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Are occupational complexity and socioeconomic position related to psychological distress 20 years later?

Abstract

Objectives: To assess occupational complexity in midlife *in relation to psychological distress in older adulthood* (69+ years) and *explore the role of socioeconomic position*.

Methods: Baseline data from the Swedish Level of Living Survey and follow-up data from the Swedish Longitudinal Study of Living Conditions of the Oldest Old were combined, resulting in 20+ years of follow-up. Data were analyzed using ordered logistic regressions.

Results: Higher occupational complexity was associated with less psychological distress 20 years later. Higher socioeconomic position yielded the same pattern of results. Socioeconomic position partially accounted for the association between occupational complexity and psychological distress.

Discussion: With the social gradient not easily amenable to modification, efforts to increase engagement at work may offer a viable option to attenuate the influence of work environment on psychological distress later in life.

Keywords: Psychological distress, occupational complexity, socioeconomic position, old age, population based.

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Introduction

Earlier studies show that mental health in old age is dependent on experiences during the life course (Gruenewald et al., 2012; Mirowsky and Ross, 2005). Most people spend a large part of their lives at work, so the work environment is probably one of the most important sources of health-related exposures. Findings from the Whitehall II study suggest that adverse socioeconomic conditions and working conditions in midlife are strong predictors for post-retirement depressive symptoms (Virtanen et al., 2014).

Intellectually challenging occupations have been associated with better cognitive abilities in older adulthood (Andel et al., 2007; Gow et al., 2010). In addition, the influence of work characteristics on cognitive abilities appears not to be attenuated by retirement (Coe et al., 2012). In turn, cognitive abilities have been related to a number of health-related outcomes in old age (Small et al., 2011; Verhaegen et al., 2003), suggesting that the established association between occupational characteristics on cognitive abilities may have a more widespread influence on health and aging.

Kohn and Schooler (1983) formulated the *environmental complexity hypothesis* based on the idea that environmental demands posed by complex environments are related to favorable mental health outcomes. More complex work constantly allows or demands that persons do challenging tasks that engage the person cognitively but may also increase psychological wellbeing. Occupational complexity has also been associated with multiple positive psychological outcomes in people of working age (Miller et al., 1979; Adelman, 1987). Thus, complex occupations may be associated with better psychological wellbeing even in older adulthood.

Social engagement, measured as social activity and as paid or unpaid work, has been associated with fewer depressive symptoms in old age in both cross-sectional and longitudinal studies (Glass et al., 2006). In the current study, we focus specifically on the association between intellectual engagement measured as occupational complexity of paid work at midlife and self-reported psychological distress in older adulthood.

Occupational complexity is positively correlated with socioeconomic position (SEP). SEP is conventionally assessed using education, social class, and financial conditions (e.g., income, wealth, or cash margin), all of which are also related to occupational complexity (Mirowsky and Ross, 2005; Tåhlin, 2007; le Grand and Tåhlin, 2013). A substantial body of research has also shown associations between SEP and psychological problems; individuals with lower SEP are more likely to report psychological distress than those with higher SEP (Mirowsky and Ross, 2003). Thus, any assessment of the associations between occupational complexity and psychological distress must take differences in SEP into consideration.

Prospective studies have typically focused either on working conditions or on socioeconomic conditions (Hoven and Siegrist, 2013), but we were able to study both. Moreover, studies rarely use more than one or two indicators of SEP (Hoven and Siegrist, 2013), whereas we had the opportunity to use multiple indicators, which helped capture the multidimensionality of this complex variable.

Aims

The overarching aim of this study was to assess whether occupational complexity would be associated with psychological distress in older adulthood (69+ years). We also set out to study whether any such associations would be explained by midlife SEP. Our hypotheses were:

- Higher occupational complexity in midlife would be associated with less psychological distress in older adulthood.

- Higher SEP in midlife would be associated with less psychological distress in older adulthood.
- Higher occupational complexity in midlife would be associated with less psychological distress in older adulthood even after adjustment for midlife SEP.

Methods

Data

Data from the Swedish Level of Living Surveys (LNU), collected in 1968, 1981, and 1991, were used as baseline assessment data. Data from the Swedish Longitudinal Study of Living Conditions of the Oldest Old (SWEOLD), collected in 1992, 2002, 2004, and 2011, were used as follow-up data (see Table 1). The linkages represent observations from two waves of data collection separated by 20+ years (baseline and follow-up for the different years), specifically 1968-1992, 1981-2002, 1981-2004, and 1991-2010. We found small or no differences in the associations between the independent variables and the outcomes for the different linkages. Therefore, the linkages were combined and analyzed as one dataset by retaining a covariate with separate value specified for each linkage.

Both LNU (response rates 78.3–90.8%) and SWEOLD (response rates 84.4–95.4%) are nationally representative of the Swedish population; new respondents are added every survey year to maintain representativeness. SWEOLD is a continuation of LNU: LNU includes persons aged 15–75 years, whereas SWEOLD includes persons older than 75 who participated in LNU. SWEOLD 2004 was an exception; it included people 69 years and older.

Because of the sampling procedure (using 1981 data collection as baseline for two different linkages), 282 persons (from baseline 1981) were linked within two follow-ups, 2002 and 2004. The small time difference between the 2002 and 2004 follow-ups made it problematic to treat them as independent observations, as this could lead to artificially low standard errors. To control for this, cluster-correlated robust estimate of variance was used in the analyses (Hardin and Hilbe, 2012).

Insert Table 1 about here.

Participants without a gainful occupation at baseline (mostly housewives) were excluded (linkage 1=24.5 % of the linked observations, linkage 2=32.9 %, linkage 3=13.9 %, and linkage 4=23.8 %; overall=21.9 %). Persons who had passed retirement age at baseline were also excluded (linkage 1=9.2 % of the linked observations, linkage 2=12.0 %, linkage 3=7.0 %, and linkage 4=26.4 %; overall=12.7 %). Retirement age was 67 in 1968 and 65 in all other baseline years. The oldest person in the 1968 LNU baseline data collection wave was therefore 66 years, whereas the oldest person in the other baseline data collection waves was 64 years. Observations with item non-response for any of the independent variables, or the covariates, were excluded (linkage 1=7.2 % of the linked observations, linkage 2=1.8 %, linkage 3=2.9 %, and linkage 4=2.5 %; overall=3.5 %). The linkages were analyzed separately. The results showed small differences between the linkages; the linkages were therefore merged and analyzed as one dataset.

Measures

Dependent Variables

In both LNU and SWEOLD, respondents were asked about many different outcomes, including outcomes pertaining to psychological distress, such as fatigue, anxiety, and depression. The question was “Have you had any of the following diseases or disorders during the last 12 months?” and the response alternatives were “no,” “yes, slight,” and “yes, severe.” Answers were coded 0, 1, and 2. Fatigue, anxiety, and depression were examined separately and in a summarized index of psychological distress. Fatigue may be considered a less common measure of psychological distress. However, previous research suggests that fatigue may tap into the psychological distress construct well (Mänty et al., 2012)

In the summarized index of psychological distress all the items were given equal weight. The index ranged from 0 to 6. A rating of 0 equaled no problems, and a rating of 6 equaled severe problems in all three items (fatigue, anxiety, and depression).

Independent variables

The main independent variables were occupational complexity and SEP. We measured occupational complexity as substantive complexity, complexity of work with data, and complexity of work with people. The measures of occupational complexity build on research in functional job analysis (Fine, 1968), which focuses on complexity of work with data, people, and things. Note that complexity of work with things was not used in this study because of its low reliability and predictive ability (Andel et al., 2005; Cain and Treiman, 1981).

To generate these scores, qualified job analysts observed workers and classified jobs on the basis of work tasks and skills needed to carry out the tasks specific to each occupation. Complexity scores for each of the three dimensions (data, people, and things) are included among the 46 worker characteristics obtained via the observations and presented in the U.S. Dictionary of Occupational Titles (DOT) (Cain and Treiman, 1981). Specifically, complexity in work with data refers to the level at which persons handle *information* in their work (see the Appendix). For example, it is considered more complex to synthesize information or knowledge than to compile it. Complexity of work with people refers to the demands imposed by working with others. For example, therefore it is considered more complex to negotiate than to supervise. With respect to specific occupations, a secretary (the most common occupation in the analyzed population) would score 2.2 in complexity of work with data (range 0–6) and 1.8 in complexity of work with people (range 0–7). This means their work mainly includes “computing” data and “speaking/signaling” with people to exchange information. Teachers would score 4.00 in complexity of work with data and 6.00 in complexity of work with people because they “analyze” data and “instruct” people. Being a teacher is more complex and engaging because the work is less routine; requires more initiative, thought, and independent judgement; and involves more freedom from supervision than the work of a secretary. See the appendix for precise definitions of “data” and “people.”

Besides the complexity of work with data and people, we also assessed *substantive complexity* using a measure previously developed by Roos and Treiman (1980). Roos and Treiman used a principal components analysis to reduce all 46 worker characteristics included as part of job descriptions in the Dictionary of Occupational Titles (see Miller et al., 1980). The principal component included eight of the 46 worker characteristics, namely general educational development, specific vocational preparation, complexity of work with data, intelligence aptitude, verbal aptitude, numerical aptitude, abstract interest in the job, and temperament for repetitive and continuous processes. According to

Roos and Treiman, an index of these eight worker characteristics represents substantive, or overall, complexity. All measures of work complexity were standardized as z-scores in the main analyses.

The scores from the approximately 12,000 occupations listed in the DOT were averaged and assigned to the occupational categories in the 1970 U.S. Census. Occupational codes from the 1980 Swedish Population and Housing Census were matched with the U.S. occupational categories and assigned complexity scores. The matching procedure has been described previously (Andel et al., 2005).

Socioeconomic position. Geyer et al. (2006) have concluded that the most commonly used indicators of SEP (education, income, and social class) are not interchangeable because they measure different social dimensions that are associated with different health outcomes and tap into different mechanisms. Prospective studies rarely use more than one or two indicators of SEP (Hoven and Siegrist, 2013), which may create bias. Given the availability of relevant data, we were able to create an index that comprises all three dimensions of SEP as suggested by Geyer et al. (2006)—social class, education, income, and cash margin.

Years of education was included as a continuous variable.

Occupation-based *social class* was divided into four social classes: (A) unskilled blue-collar workers; (B) skilled blue-collar workers (those who normally need two years of formal training), small farmers (less than 10 hectare arable land), and entrepreneurs without employees; (C) lower white-collar workers, large-scale farmers (at least 100 hectares arable land), and entrepreneurs with 1–19 employees; and (D) intermediate and upper white-collar workers, entrepreneurs with at least 20 employees, and academic professionals (Kåreholt et al., 2011).

The SEP-index also included log transformed individual *income*.

Finally, a less traditional indicator of SEP, *cash margin*, was also included in the SEP-index. In 1968, cash margin was assessed with the question “Can you raise 2000 SEK in a week?” After 1968, the amount was adjusted to have the same purchase value at each baseline wave of interviews as 2000 SEK had in 1968. Cash margin was divided into three categories: “Yes, from own savings or borrowing from someone in the family”; “Yes, by borrowing from someone else or raising the money in some other way” (e.g., by selling things); and no.

All indicators of SEP had approximately linear associations with the outcome. All SEP items were standardized as z-scores and summarized in the SEP-index.

The index was created to account for as much variation in psychological distress associated with SEP as possible without multicollinearity. All variables were also tested separately against the outcome, and overall, the SEP-index was more strongly associated with the outcomes compared to the separate items included in the index. The exceptions were the association between income and fatigue ($OR = .76, p = .002$) (SEP-index and fatigue: $OR = .86, p = .014$) and between cash margin and anxiety ($OR = .77, p = .003$) (SEP-index and anxiety: $OR = .83, p = .005$). The SEP-index was then divided into three groups with ranges of equal size on the SEP-index scale (0–2.14, >2.14–4.28, >4.28–6.42).

Covariates

Covariates in all models presented were *age, sex, family status, interaction of sex and family status, follow-up year, hours worked the year before baseline, childhood conditions, and psychological distress* at baseline. Family status can affect psychological distress and therefore was controlled in the analyses. Family status was measured as married, divorced, widowed or cohabitating. Childhood conditions were included to adjust for potential bias by pre-selection to occupations with varying

levels of complexity. Childhood conditions were measured with retrospective questions about fathers social class and education, family conflicts (yes/no), financial hardship (yes/no), and if some family member had severe or long lasting sickness. Adjusting for follow-up year adjusts for period effects, and in combination with adjusting for age, is a simple way of adjusting for cohort effects. Adjusting for hours worked the year before the survey year is a simple way of controlling for how much individuals work, so associations with psychological distress will not be due to differing amounts of work. Niedhammer et al. (2008) argue that adjusting for working hours could limit selection bias caused by the healthy worker effect. We also adjusted for psychological distress (the index) at baseline.

Statistical methods

All analyses were conducted with StataMP 12. The main analyses were conducted with ordered logistic regressions. The odds ratios (OR) of an ordered logistic regression corresponds to the weighed OR of a series of binary logistic regressions. The final OR is the OR of the dependent variable when the independent variable changes by one unit and all other variables in the model are held constant.

All models (1–8) included all covariates. Independent variables of interest were tested separately. In models 5–7, occupational complexity measures were also adjusted for SEP, and in model 8, the association between SEP and the outcomes was adjusted for substantive complexity.

Results

As shown in Table 2, approximately half the respondents reported at least one slight problem with fatigue, anxiety, or depression during the last twelve months (values > 0 in the index of psychological distress). The most common kind of distress was fatigue and the least common was depression. About 1 percent experienced severe problems in all three areas, and 2.3 percent had at least two severe and one slight problem. Women reported more distress than men in all the indicators. Women experienced both more slight problems and more severe problems than men.

Insert Table 2 about here.

Table 2 also shows the mean values of occupational complexity measures and the SEP-index. Men's complexity of work with data was typically one unit higher than women's. Thus, men's occupations, on average, included compiling and analyzing data, and women's included computing and some compiling (see Appendix). Women, on average, worked in occupations with higher complexity of work with people, even though the differences between men and women with regard to this kind of complexity were small. This finding indicates that most individuals, on average, had jobs that including speaking with people to exchange information, such as giving assignments and directions. Men had occupations that were about one unit higher in substantive complexity than women's. Table 2 also presents the mean scores in the SEP-index. These scores cannot be interpreted directly because they are purely relative. In general, men had higher SEP than women. Men also reported more education, a higher social class, higher income, and less economic hardship at baseline. Finally, Table 2 also shows mean scores for occupational complexity divided by SEP and sex.

Table 3 presents the associations between occupational complexity and SEP at midlife and late-life psychological distress. Two sets of models are presented. Both sets of models were adjusted for all the covariates. In addition, models 5–7 were adjusted for the SEP-index, and model 8 was additionally adjusted for substantive complexity.

Insert Table 3 about here.

As shown in Table 3, models 1–4, all measures of occupational complexity and the SEP-index were separately associated with psychological distress. Higher level of occupational complexity and SEP in midlife were associated with less psychological distress 20 years later. Complexity of work with data was significantly associated with all outcomes. For example, the OR of 0.86 (complexity of work with data in relation to fatigue) shows that complexity of work with data (a z-score) that is one standard deviation unit higher was associated with 14 percent lower odds of fatigue. The findings indicate that occupational complexity contributes to the understanding of psychological distress in older adulthood. Medium and low SEP were associated with more psychological distress than high SEP. For example, medium SEP was associated with 2.30 greater odds of anxiety, indicating that those with medium SEP had 130% greater odds of reporting anxiety than those with high SEP. In models 5–7, the associations between occupational complexity and psychological distress were additionally adjusted for SEP. Most associations were attenuated. This indicates that the association between occupational complexity and psychological distress was partially captured by socioeconomic conditions. The significant association between complexity of work with data at midlife and late-life depression remained, independent of SEP. The associations between substantive complexity and psychological distress were also attenuated when we adjusted for SEP. However, these associations were still significant.

In model 8, the associations between SEP and psychological distress were adjusted for substantive complexity, which attenuated the ORs. The associations between SEP and psychological distress were also adjusted for complexity of work with data, complexity of work with people, and both dimensions at the same time. Substantive complexity had the greatest impact on the association between socioeconomic position and psychological distress.

In addition to the above-mentioned results, we checked for interaction effects between 1) sex and occupational complexity, 2) SEP and occupational complexity, 3) sex and SEP, 4) the different linkage years and occupational complexity, and 5) the different linkage years and SEP. None of the results were significant.

Discussion

We found that higher occupational complexity was associated with less psychological distress 20 years later, even after adjustment for age, sex, family status, interaction of sex and family status, childhood conditions, follow-up year, hours worked the year before baseline, and psychological distress at baseline. Higher SEP yielded a similar pattern of results. Adjustment for SEP reduced the associations between complexity of work with data and psychological distress and between complexity of work with people and psychological distress to non-significant, suggesting that these associations were mostly a function of differences in SEP. On the other hand, substantive complexity seems to have long-term associations with psychological distress that are independent of SEP. Our findings also support the notion that there is a social gradient in psychological distress in older

adulthood. Results from model 8 (Table 3) indicate that occupational complexity might play a role in the social gradient, since substantive complexity attenuates the association between midlife SEP and psychological distress in older adulthood. This is important for intervention as substantive complexity, which reflects intellectual engagement at work, may be more easily modified in the workplace than SEP.

Several mechanisms may lie behind these findings: 1) higher occupational complexity may build a reserve of psychological resources and coping strategies, 2) people whose occupations are more complex may, out of habit, stay more socially engaged and productive in older adulthood, and 3) there may be a selection effect; that is, specific characteristics of people and society may influence individuals' occupational pathways.

First, occupational complexity might influence psychological distress in older adulthood by increasing cognitive and psychological resource reserves, including self-esteem, self-efficacy, sense of control over one's life, and self-worth. These psychological resources might protect against mental health problems by influencing physiological pathways related to stress (Berkman et al., 2000). Jonker et al. (2009) found that changes in coping resources indicating feelings of control, self-esteem, and self-efficacy protected against decreasing life satisfaction and promoted positive affect in people with persistent health decline. Research shows that occupational complexity acts as a buffer against both cognitive decline (Andel et al., 2007) and dementia (Andel et al., 2005; Karp et al., 2009) and reduces mortality risk in men (Moore and Hayward, 1990). More complex occupations that demand more engagement might also build up a reserve that protects against psychological distress via psychological pathways and by stimulating multiple bodily systems.

Second, there is path dependency. People are "creatures of habit," and having a demanding, challenging, and engaging occupation might set them on a path of continuing high engagement that are protective against mental ill-health in old age (Glass et al., 2006; Glass et al., 1999). Agahi et al. (2006) found that leisure activities in old age are dependent on earlier life activities which suggests that occupational complexity might play a role in the continuation of one's activities and social engagement in old age.

Third, the strong association between occupational complexity and SEP shows that SEP is associated with people's occupational pathways, which in turn might affect the associations between midlife occupational complexity and late-life psychological distress. Selection into different occupations (e.g., because of "the healthy worker effect" or societal structures), may mean that people with low levels of sickness absence or those with specific characteristics (e.g., intelligence or certain personality traits) end up in more complex occupations. For example, previous studies have shown that higher intelligence is associated with higher occupational complexity (Ganzach, 1998) and that specific personality traits are associated with structural characteristics of occupations (Bihagen et al., 2012), which could include occupational complexity. Selection might have affected the population in the current analyses. However, the association between substantive complexity and psychological distress, independent of SEP, suggests that occupational complexity plays a role in psychological distress in older adulthood.

The findings are relevant to debates about working conditions and mental health, retirement age and working conditions, and the social gradient in health. The information about long-term associations provided by this study contributes to the discourse about working conditions and mental health. The ongoing debate about retirement age in many affluent democracies that has arisen from the need to finance retirement benefits for the growing population of older people often focus on who will be able to continue to work at older ages (van Rijn et al., 2013; Swedish Government Report, 2013:25). To increase the age of the workforce, investments in favorable working conditions have been

proposed (Wahrendorf et al., 2011; Swedish Government Report, 2013:25). Long-term effects of working conditions are infrequently discussed but would also affect health in older adulthood and could be a prerequisite for policy making regarding the workforce. The results show that working conditions, such as occupational complexity, may have long-term effects on mental health into older adulthood.

It may be difficult to implement changes that modify socioeconomic hierarchy as redistribution of resources is a complex and politically difficult issue. Therefore, modifications to work environment might be a more readily available area for policy considerations with respect to improving population health in older adulthood.

Further, it is important to note that because this study only included participants who held a gainful occupation, it is only representative of individuals in the workforce. This is particularly important to the generalizability of the results to women. Specifically, women in the workforce may be more career oriented or, conversely, may seek income as a means of survival, leading to greater disruptions to work-life balance. Therefore, they may differ substantially, and in many respects, from women not in the workforce. Some other limitations should be mentioned. The results might have been affected by selective survival (Markides and Machalek, 1984); individuals with better mental health and those with higher SEP were more likely to be included in the study. However, our intention was to study those who survived into old age, and we used data from nationally representative surveys. In SWEOLD, non-responders had a higher mortality rate than responders. However, individuals living in institutions were included and proxy interviews used to increase response rate and facilitate representativeness of the sample (Kelfve et al., 2013). Another bias might come from the “healthy worker effect”, whereby less healthy people might not have been employed at baseline and therefore might not be included in the study. A meta-analysis by van Rijn et al. (2013) showed that poor health increased the risk of exiting the labor market through disability pension, early retirement, or by unemployment. Most plausibly, the healthy worker effect leads to underestimation of the associations found.

Further, it is possible that personality or intelligence played a role in job selection (Roberst et al., 2007; Bihagen et al., 2012), thus affecting study outcomes above and beyond work environment itself. To reduce this bias, we added control over childhood conditions including fathers SEP. Father’s SEP is known to be associated with intelligence (Neisser et al., 1996). In addition, occupational complexity was previously associated with late-life cognitive outcomes irrespective of familial, predisposing factors (Andel et al., 2005). Still, pre-selection into occupations based on inherent characteristics remains a concern and may deem intervention to modify work environment based on our findings somewhat less effective.

Fatigue in old age could be related to many different sources, for example medication. Hence, the associations between occupational complexity in midlife and fatigue 20 years later should be interpreted with caution. Still, fatigue is known to be related to depressive symptoms (Mänty et al., 2012) and the results for fatigue, anxiety, and depression were very similar.

Furthermore, occupational complexity was measured at one point in time, so changes in individuals’ occupational complexity were not taken in to consideration. Changes in the type of industry people work in decrease with age (Swedish Work Environment Authority, 2011:12), and we believe that the respondents had probably reached their highest occupational complexity level by baseline. To test this idea, a mean value of level of occupational complexity was calculated using two points of measurement, but the differences between complexity scores at one and two points of measurement were negligible. Overall, we believe the limitations might have attenuated the

observed associations, potentially leading to underestimation of the associations between midlife occupational complexity and psychological distress in older adulthood.

Our results confirm earlier findings showing a social gradient in mental health in older adulthood in the Swedish population, and it seems as if occupational complexity contributes to the understanding of the social gradient. However, more research is needed to clarify the relationship between occupational complexity, SEP, and psychological distress. Research should focus on using the life-course perspective to disentangle how occupational complexity and SEP at different ages, during different periods of time, and in different cohorts are related to mental health. In conclusion, occupational complexity contributes to our understanding of differences in psychological distress in older adulthood. With social gradient not readily amenable to modification, it may be that efforts to increase engagement at work (i.e., substantive complexity) may offer a viable option to attenuate the influence of work environment on psychological distress later in life.

Declarations of interest

None.

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Table 1. *Analytical population.*

Linkage	Baseline years	Age at baseline	Follow-up years	Age at follow-up	Follow- up time (years)	Linked observations	Analytical population
1	1968	53 – 66	1992	77 – 91	24	535	316
2	1981	56 – 64	2002	77 – 86	21	617	330
3	1981	46 – 64	2004	69 – 88	23	1166	820
4	1991	57 – 64	2011	76 – 85	20	663	343
Total/mean:		$\bar{x}=57.8$		$\bar{x}=79.9$		2981	1809

Table 2. Prevalence of self-reported psychological distress¹ and descriptive information on the independent variables.²

		Women %	Men %	Total %
Fatigue	No	58.69	67.62	62.89
	Yes, slight	32.35	25.15	28.96
	Yes, severe	8.96	7.24	8.15
	Total	100 (949)	100 (843)	100 (1792)
Anxiety	No	67.93	81.55	74.33
	Yes, slight	24.89	14.76	20.13
	Yes, severe	7.17	3.69	5.54
	Total	100 (948)	100 (840)	100 (1788)
Depression	No	85.76	90.25	87.87
	Yes, slight	10.55	7.02	8.89
	Yes, severe	3.69	2.73	3.24
	Total	100 (948)	100 (841)	100 (1789)
Psychological distress¹	0	43.70	58.73	50.76
	1	29.21	23.68	26.61
	2	13.86	10.65	12.35
	3	6.67	2.87	4.88
	4	3.81	2.27	3.09
	5	1.69	0.96	1.35
	6	1.06	0.84	0.95
Total		100 (945)	100 (836)	100 (1781)

Range and mean for independent variables divided by sex.

	Range		Women	Men	Total
Data³	0 – 6	Mean:	2.59	3.45	3.00
People⁴	0 – 7	Mean:	1.91	1.85	1.88
Substantive Complexity	0 – 10	Mean:	3.68	4.70	4.16
SEP-index	0 – 6.42	Mean:	2.50	2.93	2.70

Means of occupational complexity divided by SEP-index⁵ and sex.

	Low (31.4%)			Middle (61.75%)			High (6.85%)		
	Women	Men	Total	Women	Men	Total	Women	Men	Total
Data³	2.10	2.68	2.29	2.82	3.52	3.18	4.43	4.61	4.56
People⁴	1.31	0.97	1.20	2.13	1.83	1.98	5.12	3.80	4.18
Substantive complexity	2.71	3.74	3.04	4.13	4.70	4.43	7.34	6.64	6.84
Total	385	183	568	539	578	1117	36	88	124

¹0=no problems, 1=one slight problem, 2=two slight problems or one slight and one severe problem, 3=three slight problems or one severe problem plus one slight problem, 4=two severe problems or one severe and two slight problems, 5=two severe problems and one slight problem, and 6=severe problems in all three items.

²Number of observations differs by dependent variable because of internal non-response.

³Complexity of work with data.

⁴Complexity of work with people.

⁵The SEP-index was divided into three groups with equal range on the SEP-index scale (0–2.14, >2.14–4.28, >4.28–6.42).

Table 3. Associations between work complexity and socioeconomic position in midlife and late-life psychological distress.

Models 1-3 ¹	Fatigue		Anxiety		Depression		Psychological distress	
	OR	CI	OR	CI	OR	CI	OR	CI
Data²	0.86*	0.77 – 0.96	0.87*	0.77 – 0.98	0.79**	0.67 – 0.93	0.87**	0.78 – 0.96
People³	0.92	0.82 – 1.02	0.87*	0.76 – 0.99	0.82*	0.68 – 0.99	0.90*	0.81 – 0.99
Substantive complexity	0.80***	0.71 – 0.89	0.85*	0.75 – 0.96	0.71***	0.60 – 0.83	0.81***	0.73 – 0.90
Model 4								
SEP-index								
High		Ref		Ref		Ref		Ref
Medium	2.12**	1.29 – 3.48	2.30*	1.15 – 4.60	9.01**	1.95 – 42.17	2.46***	1.60 – 3.85
Low	2.58**	1.50 – 4.44	2.59*	1.24 – 5.39	9.15**	1.93 – 43.41	2.82***	1.73 – 4.62
Models 5-7								
Data^{2,4}	0.90†	0.80 – 1.01	0.90†	0.79 – 1.02	0.82**	0.70 – 0.97	0.91†	0.81 – 1.01
People^{3,4}	0.98	0.87 – 1.11	0.91	0.80 – 1.05	0.88	0.73 – 1.07	0.96	0.86 – 1.07
Substantive complexity⁴	0.83**	0.74 – 0.93	0.88†	0.77 – 1.00	0.73***	0.62 – 0.87	0.85**	0.76 – 0.95
Model 8								
SEP-index⁵								
High		Ref		Ref		Ref		Ref
Medium	1.67*	1.09 – 2.98	2.03*	1.01 – 4.01	6.89*	1.46 – 32.48	2.13**	1.35 – 3.37
Low	2.01*	1.15 – 3.52	2.01*	1.02 – 4.54	5.99*	1.46 – 28.82	2.27**	1.37 – 3.77

†p<0.10. *p<0.05. **p<0.01. ***p<0.001.

All models adjusted for age, sex, family status, interaction of sex and family status, childhood conditions, follow-up year, hours worked the year before baseline, and psychological distress at baseline.

¹ Each variable was entered into a separate model.

² Complexity of work with data.

³ Complexity of work with people.

⁴ Also adjusted for SEP-index.

⁵ Also adjusted for substantive complexity.

Appendix:

Description of complexity scores as presented in the Fourth Edition of the Dictionary of Occupational Titles (U.S. Department of Labor, Fourth Edition, Revised, 1991, pp. 1005-1007). Complexity of work is rated along three dimensions: data, people, and things.

Note. The scores were reversed to reflect higher complexity with higher scores and lower complexity with lower scores.

	DATA	<i>Information, knowledge, and conceptions, related to data, people, or things, obtained by observation, investigation, interpretation, visualization, and mental creation, data are intangible and include numbers, words, symbols, ideas, concepts, and oral verbalization.</i>
6	<i>Synthesizing</i>	Integrating analyses of data to discover facts and/or to develop knowledge concepts or interpretations.
5	<i>Coordinating</i>	Determining time, place, and sequence of operations or action to be taken on the bases of analysis of data; executing determinations and/or reporting on events.
4	<i>Analyzing</i>	Examining and evaluating data. Presenting alternative actions in relation to the evaluation is frequently involved.
3	<i>Compiling</i>	Gathering, collating, or classifying information about data, people, or things. Reporting and/or carrying out a prescribed action in relation to the information is frequently involved.
2	<i>Computing</i>	Performing arithmetic operations and reporting on and/or carrying out a prescribed action in relation to them. Does not include counting.
1	<i>Copying</i>	Transcribing, entering, or posting data.
0	<i>Comparing</i>	Judging the readily observable functional, structural, or compositional characteristics (whether similar to or divergent from obvious standards) of data, people, or things.
	PEOPLE	<i>Human beings; also animals dealt with on an individual basis as if they were human beings.</i>
8	<i>Mentoring</i>	Dealing with individuals in terms of their total personality in order to advise, counsel, and/or guide them with regard to problems that may be resolved by legal, scientific, clinical, spiritual, and/or other professional principles.
7	<i>Negotiating</i>	Exchanging ideas, information, and opinions with others to formulate policies and programs and/or arrive jointly at decisions, conclusions, or solutions.
6	<i>Instructing</i>	Teaching subject matter to others, or training others (including animals) through explanation, demonstration, and supervised

		practice; or making recommendations on the basis of technical disciplines.
5	<i>Supervising</i>	Determining or interpreting work procedures for a group of workers, assigning specific duties to them, maintaining a harmonious relations among them, and promoting efficiency, a variety of responsibilities is involved in this function.
4	<i>Diverting</i>	Amusing others. (Usually accomplished through the medium of stage, screen, television, or radio.)
3	<i>Persuading</i>	Influencing others in favor of a product, service, or point of view.
2	<i>Speaking-Signaling</i>	Talking with and/or signaling people to convey or exchange information. Includes giving assignments and/or directions to helpers or assistants.
1	<i>Serving</i>	Attending to the needs or requests of people or animals or the expressed or implicit wishes of people. Immediate response is involved.
0	<i>Taking instructions-Helping</i>	Helping applies to “non-learning” helpers. No variety of responsibility is involved in this function.