the details of the search strategy). The search terms were determined based on our previous meta-analyses on the association of psychosocial factors at work with metabolic syndrome [28 29] and inflammation [30]), which was an extensive set of terms covering a broad range of psychosocial factors at work (see details of search terms elsewhere [28-30]). In order to conduct the literature search comprehensively, a wide range of search terms related to exposure were selected.

The following search terms will be used:

(1) psychosocial factors at work (stress, sedentary, workload, demand, control, effort, reward, support, social capital, working hours, and shift work, among others);
(2) retirement (retire, step down, resign, leave, quit, and withdraw, among others);
(3) study design (longitudinal, prospective, cohort, and follow up, among others)

Study records

Data management

Study records will be managed by using a standardized form in a Microsoft Excel (Washington, USA) file. Prior to screening the studies, deduplication within this Excel file will be conducted by KI.

Selection process

Fifteen investigators (KI, YA, HA, EA, AI, RI, MI, HE, YO, YK, ASa, NS, KT, AH, and KW) will independently assess the studies according to the eligibility criteria through the following steps (i.e., sifting phase and full text review phase). After excluding duplicated records, the remained articles will be shared by 15 investigators, and pairs of investigators will independently assess the title and abstract of each article to identify eligible studies according to the eligibility criteria (sifting phase). In the full text review phase, pairs of investigators will independently review the full texts that will be included as eligible studies after the sifting phase. When the results (i.e., include or exclude) between the pairs of investigators are inconsistent at this phase, the disagreements will be settled by consensus among all

authors. The results of the assessment by a pair of the two independent reviewers (i.e., consistent or inconsistent) and reasons for excluding studies will be recorded. A flow chart will be provided to show the entire review process. Before starting the sifting phase, a brief session will be held to monitor quality of assessment by each investigator.

Data collection process

Data will be extracted independently from the included studies by 15 investigators (KI, YA, HA, EA, AI, RI, MI, HE, YO, YK, ASa, NS, KT, AH, and KW) using a standardized data extraction form. Any disagreements or inconsistencies will be solved by consultation and consensus among all authors. Investigators will extract data on publication year, study design, country where the study was conducted, the number of participants included in the baseline survey and in the statistical analysis, demographic characteristics of participants (i.e., age, sex and occupational status), the number of years from baseline survey to retirement, the number of years from retirement to follow-up surveys, length of follow-up and attrition rate, exposure variables before retirement (i.e., adverse psychosocial factors at work), outcome variables after retirement (i.e., any physical or mental health indicator), and sufficient data for calculating the coefficients (ß, γ), odds ratios (ORs), relative risks (RRs) or hazard ratios (HRs) with standard errors (SEs) or 95% confidence intervals (CIs) for the association between adverse work-related psychosocial factors before retirement, and health outcomes after retirement. If necessary, the authors of the included studies will be contacted to obtain additional relevant information.

Data synthesis

The included studies will be statistically synthesized in a meta-analysis to estimate pooled coefficients and 95% CIs, stratified by types of measures of association (ß, γ, OR, RR, and HR). If the included studies report ORs, RRs, or HRs, we will calculate log-transformed ORs, RRs, or HRs and determine SEs based on 95% CIs. These parameters will be used in the meta-analysis and for examining publication bias by means of a funnel plot and Egger's test.

Risk of bias in individual studies and assessment of meta-bias

Fifteen investigators (KI, YA, HA, EA, AI, RI, MI, HE, YO, YK, ASa, NS, KT, AH, and KW) will independently assess in pairs the quality of each included study using the internationally recognized tool for evaluating risk of bias (Risk Of Bias In Non-

randomised Studies – of Interventions; ROBINS-I) [31]. The ROBINS-I is a newly developed tool for evaluating risk of bias in estimates of the comparative effectiveness (harm or benefit) of interventions (or specific exposures) from studies that did not use randomization to allocate units (individuals or clusters of individuals) to comparison groups, including observational studies such as cohort studies and case-control studies [31]. The risk of bias is classified as low, high, or unclear risk. Any discrepancies in quality assessment among the investigators will be recorded and discussed among all authors until consensus is reached. For the assessment of meta-bias, publication bias will be assessed by using Egger's test, as well as visually on a funnel plot.

Statistical methods

Primary analyses

For the main analysis, we will synthesize all types of psychosocial factors at work and all types of health outcomes. In this review, it is expected that most of the outcomes of studies that will be included are assessed as dichotomous variables [19-22]. If the outcomes are assessed by continuous variables, we will apply the appropriate cut-off points and convert to dichotomous variables. If we cannot use the appropriate cut-off point, dichotomous variables and continuous variables will be analyzed separately.

Meta-analysis will be conducted when at least three eligible studies can be collected. If a meta-analysis is not appropriate (i.e., only two or fewer studies are eligible and included), the results will be presented in a narrative format. A fixed-effect model will be used if heterogeneity is not observed (e.g., types of exposures, and populations, among others); otherwise, a random-effects model will be used [32]. Heterogeneity will be assessed using the chi-square test with Cochran's Q statistic and I^2 [33]. Usually, I^2 Values of 25%, 50%, and 75% indicate low, medium, and high heterogeneity, respectively [34].

Subgroup and sensitivity analyses

Subgroup analyses will be conducted to compare the results under specific outcomes or conditions. Major possible grouping characteristics will include types of exposure according to some specific work-related stress models (i.e., job strain and support from supervisors/colleagues based on the job demand control support model [18 35], and effort-reward imbalance based on the effort reward imbalance model [36]) and outcome (diseases/symptoms, mobility/physical function, and cognitive function).

Any subgroup differences will be reported, and our findings will be explained by considering these differences. If trends are observed between pooled associations and any grouping characteristics, meta-regression will be conducted [37]. A sensitivity analysis will be conducted for included studies where the ROBINS-I is classified as low risk [31]

Patient and Public Involvement

There is no direct patient or public involvement in the design of this study.

ETHICS AND DISEMINATION

Ethical approval will not be needed to apply this review protocol because data will be extracted from published studies and there will be no concerns about privacy. Results and findings will be submitted and published in a scientific peer-reviewed journal and will be disseminated broadly to researchers and policymakers interested in the translatability of scientific evidence into good practices.

Strengths and limitations

To our knowledge, this will be the first systematic review and meta-analysis to show integrated evidence for the associations between psychosocial factors at work and post-retirement health conditions. The findings of this study will establish a link between psychosocial factors at work in working age and health problems after retirement. Then it would contribute to prevention of chronic conditions and promotion of health and well-being of older adults after retirement, that is, to achieve active aging in our rapidly aging society through proposing an innovative life-course strategy to improve psychosocial factors at work in working age. Practically, the results of this study could facilitate implementation of appropriate intervention for workers who have been exposed to specific adverse psychosocial factors at work.

This systematic review and meta-analysis may have some limitations. A major limitation is that this study will include mostly observational studies and will not be limited to randomized controlled trials, although we will focus on well-designed prospective cohort studies. In addition, the findings may be biased by potential confounders. Moreover, generalization of the findings may be limited by participants' characteristics, depending on the included studies.

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Author's contribution

KI, AT, YA, HA, EA, AI, RI, MI, HE, YO, YK, ASa, NS, KT, AH, KW, ASh and NK have made substantial contributions to the conception and design, writing the protocol and revising it critically for important intellectual content, and approving the final version to be published.

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Competing interest

All authors declare that they have no competing interests.

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Supplementary Appendix

Search terms for PubMed

(("Stress, Mechanical"[Mesh] OR "Lifting"[Mesh] OR "Moving and Lifting Patients"[Mesh] OR "Weight-Bearing"[Mesh] OR "Biomechanics" OR "Physical Exertion"[Mesh] OR "Torsion, Mechanical"[Mesh] OR "Postural Balance"[Mesh] OR "Walking"[Mesh] OR "Recovery of Function"[Mesh] OR "Relaxation"[Mesh] OR (static[Title/Abstract] AND posture) OR (awkward[Title/Abstract] AND posture) OR (dynamic[Title/Abstract] AND posture) OR static work[Title/Abstract] OR dynamic load*[Title/Abstract] OR lift*[Title/Abstract] OR carry*[Title/Abstract] OR hold*[Title/Abstract] OR pull*[Title/Abstract] OR drag*[Title/Abstract] OR push*[Title/Abstract] OR manual handling[Title/Abstract] OR force*[Title/Abstract] OR biomechanic*[Title/Abstract] OR walking*[Title/Abstract] OR postural balance[Title/Abstract] OR flexion*[Title/Abstract] OR extension*[Title/Abstract] OR turning[Title/Abstract] OR sitting[Title/Abstract] OR kneeling[Title/Abstract] OR squatting[Title/Abstract] OR twisting[Title/Abstract] OR bending[Title/Abstract] OR reaching[Title/Abstract] OR standing[Title/Abstract] OR sedentary[Title/Abstract] OR repetitive movement*[Title/Abstract] OR monotonous work[Title/Abstract] OR relaxation[Title/Abstract] OR recovery of function[Title/Abstract] OR physical demand*[Title/Abstract] OR physically demand*[Title/Abstract]) OR ("Stress, Psychological"[Majr] OR "Social Support"[Majr] OR "Job Satisfaction"[Mesh] OR "Work Schedule Tolerance"[Mesh] OR "Employee Performance Appraisal"[Mesh] OR "Employee Grievances"[Mesh] OR "Social Justice/psychology"[Mesh] OR "Personnel Downsizing"[Mesh] OR "Staff Development"[Mesh] OR "Organizational Culture"[Mesh] OR "Bullying"[Mesh] OR "Prejudice"[Mesh] OR "Social Discrimination"[Mesh] OR "Interpersonal Relations"[Mesh] OR "Communication/psychology"[Mesh]) OR (psychosocial[Title/Abstract] OR job strain[Title/Abstract] OR work strain[Title/Abstract] OR work demand*[Title/Abstract] OR job demand*[Title/Abstract] OR high demand*[Title/Abstract] OR low control[Title/Abstract] OR lack of control[Title/Abstract] OR work control[Title/Abstract] OR job control[Title/Abstract] OR decision latitude[Title/Abstract] OR work influence*[Title/Abstract] OR demand resource*[Title/Abstract] OR effort reward*[Title/Abstract] OR time pressure*[Title/Abstract] OR recuperation*[Title/Abstract] OR work overload*[Title/Abstract] OR work over-load*[Title/Abstract] OR recovery[Title/Abstract] OR coping[Title/Abstract] OR work ability[Title/Abstract] OR social support[Title/Abstract] OR support system*[Title/Abstract] OR social

network*[Title/Abstract] OR emotional support[Title/Abstract] OR interpersonal relation*[Title/Abstract] OR interaction*[Title/Abstract] OR justice*[Title/Abstract] OR injustice*[Title/Abstract] OR job satisfaction[Title/Abstract] OR work satisfaction[Title/Abstract] OR boredom[Title/Abstract] OR skill discretion*[Title/Abstract] OR staff development[Title/Abstract] OR discrimination[Title/Abstract] OR harass*[Title/Abstract] OR work-place conflict*[Title/Abstract] OR workplace violen*[Title/Abstract] OR work-place violen*[Title/Abstract] OR bullying[Title/Abstract] OR ageism[Title/Abstract] OR homophobia[Title/Abstract] OR racism[Title/Abstract] OR sexism[Title/Abstract] OR victimization*[Title/Abstract] OR silent workplace*[Title/Abstract] OR role ambiguity[Title/Abstract] OR role-conflict*[Title/Abstract] OR work-role*[Title/Abstract] OR working hour*[Title/Abstract] OR working time[Title/Abstract] OR day-time[Title/Abstract] OR night-time[Title/Abstract] OR shift work*[Title/Abstract] OR work shift*[Title/Abstract] OR temporary work[Title/Abstract] OR full-time[Title/Abstract] OR part-time[Title/Abstract] OR flexible work*[Title/Abstract] OR organizational change[Title/Abstract] OR organisational change[Title/Abstract] OR lean production[Title/Abstract] OR job security[Title/Abstract] OR job insecurity[Title/Abstract])) AND (retire OR (step AND down) OR (((work AND exit) OR resign OR leave OR quit OR withdraw) AND (office OR job OR employment OR work)) OR superannuate OR (bow AND out)) AND (longitudinal OR prospective OR cohort OR (follow AND up) OR observational)

PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item	Page
ADMINISTRATIVE INFORMATION			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	p.1
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	N/A
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	
Authors:			p.3
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	pp.1-2
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	pp.1-2
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	N/A
Support:			
Sources	5a	Indicate sources of financial or other support for the review	p.12
Sponsor	5b	Provide name for the review funder and/or sponsor	p.12
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	p.12
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	pp.5-6
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	pp.6-7
METHODS			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	pp.7-8
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	p.8
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	p.8
Study records:			
Data	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	p.8

management			
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	p.8
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	pp.8-9
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	p.9
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	p.9
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	p.9
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	p.9
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2, Kendall's τ)	pp.9-10
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	pp.10
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	pp.10
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	p.9
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	p.9

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

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