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

Authors

Kotaro Imamura (PhD),

Department of Mental Health, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan.

Akizumi Tsutsumi (MD),

Department of Public Health, Kitasato University School of Medicine, Sagamihara, Japan.

Yumi Asai (MS),

Department of Mental Health, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan.

Hideaki Arima (MD),

Department of Mental Health, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan.

Emiko Ando (PhD),

Center for Public Health Sciences, National Cancer Center Japan, Tokyo, Japan

Akiomi Inoue (PhD),

Department of Public Health, Kitasato University School of Medicine, Sagamihara, Japan.

Reiko Inoue (MD),

Department of Public Health, Kitasato University School of Medicine, Sagamihara, Japan.

Mai Iwanaga (MS),

Department of Psychiatric Nursing, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan.

Hisashi Eguchi (MD)

Department of Public Health, Kitasato University School of Medicine, Sagamihara, Japan.

Yasumasa Otsuka (PhD),

Faculty of Human Sciences, University of Tsukuba, Tokyo, Japan

Yuka Kobayashi (PhD),

Department of Mental Health, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan.

Asuka Sakuraya (PhD),

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Department of Public Health, Tokyo Women's Medical University, Tokyo, Japan.

Natsu Sasaki (MD),

Department of Mental Health, Graduate School of Medicine, The University of Tokyo,
Tokyo, Japan.

Kanami Tsuno (PhD),

School of Health Innovation, Kanagawa University of Human Services, Kawasaki,
Japan.

Ayako Hino (MD),

Department of Mental Health, Institute of Industrial Ecological Sciences, University
of Occupational and Environmental Health, Japan, Kitakyushu, Japan

Kazuhiro Watanabe (PhD),

Department of Mental Health, Graduate School of Medicine, The University of Tokyo,
Tokyo, Japan.

Akihito Shimazu (PhD),

Faculty of Policy Management, Keio University, Fujisawa, Kanagawa, Japan

Norito Kawakami (MD),

Department of Mental Health, Graduate School of Medicine, The University of Tokyo,
Tokyo, Japan.

Correspondence to: Norito Kawakami

Department of Mental Health, Graduate School of Medicine, The University of Tokyo,
Tokyo, Japan

7-3-1, Hongo, Bunkyo-ku, Tokyo, 113-0033, JAPAN

Tel: +81-3-5841-3522 Fax: +81-3-5841-3392 E-mail: nkawakami@m.u-tokyo.ac.jp

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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

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aging.

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

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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

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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].

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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.

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(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

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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

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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.

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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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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	p.3
Authors:			
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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3

4 Authors

5 Kotaro Imamura (PhD),

6 Department of Mental Health, Graduate School of Medicine, The University of Tokyo,

7 Tokyo, Japan.

8 Akizumi Tsutsumi (MD),

9 Department of Public Health, Kitasato University School of Medicine, Sagamihara,

10 Japan.

11 Yumi Asai (MS),

12 Department of Mental Health, Graduate School of Medicine, The University of Tokyo,

13 Tokyo, Japan.

14 Hideaki Arima (MD),

15 Department of Mental Health, Graduate School of Medicine, The University of Tokyo,

16 Tokyo, Japan.

17 Emiko Ando (PhD),

18 Center for Public Health Sciences, National Cancer Center Japan, Tokyo, Japan

19 Akiomi Inoue (PhD),

20 Department of Public Health, Kitasato University School of Medicine, Sagamihara,

21 Japan.

22 Reiko Inoue (MD),

23 Department of Public Health, Kitasato University School of Medicine, Sagamihara,

24 Japan.

25 Mai Iwanaga (MS),

26 Department of Psychiatric Nursing, Graduate School of Medicine, The University of

27 Tokyo, Tokyo, Japan.

28 Hisashi Eguchi (MD)

29 Department of Public Health, Kitasato University School of Medicine, Sagamihara,

30 Japan.

31 Yasumasa Otsuka (PhD),

32 Faculty of Human Sciences, University of Tsukuba, Tokyo, Japan

33 Yuka Kobayashi (PhD),

34 Department of Mental Health, Graduate School of Medicine, The University of Tokyo,

35 Tokyo, Japan.

36 Asuka Sakuraya (PhD),

1

1   Department of Public Health, Tokyo Women's Medical University, Tokyo, Japan.

2   Natsu Sasaki (MD),

3   Department of Mental Health, Graduate School of Medicine, The University of Tokyo,

4   Tokyo, Japan.

5   Kanami Tsuno (PhD),

6   School of Health Innovation, Kanagawa University of Human Services, Kawasaki,

7   Japan.

8   Ayako Hino (MD),

9   Department of Mental Health, Institute of Industrial Ecological Sciences, University

10   of Occupational and Environmental Health, Japan, Kitakyushu, Japan

11   Kazuhiro Watanabe (PhD),

12   Department of Mental Health, Graduate School of Medicine, The University of Tokyo,

13   Tokyo, Japan.

14   Akihito Shimazu (PhD),

15   Faculty of Policy Management, Keio University, Fujisawa, Kanagawa, Japan

16   Norito Kawakami (MD),

17   Department of Mental Health, Graduate School of Medicine, The University of Tokyo,

18   Tokyo, Japan.

19

20   Correspondence to: Norito Kawakami

21   Department of Mental Health, Graduate School of Medicine, The University of Tokyo,

22   Tokyo, Japan

23   7-3-1, Hongo, Bunkyo-ku, Tokyo, 113-0033, JAPAN

24   Tel: +81-3-5841-3522 Fax: +81-3-5841-3392 E-mail: nkawakami@m.u-tokyo.ac.jp

25

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2

1 **ABSTRACT** (300 words)

2 **Introduction:** The world's population is rapidly aging, and health among older people

3 is thus an important issue. Several previous studies have reported an association

4 between adverse psychosocial factors at work before retirement and post-retirement

5 health. The objective of this systematic review and meta-analysis is to examine the

6 association between psychosocial factors at work and health outcomes after

7 retirement, based on a synthesis of well-designed prospective studies.

8 **Methods and analysis:** The participants, exposures, comparisons and outcomes

9 (PECO) of the studies in this systematic review and meta-analysis are defined as

10 follows: (P) People who have retired from their job, (E) Presence of adverse

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

12 factors at work before retirement, and (O) Any physical and mental health outcomes

13 after retirement. Published studies will be searched using the following electronic

14 databases: MEDLINE, EMBASE, PsycINFO, PsycARTICLES and Japan Medical

15 Abstracts Society. The included studies will be statistically synthesized in a meta-

16 analysis to estimate pooled coefficients and 95% CIs. The quality of each included

17 study will be assessed using the Risk Of Bias In Non-randomised Studies – of

18 Interventions (ROBINS-I). For the assessment of meta-bias, publication bias will be

19 assessed by using Egger's test, as well as visually on a funnel plot. Heterogeneity

20 will be assessed using the chi-square test with Cochran's Q statistic and I^2.

21 **Ethics and dissemination:** Results and findings will be submitted and published in

22 a scientific peer-reviewed journal and will be disseminated broadly to researchers

23 and policymakers interested in the translatability of scientific evidence into good

24 practices.

25 **Trial registration:** The study protocol is registered at the PROSPERO (registration

26 number: CRD42018099043). The registration date is 31 July 2018.

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

28 **Keywords:** psychosocial factors at work, retirement, health status, mobility,

29 cognitive function

30

31 STRENGTHS AND LIMITATION OF THIS STUDY

32 ● This will be the first systematic review and meta-analysis to show integrated

33 evidence for associations between psychosocial factors at work before retirement

34 and post-retirement health conditions.

35 ● The findings would contribute to prevention of chronic conditions and promotion

36 of health and well-being of older adults after retirement and to achieve active

3

1 aging.

2 ● Practically, the results of this study could facilitate implementation of

3 appropriate intervention for workers who have been exposed to specific adverse

4 psychosocial factors at work.

5 ● One major limitation is that this study will include mostly observational

6 studies and the findings may be biased by potential confounds.

7

8

4

1 INTRODUCTION

2 The population of the world is rapidly aging. The United Nations reported that the

3 global population of those aged 60 or above is growing at a rate of 3.26% per year,

4 and the number of persons in this age group is projected to be 2.1 billion (21.5%) by

5 2050 [1]. Within this context, health and well-being among older people is focused

6 on important issues [2-6]. To respond to this global challenge, the World Health

7 Organization (WHO) has developed a policy framework of "Active Aging," which

8 optimizes opportunities for health, participation, and security in order to enhance

9 the quality of life of older people [7]. The life course approach adopted in the WHO

10 Active Aging policy framework [7] is an approach intended to maintain and prevent

11 the deterioration of functional capacity of older people [8]. Determinants of health in

12 older age are established in early childhood, even before birth, and influenced by

13 conditions experienced throughout life. Therefore, it is important to apply the life

14 course perspective to considering the dynamic process and multidimensional nature

15 of health and well-being in adults and elderly [9]. Some reviews have reported that

16 the risk factors including some sociodemographic factors, poor mental health,

17 chronic physical disease burden, and adverse lifestyle habits and behaviors for

18 functional decline and mortality increased in the elderly [10-12]. These risk factors

19 are important targets for health promotion. Especially, it is strategically important

20 to reduce potentially modifiable risk factors in early life and across the life course

21 [11].

22   Work, including employment and working conditions, has been recognized

23 as an important social determinant of health in the working age population [13 14].

24 However, work also may be an important life course determinant of health as a

25 person ages. Recently, association of working conditions and employment has

26 received attention as a social determinant of health status for older people (i.e., after

27 retirement). For instance, while the overall impact of retirement (including early or

28 voluntary retirement) and health have been reported small and inconsistent [15],

29 people who worked in white-collar jobs have tended to have a more beneficial health

30 effect after retirement than those who worked in blue-collar jobs [16]. There is a

31 possibility that employment status and working conditions at the working age could

32 affect health at an older age after retirement.

33   Psychosocial factors at work are well known determinants of health on

34 working population. The Joint ILO/WHO (International Labor Organization/World

35 Health Organization) Committee on Occupational Health has defined psychosocial

36 factors at work as "interactions between and among work environment, job content,

5

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].

6

1 **METHODS AND ANALYSIS**

2 **Study design**

3 This is a systematic review and meta-analysis protocol of prospective studies,

4 according to the Preferred Reporting Items for Systematic Reviews and Meta-

5 Analysis protocols (PRISMA-P) guideline [26]. The systematic review and meta-

6 analysis will be reported according to the Meta-analysis Of Observational Studies in

7 Epidemiology (MOOSE) guideline [27]. The study protocol has been registered at

8 PROSPERO (CRD42018099043).

9

10 **PECO and eligibility criteria of this study**

11 The participants, exposures, comparisons and outcomes (PECO) of the studies in this

12 systematic review and meta-analysis are defined as follows:

13 (P) People who have retired from their job.

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

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

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

17   The adverse psychosocial factors at work include a wide range of task and

18 organizational characteristics, working conditions, and workplace interactions, such

19 as job strain, effort-reward imbalance, working hours, shift work, low social support

20 and other organizational-level factors.

21   Inclusion criteria are as follows:

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

23 period;

24 (2) studies that assessed adverse psychosocial factors at work before retirement as

25 exposure variables at baseline survey;

26 (3) studies that assessed any health outcomes as outcome variables after retirement

27 at baseline and follow-up surveys;

28 (4) studies that used a prospective cohort design;

29 (5) studies published in English or Japanese; and

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

31 publication).

32   Exclusion criteria are as follows:

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

34 (2) studies targeting participants who experienced early retirement due to any

35 problem with their own health, family caregiving responsibilities, or other issues

36 compelling participants to retire early; and

7

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

2

3 **Information sources and search strategy**

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

14   The following search terms will be used:
15 (1) psychosocial factors at work (stress, sedentary, workload, demand, control, effort,
16 reward, support, social capital, working hours, and shift work, among others);
17 (2) retirement (retire, step down, resign, leave, quit, and withdraw, among others);
18 (3) study design (longitudinal, prospective, cohort, and follow up, among others)

19

20 **Study records**

21 *Data management*

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

25

26 *Selection process*

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

8

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

6

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

24

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

32

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

9

1   randomised Studies – of Interventions; ROBINS-I) [31]. The ROBINS-I is a newly

2   developed tool for evaluating risk of bias in estimates of the comparative

3   effectiveness (harm or benefit) of interventions (or specific exposures) from studies

4   that did not use randomization to allocate units (individuals or clusters of

5   individuals) to comparison groups, including observational studies such as cohort

6   studies and case-control studies [31]. The risk of bias is classified as low, high, or

7   unclear risk. Any discrepancies in quality assessment among the investigators will

8   be recorded and discussed among all authors until consensus is reached. For the

9   assessment of meta-bias, publication bias will be assessed by using Egger's test, as

10   well as visually on a funnel plot.

11

12   **Statistical methods**

13   *Primary analyses*

14   For the main analysis, we will synthesize all types of psychosocial factors at work

15   and all types of health outcomes. In this review, it is expected that most of the

16   outcomes of studies that will be included are assessed as dichotomous variables [19-

17   22]. If the outcomes are assessed by continuous variables, we will apply the

18   appropriate cut-off points and convert to dichotomous variables. If we cannot use the

19   appropriate cut-off point, dichotomous variables and continuous variables will be

20   analyzed separately.

21   Meta-analysis will be conducted when at least three eligible studies can be

22   collected. If a meta-analysis is not appropriate (i.e., only two or fewer studies are

23   eligible and included), the results will be presented in a narrative format. A fixed-

24   effect model will be used if heterogeneity is not observed (e.g., types of exposures,

25   and populations, among others); otherwise, a random-effects model will be used [32].

26   Heterogeneity will be assessed using the chi-square test with Cochran's Q statistic

27   and I^2 [33]. Usually, I^2 Values of 25%, 50%, and 75% indicate low, medium, and high

28   heterogeneity, respectively [34].

29

30   *Subgroup and sensitivity analyses*

31   Subgroup analyses will be conducted to compare the results under specific outcomes

32   or conditions. Major possible grouping characteristics will include types of exposure

33   according to some specific work-related stress models (i.e., job strain and support

34   from supervisors/colleagues based on the job demand control support model [18 35],

35   and effort-reward imbalance based on the effort reward imbalance model [36]) and

36   outcome (diseases/symptoms, mobility/physical function, and cognitive function).

10

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

6

7 **Patient and Public Involvement**

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

9

10

11

1   **ETHICS AND DISEMINATION**

2   Ethical approval will not be needed to apply this review protocol because data will

3   be extracted from published studies and there will be no concerns about privacy.

4   Results and findings will be submitted and published in a scientific peer-reviewed

5   journal and will be disseminated broadly to researchers and policymakers interested

6   in the translatability of scientific evidence into good practices.

7

8   **Strengths and limitations**

9   To our knowledge, this will be the first systematic review and meta-analysis to show

10   integrated evidence for the associations between psychosocial factors at work and

11   post-retirement health conditions. The findings of this study will establish a link

12   between psychosocial factors at work in working age and health problems after

13   retirement. Then it would contribute to prevention of chronic conditions and

14   promotion of health and well-being of older adults after retirement, that is, to

15   achieve active aging in our rapidly aging society through proposing an innovative

16   life-course strategy to improve psychosocial factors at work in working age.

17   Practically, the results of this study could facilitate implementation of appropriate

18   intervention for workers who have been exposed to specific adverse psychosocial

19   factors at work.

20   This systematic review and meta-analysis may have some limitations. A

21   major limitation is that this study will include mostly observational studies and will

22   not be limited to randomized controlled trials, although we will focus on well-

23   designed prospective cohort studies. In addition, the findings may be biased by

24   potential confounders. Moreover, generalization of the findings may be limited by

25   participants' characteristics, depending on the included studies.

26

27

12

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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) and 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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BMJ Open

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

Secondary Subject Heading:	Public health
Keywords:	psychosocial factors at work, retirement, health status, mobility, cognitive function

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Manuscripts

1   Title: The association between psychosocial factors at work and health outcomes

2   after retirement: a protocol for a systematic review and meta-analysis

3

4   Authors

5   Kotaro Imamura (PhD),

6   Department of Mental Health, Graduate School of Medicine, The University of Tokyo,

7   Tokyo, Japan.

8   Akizumi Tsutsumi (MD),

9   Department of Public Health, Kitasato University School of Medicine, Sagamihara,

10   Japan.

11   Yumi Asai (MS),

12   Department of Mental Health, Graduate School of Medicine, The University of Tokyo,

13   Tokyo, Japan.

14   Hideaki Arima (MD),

15   Department of Mental Health, Graduate School of Medicine, The University of Tokyo,

16   Tokyo, Japan.

17   Emiko Ando (PhD),

18   Center for Public Health Sciences, National Cancer Center Japan, Tokyo, Japan

19   Akiomi Inoue (PhD),

20   Department of Public Health, Kitasato University School of Medicine, Sagamihara,

21   Japan.

22   Reiko Inoue (MD),

23   Department of Public Health, Kitasato University School of Medicine, Sagamihara,

24   Japan.

25   Mai Iwanaga (MS),

26   Department of Psychiatric Nursing, Graduate School of Medicine, The University of

27   Tokyo, Tokyo, Japan.

28   Hisashi Eguchi (MD)

29   Department of Public Health, Kitasato University School of Medicine, Sagamihara,

30   Japan.

31   Yasumasa Otsuka (PhD),

32   Faculty of Human Sciences, University of Tsukuba, Tokyo, Japan

33   Yuka Kobayashi (PhD),

34   Department of Mental Health, Graduate School of Medicine, The University of Tokyo,

35   Tokyo, Japan.

36   Asuka Sakuraya (PhD),

1

1 Department of Public Health, Tokyo Women's Medical University, Tokyo, Japan.

2 Natsu Sasaki (MD),

3 Department of Mental Health, Graduate School of Medicine, The University of Tokyo,

4 Tokyo, Japan.

5 Kanami Tsuno (PhD),

6 School of Health Innovation, Kanagawa University of Human Services, Kawasaki,

7 Japan.

8 Ayako Hino (MD),

9 Department of Mental Health, Institute of Industrial Ecological Sciences, University

10 of Occupational and Environmental Health, Japan, Kitakyushu, Japan

11 Kazuhiro Watanabe (PhD),

12 Department of Mental Health, Graduate School of Medicine, The University of Tokyo,

13 Tokyo, Japan.

14 Akihito Shimazu (PhD),

15 Faculty of Policy Management, Keio University, Fujisawa, Kanagawa, Japan

16 Norito Kawakami (MD),

17 Department of Mental Health, Graduate School of Medicine, The University of Tokyo,

18 Tokyo, Japan.

19

20 Correspondence to: Norito Kawakami

21 Department of Mental Health, Graduate School of Medicine, The University of Tokyo,

22 Tokyo, Japan

23 7-3-1, Hongo, Bunkyo-ku, Tokyo, 113-0033, JAPAN

24 Tel: +81-3-5841-3522 Fax: +81-3-5841-3392 E-mail: nkawakami@m.u-tokyo.ac.jp

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26 Word count: 2,417

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1   **ABSTRACT** (300 words)

2   **Introduction:** The world's population is rapidly aging, and health among older people

3   is thus an important issue. Several previous studies have reported an association

4   between adverse psychosocial factors at work before retirement and post-retirement

5   health. The objective of this systematic review and meta-analysis is to examine the

6   association between psychosocial factors at work and health outcomes after

7   retirement, based on a synthesis of well-designed prospective studies.

8   **Methods and analysis:** The participants, exposures, comparisons and outcomes

9   (PECO) of the studies in this systematic review and meta-analysis are defined as

10   follows: (P) People who have retired from their job, (E) Presence of adverse

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

12   factors at work before retirement, and (O) Any physical and mental health outcomes

13   after retirement. Published studies will be searched using the following electronic

14   databases: MEDLINE, EMBASE, PsycINFO, PsycARTICLES and Japan Medical

15   Abstracts Society. The included studies will be statistically synthesized in a meta-

16   analysis to estimate pooled coefficients and 95% CIs. The quality of each included

17   study will be assessed using the Risk Of Bias In Non-randomised Studies – of

18   Interventions (ROBINS-I). For the assessment of meta-bias, publication bias will be

19   assessed by using Egger's test, as well as visually on a funnel plot. Heterogeneity

20   will be assessed using the chi-square test with Cochran's Q statistic and I^2.

21   **Ethics and dissemination:** Results and findings will be submitted and published in

22   a scientific peer-reviewed journal and will be disseminated broadly to researchers

23   and policymakers interested in the translatability of scientific evidence into good

24   practices.

25   **Trial registration:** The study protocol is registered at the PROSPERO (registration

26   number: CRD42018099043). The registration date is 31 July 2018.

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

28   **Keywords:** psychosocial factors at work, retirement, health status, mobility,

29   cognitive function

30

31   STRENGTHS AND LIMITATION OF THIS STUDY

32   ● This will be the first systematic review and meta-analysis to show integrated

33   evidence for associations between psychosocial factors at work before retirement

34   and post-retirement health conditions.

35   ● The findings would contribute to prevention of chronic conditions and promotion

36   of health and well-being of older adults after retirement and to achieve active

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6   1   aging.
7   2   ●   Practically, the results of this study could facilitate implementation of
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9   3   appropriate intervention for workers who have been exposed to specific adverse
10   4   psychosocial factors at work.
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12   5   ●   One major limitation is that this study will include mostly observational
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14   6   studies and the findings may be biased by potential confounds.
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1 INTRODUCTION

2 The population of the world is rapidly aging. The United Nations reported that the
3 global population of those aged 60 or above is growing at a rate of 3.26% per year,
4 and the number of persons in this age group is projected to be 2.1 billion (21.5%) by
5 2050 [1]. Within this context, health and well-being among older people is focused
6 on important issues [2-6]. To respond to this global challenge, the World Health
7 Organization (WHO) has developed a policy framework of "Active Aging," which
8 optimizes opportunities for health, participation, and security in order to enhance
9 the quality of life of older people [7]. The life course approach adopted in the WHO
10 Active Aging policy framework [7] is an approach intended to maintain and prevent
11 the deterioration of functional capacity of older people [8]. Determinants of health in
12 older age are established in early childhood, even before birth, and influenced by
13 conditions experienced throughout life. Therefore, it is important to apply the life
14 course perspective to considering the dynamic process and multidimensional nature
15 of health and well-being in adults and elderly [9]. Some reviews have reported that
16 the risk factors including some sociodemographic factors, poor mental health,
17 chronic physical disease burden, and adverse lifestyle habits and behaviors for
18 functional decline and mortality increased in the elderly [10-12]. These risk factors
19 are important targets for health promotion. Especially, it is strategically important
20 to reduce potentially modifiable risk factors in early life and across the life course
21 [11].

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

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

5

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].

6

1 **METHODS AND ANALYSIS**

2 **Study design**

3 This is a systematic review and meta-analysis protocol of prospective studies,

4 according to the Preferred Reporting Items for Systematic Reviews and Meta-

5 Analysis protocols (PRISMA-P) guideline [26]. The systematic review and meta-

6 analysis will be reported according to the Meta-analysis Of Observational Studies in

7 Epidemiology (MOOSE) guideline [27]. The study protocol has been registered at

8 PROSPERO (CRD42018099043).

9

10 **PECO and eligibility criteria of this study**

11 The participants, exposures, comparisons and outcomes (PECO) of the studies in this

12 systematic review and meta-analysis are defined as follows:

13 (P) People who have retired from their job.

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

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

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

17 The adverse psychosocial factors at work include a wide range of task and

18 organizational characteristics, working conditions, and workplace interactions, such

19 as job strain, effort-reward imbalance, working hours, shift work, low social support

20 and other organizational-level factors.

21 Inclusion criteria are as follows:

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

23 period;

24 (2) studies that assessed adverse psychosocial factors at work before retirement as

25 exposure variables at baseline survey;

26 (3) studies that assessed any health outcomes as outcome variables after retirement

27 at baseline and follow-up surveys;

28 (4) studies that used a prospective cohort design;

29 (5) studies published in English or Japanese; and

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

31 publication).

32 Exclusion criteria are as follows:

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

34 (2) studies targeting participants who experienced early retirement due to any

35 problem with their own health, family caregiving responsibilities, or other issues

36 compelling participants to retire early; and

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

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3   Information sources and search strategy

4   A systematic search was conducted on 15 April 2019. Published studies were

5   searched using the following electronic databases: MEDLINE, EMBASE, PsycINFO,

6   PsycARTICLES and Japan Medical Abstracts Society. The search terms included

7   words related to the PECO of the studies (see online supplementary appendix for the

8   details of the search strategy). The search terms were determined based on our

9   previous meta-analyses on the association of psychosocial factors at work with

10   metabolic syndrome [28 29] and inflammation [30]), which was an extensive set of

11   terms covering a broad range of psychosocial factors at work (see details of search

12   terms elsewhere [28-30]). In order to conduct the literature search comprehensively,

13   a wide range of search terms related to exposure were selected.

14   The following search terms will be used:

15   (1) psychosocial factors at work (stress, sedentary, workload, demand, control, effort,

16   reward, support, social capital, working hours, and shift work, among others);

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

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

19

20   Study records

21   *Data management*

22   Study records will be managed by using a standardized form in a Microsoft Excel

23   (Washington, USA) file. Prior to screening the studies, deduplication within this

24   Excel file will be conducted by KI.

25

26   *Selection process*

27   Fifteen investigators (KI, YA, HA, EA, AI, RI, MI, HE, YO, YK, ASa, NS, KT, AH,

28   and KW) will independently assess the studies according to the eligibility criteria

29   through the following steps (i.e., sifting phase and full text review phase). After

30   excluding duplicated records, the remained articles will be shared by 15

31   investigators, and pairs of investigators will independently assess the title and

32   abstract of each article to identify eligible studies according to the eligibility criteria

33   (sifting phase). In the full text review phase, pairs of investigators will independently

34   review the full texts that will be included as eligible studies after the sifting phase.

35   When the results (i.e., include or exclude) between the pairs of investigators are

36   inconsistent at this phase, the disagreements will be settled by consensus among all

8

1 authors. The results of the assessment by a pair of the two independent reviewers

2 (i.e., consistent or inconsistent) and reasons for excluding studies will be recorded. A

3 flow chart will be provided to show the entire review process. Before starting the

4 sifting phase, a brief session will be held to monitor quality of assessment by each

5 investigator.

6

7 *Data collection process*

8 Data will be extracted independently from the included studies by 15 investigators

9 (KI, YA, HA, EA, AI, RI, MI, HE, YO, YK, ASa, NS, KT, AH, and KW) using a

10 standardized data extraction form. Any disagreements or inconsistencies will be

11 solved by consultation and consensus among all authors. Investigators will extract

12 data on publication year, study design, country where the study was conducted, the

13 number of participants included in the baseline survey and in the statistical analysis,

14 demographic characteristics of participants (i.e., age, sex and occupational status),

15 the number of years from baseline survey to retirement, the number of years from

16 retirement to follow-up surveys, length of follow-up and attrition rate, exposure

17 variables before retirement (i.e., adverse psychosocial factors at work), outcome

18 variables after retirement (i.e., any physical or mental health indicator), and

19 sufficient data for calculating the coefficients (ß, γ), odds ratios (ORs), relative risks

20 (RRs) or hazard ratios (HRs) with standard errors (SEs) or 95% confidence intervals

21 (CIs) for the association between adverse work-related psychosocial factors before

22 retirement, and health outcomes after retirement. If necessary, the authors of the

23 included studies will be contacted to obtain additional relevant information.

24

25 **Data synthesis**

26 The included studies will be statistically synthesized in a meta-analysis to estimate

27 pooled coefficients and 95% CIs, stratified by types of measures of association (ß, γ,

28 OR, RR, and HR). If the included studies report ORs, RRs, or HRs, we will calculate

29 log-transformed ORs, RRs, or HRs and determine SEs based on 95% CIs. These

30 parameters will be used in the meta-analysis and for examining publication bias by

31 means of a funnel plot and Egger's test.

32

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

34 Fifteen investigators (KI, YA, HA, EA, AI, RI, MI, HE, YO, YK, ASa, NS, KT, AH,

35 and KW) will independently assess in pairs the quality of each included study using

36 the internationally recognized tool for evaluating risk of bias (Risk Of Bias In Non-

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1   randomised Studies – of Interventions; ROBINS-I) [31]. The ROBINS-I is a newly

2   developed tool for evaluating risk of bias in estimates of the comparative

3   effectiveness (harm or benefit) of interventions (or specific exposures) from studies

4   that did not use randomization to allocate units (individuals or clusters of

5   individuals) to comparison groups, including observational studies such as cohort

6   studies and case-control studies [31]. The risk of bias is classified as low, high, or

7   unclear risk. Any discrepancies in quality assessment among the investigators will

8   be recorded and discussed among all authors until consensus is reached. For the

9   assessment of meta-bias, publication bias will be assessed by using Egger's test, as

10 well as visually on a funnel plot.

11

12 **Statistical methods**

13 *Primary analyses*

14 For the main analysis, we will synthesize all types of psychosocial factors at work

15 and all types of health outcomes. In this review, it is expected that most of the

16 outcomes of studies that will be included are assessed as dichotomous variables [19-

17 22]. If the outcomes are assessed by continuous variables, we will apply the

18 appropriate cut-off points and convert to dichotomous variables. If we cannot use the

19 appropriate cut-off point, dichotomous variables and continuous variables will be

20 analyzed separately.

21   Meta-analysis will be conducted when at least three eligible studies can be

22 collected. If a meta-analysis is not appropriate (i.e., only two or fewer studies are

23 eligible and included), the results will be presented in a narrative format. A fixed-

24 effect model will be used if heterogeneity is not observed (e.g., types of exposures,

25 and populations, among others); otherwise, a random-effects model will be used [32].

26 Heterogeneity will be assessed using the chi-square test with Cochran's Q statistic

27 and I^2 [33]. Usually, I^2 Values of 25%, 50%, and 75% indicate low, medium, and high

28 heterogeneity, respectively [34].

29

30 *Subgroup and sensitivity analyses*

31 Subgroup analyses will be conducted to compare the results under specific outcomes

32 or conditions. Major possible grouping characteristics will include types of exposure

33 according to some specific work-related stress models (i.e., job strain and support

34 from supervisors/colleagues based on the job demand control support model [18 35],

35 and effort-reward imbalance based on the effort reward imbalance model [36]) and

36 outcome (diseases/symptoms, mobility/physical function, and cognitive function).

10

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

6

7 **Patient and Public Involvement**
8 There is no direct patient or public involvement in the design of this study.

9

10

11

1 **ETHICS AND DISEMINATION**

2 Ethical approval will not be needed to apply this review protocol because data will

3 be extracted from published studies and there will be no concerns about privacy.

4 Results and findings will be submitted and published in a scientific peer-reviewed

5 journal and will be disseminated broadly to researchers and policymakers interested

6 in the translatability of scientific evidence into good practices.

7

8 **Strengths and limitations**

9 To our knowledge, this will be the first systematic review and meta-analysis to show

10 integrated evidence for the associations between psychosocial factors at work and

11 post-retirement health conditions. The findings of this study will establish a link

12 between psychosocial factors at work in working age and health problems after

13 retirement. Then it would contribute to prevention of chronic conditions and

14 promotion of health and well-being of older adults after retirement, that is, to

15 achieve active aging in our rapidly aging society through proposing an innovative

16 life-course strategy to improve psychosocial factors at work in working age.

17 Practically, the results of this study could facilitate implementation of appropriate

18 intervention for workers who have been exposed to specific adverse psychosocial

19 factors at work.

20 This systematic review and meta-analysis may have some limitations. A

21 major limitation is that this study will include mostly observational studies and will

22 not be limited to randomized controlled trials, although we will focus on well-

23 designed prospective cohort studies. In addition, the findings may be biased by

24 potential confounders. Moreover, generalization of the findings may be limited by

25 participants' characteristics, depending on the included studies.

26

27

12

1 **ACKNOWLEDGEMENT**

2 **Author's contribution**

3 KI, AT, YA, HA, EA, AI, RI, MI, HE, YO, YK, ASa, NS, KT, AH, KW, ASh and NK

4 have made substantial contributions to the conception and design, writing the

5 protocol and revising it critically for important intellectual content, and approving

6 the final version to be published.

7

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10 (180701) from the Ministry of Health, Labour and Welfare, Japan.

11

12 **Competing interest**

13 All authors declare that they have no competing interests.

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16

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	p.3
Authors:			
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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