Occupational Health

Adverse employment histories and health functioning: the CONSTANCES study

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Abstract

Background: With changing employment histories in European labour markets, occupational health research needs to be supplemented by an approach that integrates adverse characteristics of entire employment histories, in terms of precarious, discontinued and disadvantaged employment careers. We analyse associations of adverse employment histories and six measures of health functioning, including affective, physical and cognitive functioning.

Methods: We use baseline data from the CONSTANCES study with detailed retrospective data on previous employment histories that are linked to current health functioning among people aged 45–60 years (men = 15 134; women = 16 584). The following career characteristics are assessed (all referring to careers between ages 25 and 45 years): number of jobs with temporary contracts, number of job changes, number of unemployment periods, years out of work, mode occupational position and lack of job promotion. The measures of health functioning range from depressive symptoms, standing balance, walking speed, lung function, to verbal memory and semantic fluency.

Results: For both men and women, multilevel regressions (participant nested in health-examination centre) revealed that adverse employment histories are associated with poor health functioning later on, in particular persistent disadvantage in terms of low occupational position, repeated periods of unemployment and weak labour-market ties (years out of work). Findings remain consistent after excluding respondents who had a health-related career interruption or already retired before age 45 years and, additionally, after adjusting for age, partnership and education.

Conclusion: Findings call for increased intervention efforts among more disadvantaged groups of the labour market at early-career stages.

Key words: employment histories, work stress, life course, health functioning

Key Messages

- Current work-stress research needs to be supplemented by an approach that considers adverse characteristics of entire employment histories, in terms of precarious, discontinued and disadvantaged employment over the course of an extended time period.
- Adverse employment histories at early-career stages (between ages 25 and 45 years) are associated with poor health functioning later on, in particular continuous low occupational position, repeated periods of unemployment and weak labour-market ties over time.
- Findings call for increased intervention efforts among more disadvantaged groups of the labour market at early-career stages.

Introduction

Research has established solid evidence on the impact of work stress on health, mostly based on theoretical models, such as the demand–control and the effort–reward imbalance models, and their empirical tests in the frame of occupational cohort studies.[1,2] Yet, despite this important progress, one critique of this line of research maintains that these are static models, failing to grasp the dynamic aspects of current work and employment arrangements characterized by increased flexibility, insecurity, differentiation and fragmentation.[3–5] Similarly, in most studies, work stress was assessed only once and linked to future health risks without taking into account its chronicity.[6,7] Other studies using repeated assessment of stressful work, though, document an increased effect on health.[8–10]

In line with the life-course perspective,[11,12] recent studies started to extend the timeframe and to study whole employment histories in relation to health.[13–15] Studying employment histories (collected prospectively or retrospectively) enables the researcher to analyse risk accumulation, in terms both of repeated exposure at different time points and of exposure duration, together with information on whole patterns of employment histories and changes.[8] Whereas this extension is expected to enrich the prediction of health, one important challenge remains to be resolved: how can this empirical information be reconciled with the need of theoretical concepts and, more specifically, with core theoretical notions of work-stress models? The present paper addresses this challenge by studying career characteristics that prevent workers from meeting basic material and psychosocial needs at work that are at the core of prevailing work-stress models, such as job security, control and reward.[16,17] Thereby, the following career characteristics deserve special attention: (i) precarious careers, such as temporary contracts and repeated job changes; (ii) discontinuous working careers, such as involuntary interruptions (e.g. episodes of unemployment) and weak labour-market attachments (e.g. years out of work); (iii) cumulative disadvantages, such as disadvantaged occupational positions and lack of job promotions. In all these instances—albeit to a different degree—options of security, continuity and personal development at work are restricted, and there are few opportunities of exercising control and autonomy, and of receiving reward and recognition for one's accomplishments. To illustrate, in case of precarious careers, temporary jobs and repeated job changes are expected to be accompanied by irregular income, whereas job tasks of temporary jobs may be unusually demanding and hazardous, leading to an imbalance between high efforts spent and low rewards received in turn, thus reinforcing a sense of continued reward frustration. Or, in the case of cumulative disadvantages, we may assume that people who work for a longer period in lower-grade or unskilled occupations without job promotion have restricted opportunities to develop new skills and are excluded from organizational participation, thus restricting the experience of personal control at work. It is therefore likely that repeated stress responses of participants who work under these circumstances compromise their adaptive bodily systems, thus promoting the initiation and progression of disease, and a premature loss of health functioning.[12] This latter assumption has been supported by numerous recent studies showing that chronic stress promotes the dysregulation of core physiological systems across the life course, resulting in a state of allostatic load (AL).[18–20]

In the present study, our aim is to investigate the relationships between the adverse career characteristics mentioned that occurred between the ages of 25 and 45 years and distinct measures of health functioning later on that were proposed for use in large-scale population-based studies on healthy ageing.[12]

Methods

Data source

We use data from the French CONSTANCES project.[21,22] CONSTANCES is a population-based cohort study with a focus on occupational and environmental epidemiology. It started in 2012 to include up to 200 000 adults aged

18–69 years and recruitment is still ongoing. The sample is based on 85% of the French population, consisting of all individuals who are covered by the French General Health Insurance Fund (CNAMTS). This includes all salaried workers, professionally active or retired, and their family (approximately 50 million people in France). Self-employed and agricultural workers are only part of the study if they are insured through a family member; otherwise, they are not part because they belong to different health-insurance organizations. Data collection took place in 22 national Health Screening Centres (HSCs) throughout the country. Each HSC provides advanced medical equipment and experience in collecting data for epidemiological studies.[22] To recruit the participants, eligible persons were randomly invited to undergo a health examination at their HSC. Data used in this study were collected by either self-administered questionnaires (including retrospective information on employment histories) or as part of the health examinations at baseline (including health functioning), meeting high-quality standards,[23] including trained study nurses and Standard Operations Procedures (SOPs). The study was approved by bodies regulating ethical data collection in France [Comité Consultatif pour le Traitement des Informations Relatives à la Santé (CCTIRS); Commission Nationale Informatique et Liberté (CNIL)] and all participants signed an informed consent.

Study population

Our study relies on a sub-sample of men and women aged 45–60 years who were working at least once between ages 25 and 45 years (initial sample: 33 048 participants). This sub-sample meets our study aim because these participants had employment histories with potential change or stability. Furthermore, between ages 45 and 60 years, early signs of reduced health functioning become manifest, thus enabling us to study their variations.[12] To minimize the effect of ill health causing both specific employment histories (e.g. periods of unemployment) and the report of poor health later on, two additional restrictions are necessary. First, we excluded people with a health-related career interruption prior to age 45 years (3.8% of the initial sample, 1265 participants). Second, respondents who retired prior to age 45 years (probably due to health reasons) were not included (additional 65 participants). This resulted in a final study sample of 31 718 respondents (16 584 women and 15 134 men) at the time of this study.

Measures

Adverse employment histories

As part of the self-administered questionnaire at baseline, respondents provide detailed retrospective information on
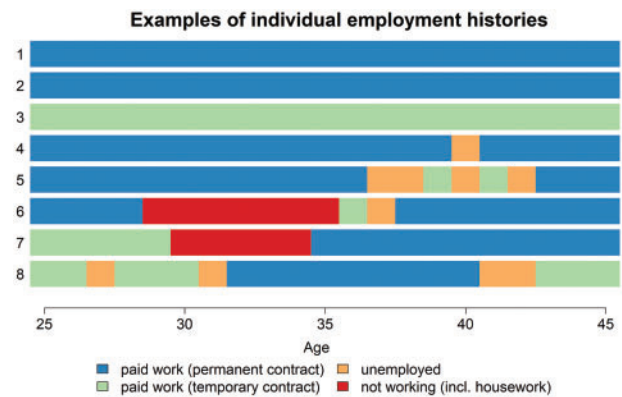

Figure 1. Examples of individual employment histories.

each job they had (starting with the first job until the moment of the interview) and on potential career interruptions (lasting 6 months or longer). Information on jobs includes the starting and ending dates, contract type, working time and an open question for details on the executed profession. Similarly, in case of an interruption, respondents specified the timing (begin and end) and gave information on the reasons (e.g. health, unemployment, housework). By combining these data, we can provide a detailed description of whole employment histories for each individual in terms of an annual description of the employment situation between ages 25 and 45 years (employment sequence), thus covering 21 years of the working career. To illustrate the richness of information evolving from these data, Figure 1 gives examples of resulting individual sequences (8 out of 31 718) using contract type as job detail and four possible employment situations ['paid work (permanent contract)', 'paid work (temporary contract)', 'unemployed', 'not working (incl. housework)']. Each sequence is presented as a horizontal line and each colour represents a specific situation. We see that the first three sequences belong to participants who either constantly worked in permanent (Participants 1 and 2) or temporary jobs (Participant 3). In the remaining cases, histories also include career interruptions, due to either unemployment or episodes of not working (including housework) or both.

Based on individual employment sequences, we then ascertained the following six career characteristics: (i) number of jobs with temporary contract and (ii) number of job changes as available indicators of 'precarious careers', (iii) number of unemployment interruptions and (iv) years out of work as available indicators of 'involuntary interruptions', (v) the mode occupational position between ages 25 and 45 years and (vi) lack of job promotion as indicators of 'cumulative disadvantages'.

The *mode occupational position* is based on the longest-held position between 25 and 45 years and measured

according to the European Socio-Economic Classification scheme (ESeC)[24] {with an average length of 15.8 years in our sample [standard deviation (SD) = 5.3]}. To classify respondents into ESeC, we relied on the national French classification scheme ['Professions et catégories socio-professionnelles' (PCS)] and grouped jobs according to the conversion table of the French National Institute of Statistics and Economic Studies.[25] In contrast to the PCS, the ESeC classification is comparative across Europe and provides a higher level of differentiation than the PCS. The theoretical foundations of the ESeC builds on the Erikson Goldthorpe Portocarero (EGP) class scheme (for details, see[24]). We adopted a version with seven different classes, where self-employed and agricultural workers were grouped into one class (because of small numbers resulting from the sample strategy). For the same reason, higher-grade blue-collar workers were combined with higher-grade white-collar workers.[26] If the longest position was unknown (e.g. when participants provided information that could not be recoded or if information was missing), people were grouped into an additional category. In the infrequent case that participants had two or more mode positions (1.5% of all cases), we prioritized the most recent one. *Lack of promotion* was measured if participants had no upward mobility during the observation period (based on occupational position) and also we ascertained whether participants were promoted but had a downward mobility thereafter (i.e. up- and downward mobility process). *Unemployment interruptions* measure the number of interruptions due to unemployment. By *years out of work*, we count the number of years without paid work (three categories). Finally, the *number of temporary jobs* was included (three categories). Details on each variable, including categories and their distributions, are shown in Table 1.

Health functioning

We use six measures of health functioning, all considered important measures of healthy ageing,[12,18] that cover the domains of affective, physical and cognitive functioning. Affective functioning is measured by a self-administrated questionnaire with the 20-item Centre for Epidemiologic Studies Depression Scale (CES-D),[27] with a sum score ranging from 0 to 60. We used sex-specific thresholds for elevated depressive symptoms (women: 20, men: 16), as validated against clinical diagnoses for the French population.[28] All remaining measures are part of the medical examinations. A walking speed test measured the time taken to walk a distance of 3 m at normal speed (using walking aids if required).[29] Unreasonable values (below 1 second; 97 participants, 0.4% of all cases) were removed and we calculated cm/sec for the analyses. As a test of

standing balance, a leg-raise test (or commonly called 'flamingo' test) ascertained whether study members successfully could raise one leg for 30 seconds from a standing position (with eyes open) or not.[30] For lung function, forced expiratory volume (FEV) in 1 second was determined with a standard hand-held Vitalograph spirometer using the highest of three measurements.[31] Cognitive functioning was measured in terms of verbal memory as part of the free and cued selective reminding test (FCSRT),[32] where study participants have to memorize a list of 16 words and thereafter to recall words based on free and cued recall (repeated three times). For the analyses, we used the free-recall score, which was shown to best predict dementia.[33] In addition, a semantic fluency test was used where participants named as many animals as possible within 60 seconds.[34] A correlation matrix of all health measures is presented in Table 2.

Additional variables

Alongside sex and age, we also included a variable measuring at which screening centre the data were collected, partnership situation, the current labour-market status (in paid work or not), current income and participants' educational level. The latter is measured according to the International Standard Classification of Educational Degrees (ISCED-2011) that we regroup into 'low' (pre-primary, primary or lower-secondary education), 'medium' (upper-secondary or post-secondary education) and 'high' (first and second stages of tertiary education). Income is based on the total monthly household income that we adjusted according to number of household members and then grouped into tertiles ('low', 'medium', 'high') for the final study sample. In case respondents refused to answer the income question, a distinct category ('answer refused') is used. For partnership, we measure whether the respondent lives with a partner or not (regardless of marital status).

Analytical strategy

All analyses are conducted for men and women separately and we start with a sample description followed by a table to study pairwise correlation of all measures of health functioning (Pearson's r). Then we estimate a series of hierarchical regression models with individuals nested in screening centres (multilevel models), to allow an accurate adjustment for centre in our study. Each career characteristic is linked with each measure of health functioning. We either use multilevel Poisson regression models to estimate relative risks in case of binary outcomes[35] or multilevel linear regressions for continuous outcomes.[36] Before estimation, all continuous outcomes were tested for normal

Table 1. Sample description: observations (No.) and percentage (Col. %) or mean and standard deviation (SD), by sex ($n = 31\,718$)

		Men		Women	
	Categories or range	No.	Col. % or mean (SD)	No.	Col. % or mean (SD)
Age	45–60	15 134	52.7 (4.5)	16 584	52.6 (4.5)
Partnership[a]	Living with partner	11 910	80.5	11 761	72.4
	Living as single	2889	19.5	4492	27.6
Education[b]	Low	1470	9.9	1620	9.9
	Medium	6213	41.9	5948	36.5
	High	7129	48.1	8736	53.6
Current employment situation	In paid work	12 526	82.8	13 497	81.4
	Not in paid work	2608	17.2	3087	18.6
Current income[c]	Low income	4714	32.3	5321	33.4
	Medium income	4867	33.3	5106	32.1
	High income	4441	30.4	4677	29.4
	Answer refused	587	4.0	815	5.1
Number of temporary jobs	No temporary job	12 963	85.7	13 306	80.2
	1 temporary job	1882	12.4	2701	16.3
	2+ temporary jobs	289	1.9	577	3.5
Number of job changes	No job change	4165	27.5	5394	32.5
	1 or 2 job changes	6427	42.5	7027	42.4
	3+ job changes	4542	30.0	4163	25.1
Number of unemployment periods	No unemployment period	13 311	88.0	13 861	83.6
	1 unemployment period	1450	9.6	2116	12.8
	2+ unemployment periods	373	2.5	607	3.7
Years out of work	No years out of work	9921	65.6	7992	48.2
	1–5 years out of work	3727	24.6	4421	26.7
	6+ years out of work	1486	9.8	4171	25.2
Mode occupational position	Large employers, higher managers and professionals	2341	15.5	1448	8.7
	Lower managers and professionals	3021	20.0	5607	33.8
	Intermediate employee	2442	16.1	4055	24.5
	Small employers and self-employed	302	2.0	209	1.3
	Lower-grade white-collar workers	472	3.1	1538	9.3
	Skilled workers	1796	11.9	268	1.6
	Semi- or unskilled workers	1128	7.5	621	3.7
	Main position unknown	3632	24.0	2838	17.1
Lack of promotion	Promotion	3247	21.5	2682	16.2
	No promotion	11 297	74.6	13 456	81.1
	Promotion with return	590	3.9	446	2.7
Depressive symptoms	Not elevated	11 730	77.51	12 510	75.43
	Elevated	2457	16.23	2922	17.62
Standing balance	Not failed	10 846	94.2	11 615	92.2
	Failed	662	5.8	986	7.8
Walking speed (cm/sec)	26–300	10 547	129.7 (26.2)	11 527	125.8 (26.9)
Lung function (FEV)	1.0–6.7	11 198	3.6 (0.6)	12 108	2.6 (0.5)
Verbal memory	0–48	11 410	32.0 (5.3)	12 631	34.7 (4.8)
Semantic fluency	0–55	11 601	23.9 (6.1)	12 757	24.0 (5.9)

[a]666 participants had missing values for partnership (2.1%).
[b]602 participants had missing values for education (1.9%).
[c]1190 participants had missing values for income (3.7%).

distribution and walking speed was log-transformed to decrease skewness. Next, we standardized all continuous outcomes to enable comparisons. Because of multiple outcomes, we adopted a Bonferroni corrected *p*-value of <0.0083 (0.05 divided by six outcomes) indicating strong evidence for an association. All models were adjusted for age, age square, as well as for two potential confounders: partnership situation and education. The sample of the

Table 2. Pairwise correlations of all measures of health functioning for men (lower-left triangle) and women (upper-right triangle)

	Depressive symptoms	Standing balance	Walking speed	Lung function	Verbal memory	Semantic fluency
Depressive symptoms[a]	1.000	0.079	–0.063	–0.058	–0.074	–0.084
Standing balance[b]	0.083	1.000	–0.119	–0.120	–0.093	–0.093
Walking speed	–0.046	–0.083	1.000	0.122	0.085	0.062
Lung function	–0.076	–0.099	0.136	1.000	0.087	0.080
Verbal memory	–0.057	–0.078	0.074	0.091	1.000	0.343
Semantic fluency	–0.069	–0.081	0.065	0.075	0.376	1.000

[a]Depressive symptoms: 0 = not elevated; 1 = elevated.
[b]Standing balance: 0 = not failed; 1 = failed.

multivariable analysis varied according to the outcome under study, because medical examination data were available for a lower proportion of participants than was the case for questionnaire data, ranging between $n = 21\,560$ (walking speed) and $n = 29\,164$ (depressive symptoms).

Results

The sample includes slightly more women than men (16 584 vs 15 134), both with a mean age of 53 years and currently employed in more than 80% of the cases. The majority have worked in lower managerial and professional occupations (men and women) and the proportion of those who have had at least one episode of unemployment is above 10% for both sexes. Most participants were working full-time for between 25 and 45 years, and more so men. Most participants changed their job once or twice (42% for both men and women) and most participants (above 80%) had no temporary work contract between ages 25 and 45 years. Most of the respondents did not move to a higher occupational position during the observation period. Based on our definition of elevated depressive symptoms (sex-specific cut-points), levels were similar between sexes, whereas men performed generally better than women in case of physical functioning (balance test and walking speed) but slightly worse in case of cognitive functioning (memory test). Correlations between measures of health functioning were generally low in all cases, with the highest values between verbal memory and semantic fluency ($r = 0.38$ for men; $r = 0.34$ for women).

Concerning our main research question, the associations between adverse career characteristics and health functioning, Table 3 presents the results for men and Table 4 for women. Results can be summarized as follows. First, participants who mainly worked in a disadvantaged occupational position between ages 25 and 45 years (especially lower-grade white-collar workers and semi- or unskilled workers) had poorer health functioning later on. This holds true for men and women and for each measure

of health functioning. Second, periods of unemployment are related to lower walking speed (men and women), to reduced lung functioning (FEV) and specifically to elevated levels of depressive symptoms. Similarly, and third, weak labour-market attachment (in terms of years out of work) is related to poorer health functioning, in particular for men. Fourth, turning to lack of promotion and temporary employment, there was an association with depressive symptoms (men and women) but not with the remaining outcomes. Fifth, in case of lack of promotion, we observe an association with depressive symptoms and lung function for male participants who experienced upward mobility and a downward process thereafter. Finally, it is worth noting that participants with an unknown mode of occupational position had no particular health profiles, thus indicating that the latter category did not represent a group with systematic associations.

In additional analyses, we pooled the entire sample and included for each of the six indicators of health functioning an interaction between career characteristics and sex (presented online in Supplementary Table 1, available as Supplementary data at *IJE* online). Overall, we found some indication that associations were stronger for men in case of depressive symptoms (four out of six *p*-values below 0.05), lung function (three out of six) and lower semantic fluency (two out of six), but results for the remaining health measures suggested that relationships were by and large similar for men and women.

Discussion

This study analysed associations of three types of adverse employment histories experienced between ages 25 and 45 years (precarious work, discontinued work, cumulative disadvantage), with six complementary indicators of health functioning at later age, i.e. between 45 and 60 years. We linked retrospectively assessed data on employment histories to current measures of health functioning (both collected at baseline screening) in a large cohort study from

Table 3a. Association between career characteristics and health functioning for men: relative risks or unstandardized coefficients, confidence intervals and *p*-values

		Depressive symptoms			Standing balance			Walking speed		
		RR	CI (95%)	*p*-value	RR	CI (95%)	*p*-value	*b*	CI (95%)	*p*-value
Number of temporary jobs	No temporary job (ref.)	–			–			–		
	1 temporary job	1.23	(1.13, 1.34)	<0.001	1.03	(0.79, 1.35)	0.825	−0.05	(−0.10, 0.00)	0.069
	2+ temporary jobs	1.71	(1.34, 2.19)	<0.001	1.15	(0.63, 2.12)	0.651	−0.03	(−0.16, 0.10)	0.614
Number of job changes	No change (ref.)	–			–			–		
	1 or 2 changes	1.05	(0.99, 1.12)	0.108	0.79	(0.68, 0.91)	0.001	0.00	(−0.04, 0.04)	0.999
	3+ changes	1.06	(0.94, 1.20)	0.324	0.94	(0.77, 1.15)	0.541	0.02	(−0.02, 0.07)	0.320
Number of unemployment periods	No unemployment period (ref.)	–			–			–		
	1 unemployment period	1.41	(1.30, 1.54)	<0.001	1.12	(0.91, 1.38)	0.291	−0.04	(−0.10, 0.02)	0.195
	2+ unemployment periods	1.68	(1.47, 1.93)	<0.001	1.06	(0.64, 1.77)	0.810	−0.12	(−0.23,−0.00)	0.045
Years out of work	No years out of work (ref.)	–			–			–		
	1–5 years out of work	1.27	(1.17, 1.37)	<0.001	1.08	(0.92, 1.27)	0.356	−0.05	(−0.10,−0.01)	0.014
	6+ years out of work	1.67	(1.52, 1.82)	<0.001	1.69	(1.34, 2.15)	0	−0.14	(−0.21,−0.08)	<0.001
Mode occupational position	Large employers, higher managers and professionals (ref.)	–			–			–		
	Lower managers and professionals	1.06	(0.92, 1.23)	0.388	1.57	(1.15, 2.13)	0.005	−0.05	(−0.11, 0.01)	0.111
	Intermediate employee	1.04	(0.92, 1.17)	0.557	1.61	(1.22, 2.13)	<0.001	−0.01	(−0.07, 0.06)	0.819
	Small employers and self-employed	1.02	(0.83, 1.24)	0.866	2.17	(1.47, 3.21)	<0.001	−0.08	(−0.21, 0.06)	0.247
	Lower-grade white-collar workers	1.40	(1.13, 1.72)	0.002	3.17	(2.37, 4.23)	<0.001	−0.11	(−0.23, 0.00)	0.055
	Skilled workers	1.28	(1.09, 1.52)	0.004	2.55	(1.82, 3.57)	<0.001	−0.13	(−0.20,−0.05)	<0.001
	Semi- or unskilled workers	1.26	(1.08, 1.46)	0.003	2.77	(2.30, 3.34)	<0.001	−0.2	(−0.29,−0.12)	<0.001
	Main position unknown	1.11	(0.98, 1.26)	0.102	1.88	(1.39, 2.56)	<0.001	−0.06	(−0.12, 0.00)	0.058
Lack of promotion	Promotion (ref.)	–			–			–		
	No promotion	1.01	(0.92, 1.10)	0.903	1.16	(0.99, 1.35)	0.068	0.00	(−0.04, 0.04)	0.925
	Promotion with return	1.27	(1.01, 1.60)	0.041	1.22	(0.86, 1.74)	0.257	−0.08	(−0.17, 0.02)	0.107

Models are based on multilevel models (individuals nested in health-examination centre) and calculated separately for each career characteristic, adjusted for age, age square, partnership situation and education. Respondents who retired or had a health-related career interruption prior age 45 years are excluded from the analyses.

Table 3b. Association between career characteristics and health functioning for men: unstandardized coefficients, confidence intervals and *p*-values

		Lung function			Verbal memory			Semantic fluency		
		b	CI (95%)	*p*-value	*b*	CI (95%)	*p*-value	*b*	CI (95%)	*p*-value
Number of temporary jobs	No temporary job (ref.)	–			–			–		
	1 temporary job	–0.06	(–0.10,–0.01)	0.013	0.01	(–0.04, 0.07)	0.684	–0.01	(–0.07, 0.04)	0.609
	2+ temporary jobs	–0.01	(–0.12, 0.10)	0.850	0.00	(–0.14, 0.14)	0.992	–0.03	(–0.16, 0.11)	0.707
Number of job changes	No change (ref.)	–			–			–		
	1 or 2 changes	–0.02	(–0.05, 0.02)	0.337	0.01	(–0.04, 0.05)	0.783	–0.03	(–0.07, 0.02)	0.204
	3+ changes	–0.03	(–0.07, 0.01)	0.194	0.06	(0.01, 0.11)	0.018	0.02	(–0.03, 0.07)	0.442
Number of unemployment periods	No unemployment period (ref.)	–			–			–		
	1 unemployment period	–0.03	(–0.08, 0.02)	0.222	0.03	(–0.03, 0.09)	0.388	–0.08	(–0.14,–0.02)	0.011
	2+ unemployment periods	–0.09	(–0.19, 0.01)	0.070	–0.01	(–0.13, 0.11)	0.832	–0.04	(–0.15, 0.08)	0.541
Years out of work	No years out of work (ref.)	–			–			–		
	1–5 years out of work	–0.06	(–0.10,–0.03)	<0.001	0.00	(–0.04, 0.05)	0.882	–0.08	(–0.13,–0.04)	<0.001
	6+ years out of work	–0.18	(–0.24,–0.13)	<0.001	–0.06	(–0.13, 0.01)	0.073	–0.27	(–0.34,–0.21)	<0.001
Mode occupational position	Large employers, higher managers and professionals (ref.)	–			–			–		
	Lower managers and professionals	–0.04	(–0.09, 0.01)	0.105	–0.05	(–0.11, 0.01)	0.090	0.02	(–0.04, 0.08)	0.494
	Intermediate employee	–0.07	(–0.12,–0.01)	0.018	–0.05	(–0.12, 0.01)	0.124	–0.08	(–0.14,–0.01)	0.026
	Small employers and self-employed	–0.12	(–0.23,–0.01)	0.037	–0.21	(–0.35,–0.07)	0.004	–0.08	(–0.22, 0.06)	0.258
	Lower-grade white-collar workers	–0.22	(–0.31,–0.12)	<0.001	–0.16	(–0.29,–0.04)	0.008	–0.33	(–0.45,–0.21)	<0.001
	Skilled workers	–0.14	(–0.21,–0.08)	<0.001	–0.31	(–0.39,–0.24)	<0.001	–0.26	(–0.34,–0.19)	<0.001
	Semi- or unskilled workers	–0.23	(–0.30,–0.16)	<0.001	–0.37	(–0.46,–0.28)	<0.001	–0.34	(–0.43,–0.25)	<0.001
	Main position unknown	–0.06	(–0.11,–0.01)	0.014	–0.14	(–0.20,–0.08)	<0.001	–0.07	(–0.13,–0.01)	0.021
Lack of promotion	Promotion (ref.)	–			–			–		
	No promotion	–0.06	(–0.09,–0.02)	0.002	–0.03	(–0.07, 0.01)	0.175	0.03	(–0.02, 0.07)	0.242
	Promotion with return	–0.17	(–0.25,–0.09)	<0.001	0.01	(–0.09, 0.11)	0.841	0.16	(0.06, 0.25)	0.002

Models are based on multilevel models (individuals nested in health-examination centre) and calculated separately for each career characteristic, adjusted for age, age square, partnership situation and education.
Respondents who retired or had a health-related career interruption prior age 45 years are excluded from the analyses.

Table 4a. Association between career characteristics and health functioning for women: relative risks or unstandardized coefficients, confidence intervals and p-values

		Depressive symptoms			Standing balance			Walking speed		
		RR	CI (95%)	p-value	RR	CI (95%)	p-value	b	CI (95%)	p-value
Number of temporary jobs	No temporary job (ref.)	–			–			–		
	1 temporary job	1.04	(0.98, 1.11)	0.186	1.31	(1.16, 1.49)	<0.001	−0.06	(−0.11,−0.02)	0.008
	2+ temporary jobs	1.24	(1.10, 1.40)	<0.001	1.33	(0.92, 1.93)	0.132	−0.07	(−0.17, 0.03)	0.171
Number of job changes	No change (ref.)	–			–			–		
	1 or 2 changes	1.03	(0.96, 1.10)	0.371	1.00	(0.92, 1.08)	0.957	−0.03	(−0.07, 0.01)	0.160
	3+ changes	1.13	(1.05, 1.22)	0.002	1.16	(0.97, 1.38)	0.112	−0.01	(−0.06, 0.04)	0.721
Number of unemployment periods	No unemployment period (ref.)	–			–			–		
	1 unemployment period	1.21	(1.11, 1.31)	<0.001	1.20	(0.97, 1.47)	0.090	−0.06	(−0.11,−0.00)	0.043
	2+ unemployment periods	1.37	(1.17, 1.61)	<0.001	1.73	(1.39, 2.16)	<0.001	−0.12	(−0.22,−0.02)	0.014
Years out of work	No years out of work (ref.)	–			–			–		
	1–5 years out of work	1.06	(0.97, 1.16)	0.204	1.00	(0.86, 1.16)	0.962	−0.07	(−0.11,−0.03)	<0.001
	6+ years out of work	1.41	(1.31, 1.51)	<0.001	1.53	(1.34, 1.75)	<0.001	−0.11	(−0.15,−0.06)	<0.001
Mode occupational position	Large employers, higher managers and professionals (ref.)	–			–			–		
	Lower managers and professionals	0.94	(0.79, 1.12)	0.498	1.29	(0.95, 1.74)	0.108	0.02	(−0.05, 0.09)	0.580
	Intermediate employee	1.18	(1.05, 1.33)	0.007	1.46	(1.08, 1.98)	0.014	−0.05	(−0.13, 0.02)	0.160
	Small employers and self-employed	1.36	(1.08, 1.71)	0.008	1.66	(1.01, 2.74)	0.046	−0.10	(−0.27, 0.08)	0.272
	Lower-grade white-collar workers	1.36	(1.13, 1.62)	<0.001	2.36	(1.70, 3.28)	<0.001	−0.17	(−0.26,−0.08)	<0.001
	Skilled workers	1.14	(0.91, 1.43)	0.243	1.65	(1.08, 2.53)	0.022	−0.03	(−0.18, 0.12)	0.710
	Semi- or unskilled workers	1.45	(1.24, 1.70)	<0.001	2.85	(1.73, 4.72)	<0.001	−0.25	(−0.37,−0.14)	<0.001
	Main position unknown	1.14	(0.99, 1.31)	0.07	1.53	(1.23, 1.90)	<0.001	−0.04	(−0.11, 0.04)	0.323
Lack of promotion	Promotion (ref.)	–			–			–		
	No promotion	0.91	(0.86, 0.97)	0.002	1.12	(0.95, 1.32)	0.168	0.03	(−0.01, 0.08)	0.157
	Promotion with return	1.00	(0.86, 1.17)	0.994	1.11	(0.65, 1.89)	0.709	−0.04	(−0.16, 0.08)	0.521

Models are based on multilevel models (individuals nested in health-examination centre) and calculated separately for each career characteristic, adjusted for age, age square, partnership situation and education. Respondents who retired or had a health-related career interruption prior age 45 years are excluded from the analyses.

Table 4b. Association between career characteristics and health functioning for women: unstandardized coefficients, confidence intervals and *p*-values

		Lung function			Verbal memory			Semantic fluency		
		b	CI (95%)	*p*-value	*b*	CI (95%)	*p*-value	*b*	CI (95%)	*p*-value
Number of temporary jobs	No temporary job (ref.)	–			–			–		
	1 temporary job	–0.03	(–0.05, 0.00)	0.064	0.01	(–0.03, 0.05)	0.603	–0.04	(–0.08, 0.01)	0.120
	2+ temporary jobs	–0.03	(–0.09, 0.02)	0.252	–0.12	(–0.21,–0.04)	0.004	–0.09	(–0.19,–0.00)	0.044
Number of job changes	No change (ref.)	–			–			–		
	1 or 2 changes	0.01	(–0.01, 0.04)	0.293	0.04	(0.00, 0.08)	0.026	0.02	(–0.02, 0.05)	0.413
	3+ changes	0.01	(–0.02, 0.04)	0.461	0.04	(–0.00, 0.08)	0.070	0.03	(–0.02, 0.07)	0.247
Number of unemployment periods	No unemployment period (ref.)	–			–			–		
	1 unemployment period	–0.01	(–0.04, 0.02)	0.645	0.01	(–0.04, 0.05)	0.788	–0.02	(–0.07, 0.03)	0.404
	2+ unemployment periods	–0.08	(–0.13,–0.03)	0.002	–0.08	(–0.16, 0.00)	0.057	–0.09	(–0.18,–0.00)	0.039
Years out of work	No years out of work (ref.)	–			–			–		
	1–5 years out of work	–0.01	(–0.03, 0.02)	0.683	–0.01	(–0.05, 0.02)	0.486	–0.02	(–0.06, 0.02)	0.419
	6+ years out of work	–0.05	(–0.08,–0.03)	<0.001	–0.02	(–0.06, 0.02)	0.377	–0.08	(–0.12,–0.03)	<0.001
Mode occupational position	Large employers, higher managers and professionals (ref.)	–			–			–		
	Lower managers and professionals	–0.03	(–0.07, 0.01)	0.114	–0.09	(–0.15,–0.03)	0.002	–0.04	(–0.10, 0.02)	0.207
	Intermediate employee	–0.07	(–0.11,–0.03)	0.002	–0.22	(–0.29,–0.16)	<0.001	–0.26	(–0.33,–0.19)	<0.001
	Small employers and self-employed	–0.09	(–0.19, 0.00)	0.057	–0.22	(–0.37,–0.07)	0.004	–0.24	(–0.39,–0.08)	0.003
	Lower-grade white-collar workers	–0.15	(–0.20,–0.09)	<0.001	–0.32	(–0.40,–0.24)	<0.001	–0.34	(–0.43,–0.26)	<0.001
	Skilled workers	–0.11	(–0.20,–0.02)	0.012	–0.27	(–0.40,–0.14)	<0.001	–0.24	(–0.39,–0.10)	<0.001
	Semi- or unskilled workers	–0.08	(–0.15,–0.01)	0.027	–0.46	(–0.56,–0.35)	<0.001	–0.51	(–0.63,–0.40)	<0.001
	Main position unknown	–0.05	(–0.10,–0.01)	0.015	–0.14	(–0.20,–0.07)	<0.001	–0.17	(–0.24,–0.10)	<0.001
Lack of promotion	Promotion (ref.)	–			–			–		
	No promotion	0.01	(–0.01,0.04)	0.289	0.00	(–0.04, 0.04)	0.939	0.01	(–0.04, 0.05)	0.776
	Promotion with return	0.00	(–0.07,0.06)	0.933	–0.02	(–0.12, 0.08)	0.686	0.02	(–0.09, 0.13)	0.749

Models are based on multilevel models (individuals nested in health-examination centre) and calculated separately for each career characteristic, adjusted for age, age square, partnership situation and education.
Respondents who retired or had a health-related career interruption prior age 45 years are excluded from the analyses.

France (the CONSTANCES study). Taken together, two main results are obvious. First, we observed a large number of associations in the expected direction, where 'cumulative disadvantage' (especially continued disadvantaged occupational position) demonstrated most consistent associations, followed by two indicators of 'discontinued employment' (number unemployment periods and years out of work). With regard to 'precarious work', the cumulative number of jobs with temporary contracts showed some, but less consistent, relationships. Second, overall associations between career characteristics and health functioning were similar for men and women, although their strength varied in some cases (i.e. stronger associations for men in cases of depressive symptoms and lung function). To our knowledge, this is one of the first studies to analyse associations of different indicators of adverse employment histories up to age 45 years with a comprehensive set of indicators of health functioning at later age among men and women.

Overall, these findings are concordant with previous research, specifically studies that investigate repeated exposure to stress at work or job insecurity in conjunction with health[9,10,37–41] and studies that linked socio-economic disadvantages across the life course to continued activation of stress-response mechanisms and functional measures of healthy ageing.[18,20] Yet, by specifying adverse characteristics of employment histories on the basis of stress-theoretical notions of work-stress models over an extended time period of the life course (between ages 25 and 45 years), this study adds to existing research. Specifically, we confirm the importance of extending the rather static concepts of stressful work that received the main attention in recent research on this topic and of studying the burden of work-related disease in a life-course perspective.[8,12] In addition, by using and comparing different measures of health functioning, we find support that potential variations of the links between career characteristics and health also depend on the outcome under study and may be restricted to mental-health outcomes (stronger for men).

Nevertheless, besides the psychobiological stress response, further potential mechanisms and explanations for the observed associations must be mentioned: e.g. it is likely that the career characteristics under study indirectly affect health through the impact they have on material circumstances at older ages (e.g. low pension level due to discontinuous working careers). Yet, in additional analyses (presented online in Supplementary Tables 2 and 3, available as Supplementary data at IJE online), estimates of career characteristics are generally attenuated, but remain statistically significant after including income as a potential mediator, suggesting that the reported associations can only partly be explained by income. In addition, as an alternative explanation, we also need to consider selection into adverse employment histories, where people with poor health are e.g. more likely to have episodes of unemployment. Albeit we excluded people who reported an episode of sickness between ages 25 and 45 years, this selection cannot be excluded. Finally, to substantiate our findings, future studies need to include markers that allow the investigation of psychobiological stress responses in more detail, such as inflammatory markers.[20]

Our study has several strengths, including a large study sample, high-quality standards of data collection through standardized procedures and trained study nurses, detailed data on employment histories and a comprehensive assessment of health-functioning measures that are commonly used in large-scale population-based studies.[12] Using a comprehensive assessment is also in line with the recommendation to move away from a disease-oriented definition of health to objective indicators that focus on the maintenance of physical and mental capacity and functioning among older people.[42] Despite these strengths, the study has several limitations. First, the core measures of our study—career characteristics between ages 25 and 45 years—were collected retrospectively. We thus need to consider a potential recall bias, with a tendency to reduce complexity,[43] or to report details rosier than they were, particularly in case of unfavourable events.[44,45] Compared with prospective data collection, though, our retrospective data make sure that information (referring to different time points) are comparable throughout time and they do not to produce missing data due to panel attrition. There is also increasing support that retrospective data, in particular when asking about socio-demographic conditions[46] and employment histories,[47–49] provide reliable and valid information. Second, albeit the measure of the career characteristics was guided by theoretical models of work stress, we may ask whether some of the derived measures could be elaborated on more extensively. For example, in case of lack of promotion, information on the class of origin and the lengths spent in different positions without job promotion may be of interest. Similarly, future studies could apply methods of sequence analysis to summarize and regroup employment sequences with similar patterns into types of employment histories.[13–15]

In conclusion, our findings support the notion that long-term exposure to adverse material and psychosocial employment conditions, including the experience of interruptions and discontinuities, may weaken physical, affective and cognitive health functioning later on. If confirmed by further results, these findings call for increased intervention efforts among more disadvantaged groups of the labour market in early stages of labour-market participation.

Supplementary data

Supplementary data are available at IJE online.

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