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Original Article

The influence of job stress, social support and health status on intermittent and chronic sleep disturbance: an 8-year longitudinal analysis

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ABSTRACT

Objective: To determine the role of health status and social support in the relationship between job stress and sleep disturbance, for both intermittent and chronic sleep disturbance.
Methods: A total of 1946 mid-life adults completed three questionnaires spanning an 8-year time frame. Sleep disturbance was assessed at each time point, and participants were classified as experiencing intermittent, chronic or no sleep disturbance across this 8-year period. Independent variables included a range of job stress measures, social support, physical and mental health, and demographic characteristics.
Results: After controlling for physical and mental health, perceived lack of job marketability increased risk of intermittent sleep disturbance (odds ratio (OR) = 1.33, $p = 0.012$). No other job stress measures were associated with either intermittent or chronic sleep disturbance after adjusting for years of education, social support, and employment status. Poorer mental and physical health status, although significantly increasing odds for intermittent sleep disturbance, represented a significantly greater increase in the odds for chronic sleep disturbance over and above intermittent disturbance (OR = 0.96, $p < 0.001$ for both SF-12 mental and physical health).
Conclusion: This population-based cohort study found little evidence that job stress had an independent effect on chronic or intermittent sleep disturbance independent of health, social support, and education. Risk profiles for intermittent and chronic sleep disturbance did not differ with regard to job stress; however, various demographic and social support factors were distinguishing factors. Health status, both physical and mental, also showed a significantly greater impact on chronic sleep disturbance than intermittent sleep disturbance. Karasek's model of job strain had little value in predicting sleep disturbance outcomes.

1. Introduction

Sleep disturbance is experienced widely, with over 37% of the adult population experiencing difficulties initiating or maintaining sleep at any given time [1] and 6–8% meeting clinical criteria for insomnia [2]. Aside from causing significant distress and disease burden [3], sleep disturbance is a risk factor of both physical and mental disorders, including diabetes [4], coronary artery disease [5] and increased mortality in general [6,7], whilst mental health problems for which sleep disturbance elevates risk most commonly include depression [8–10] and anxiety disorders [11–13].

Alongside a number of other factors relating to demographics [14], psychological risk [15–19] and cognitive–behavioural profile [20], there is some good evidence that job-related stress increases risk of sleep disturbance and insomnia. Although job stress impacts significantly on both physical [21] and mental health [22], sleep disturbance is one of the most common health impacts of occupational stressors [23]. Job-related factors such as working very long hours (>55 h/week) increase risk of sleep disturbance [24], and independent of lifestyle factors or working hours [25], job-related stress factors such as high job demands [26–28], low job control [25,26,28], work- and role-related conflict [29,30], low employment opportunities and physical working environment [30], job dissatisfaction [30] and perceived job difficulty [31] all have a significant negative impact on sleep. However, some studies have uncovered inconsistent effects, such as effort–reward imbalance having an effect on men but not women [32], whilst others, such as a cross-lagged study of the Swedish Longitudinal Occupational Cohort of job demands upon later sleep problems, suggest only

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small effects [33], the latter in contrast to the much stronger associations of job stressors on concurrent sleep problems often seen in both the academic literature [32] and lay press [34].

Evidently, there remain unanswered questions when it comes to how job stress relates to sleep disturbance, and this paper aims to address three such interrelated issues: (1) how different elements of job stress relate to the maintenance/chronicity of sleep disturbance; (2) how physical and mental health interact with job stress and sleep disturbance; and (3) the role that social support plays in these relationships.

First, how job stress relates to maintenance (or chronicity) of sleep disturbance requires further analysis. The chronicity of sleep disturbance increases risk of onset of mood and anxiety disorders and increases the risk of relapse [35,36]. Therefore, it is important to identify risk factors for chronic sleep disturbance separately, as chronic problems with sleep may indicate increased risk of mental health problems, above and beyond the risk of mental health problems associated with intermittent sleep disturbance. Furthermore, chronic insomnia may have different causes to intermittent insomnia, including chronic pain [37] and hormonal changes [38]. It is common for sleep disturbance to occur intermittently, precipitated by specific stressors and then remitting once these stressors either dissipate naturally or are adapted to [39]. Certain factors, however, increase the likelihood that sleep disturbance will become chronic. Such maintaining factors, as they are called, tend to be cognitive–behavioural in nature [40], such as holding dysfunctional beliefs about sleep [41] and engaging in maladaptive sleep-related behaviours [42]. A small amount of research, however, conducted by Jansson-Frojmark et al. [43,44] indicates that certain job-stress-related factors may also maintain sleep disturbance. Experiencing low influence over decisions and high work demands (also known as Job Strain, as per Karasek's classic demand-control model of job strain, the predominant theory of job stress [45]), for instance, may contribute to sleep disturbance becoming chronic [43]. This requires further exploration, especially taking health status into account.

Second, although sleep disturbance increases risk of health problems, and vice versa, the combined impact of job stress, sleep disturbance, and health problems is unclear. There is no consensus as to whether the relationship between job stress and sleep disturbance is attributable to health status – be it physical or mental. To illustrate: job stress may lead to sleep disturbance because job stress is more likely to be experienced by people with a pre-existing physical or mental health problem (i.e., health is a confounder). Alternatively, job stress may increase risk of physical and mental health problems, which may in turn lead to sleep disturbance (i.e., health is a mediator). Although the current study is not designed to detect such differences, the extent to which mental and physical health status relates to job stress and sleep disturbance is examined.

Third, given that social support is a protective factor for sleep disturbance [26–28,30,43,46–48], the influence of social support on sleep disturbance in the context of job stress, taking health status into account is examined [49].

Using multinomial logistic regression analyses, and utilising data collected from a mid-life cohort at three time points over an 8-year period in order to ascertain maintenance/chronicity of sleep disturbance, the current study compared (1) people who experienced intermittent sleep disturbance with people who experienced no sleep disturbance, and (2) people who experienced chronic sleep disturbance with people who experienced intermittent sleep disturbance. Based on these two regression models, analyses examined (i) whether job strain and other elements of job stress were associated with maintenance/chronicity of sleep disturbance, (ii) whether the effects of job stress on sleep disturbance (both intermittent and chronic) could be explained by existing physical and mental health problems, and (iii) whether social support impacted on this relationship.

The present study sought to identify whether, and to what extent, social stressors had a long-term impact upon the presence of intermittent and chronic sleep disturbance. Specific study hypotheses are that (a) job strain will significantly contribute to the model predicting odds of chronic sleep disturbance compared with intermittent sleep disturbance whereas other elements of job stress will significantly predict the odds of intermittent sleep disturbance compared with no sleep disturbance. (b) Physical and mental health will account for a significant amount of variance in both models, potentially negating the influence of some of the other variables in the final model. (c) Positive social support (from both family and friends) will significantly decrease odds of sleep disturbance in both models, and negative social support (from both family and friends) will significantly increase odds of sleep disturbance in both models.

2. Method

2.1. Participants

The PATH Through Life Project is a longitudinal study examining the health and well-being of people in the community who were 20–24, 40–44 and 60–64 years of age at the beginning of the study [50]. Starting in 2001, each cohort has been followed up every 4 years over a total period of 20 years. Participants were sampled from the electoral rolls for the city of Canberra, Australia, and in the neighbouring town of Queanbeyan. Registration on the electoral roll is compulsory for Australian citizens. Results presented here concern the 40–44 cohort, from the first three waves of the study. This age cohort was chosen because it encompasses prime working age, and because data on job strain were only collected in this cohort. Data from the three waves were collected in 2001, 2004 and 2008. At the first wave, 2530 from the 40s group completed interviews. At the second wave, when participants were aged 44–48, 2345 (92.7%) completed interviews while at the third wave (ages of 48–52), 2172 (85.8%) completed interviews. Because job stress was the explanatory variable of primary interest, 253 participants who did not have employment at the time of the first assessment were excluded from the analyses. The remaining participants who completed all three interviews (n = 1946) were included in the analysis sample. An additional 19 participants (1.0%) were excluded from the logistic regression analyses due to missing data on one or more independent variables. Approval for the research was obtained from The Australian National University's Human Research Ethics Committee and written informed consent was obtained from participants.

2.2. Procedure

Participants completed interviews at a convenient location, usually the participant's home or the Centre for Mental Health Research at the Australian National University. Most of the interview was self-completed on a palmtop or laptop computer. However, professional interviewers were required for physical tests, some cognitive tests and to obtain a cheek swab used for genetic testing.

2.3. Measures

The outcome measure was a three-category measure of sleep disturbance (none/intermittent/chronic) over the 8-year period. Sleep disturbance at each time point was indicated by the endorsement of two or more sleep-related items from the Goldberg Depression and Anxiety Scales [51]: 'Have you been sleeping poorly?', 'Have you had difficulty falling asleep?' or 'Have you been

waking early?'. Participants who met this criterion at none of the three time points were classified as having no sleep disturbance, those who met the criterion at one or two time points were classified as having intermittent sleep disturbance and those who met the criterion at all three time points were classified as having chronic sleep disturbance. In this way, three categories of sleep disturbance (none/intermittent/chronic) were constructed.

All independent variables included in the models were assessed at the initial interview. Stressors related to work were: being primarily responsible for household tasks (from one item, ratings of 75–100% categorised as primary responsibility), job insecurity (classified as feeling 'not secure' or 'moderately secure' in current workplace), job unmarketability ('difficult' or 'extremely difficult' to get a similar job if respondent lost present job), pay inequality (pay perceived as 'completely unfair' or 'somewhat unfair'), rarely taking time to relax (setting aside time to relax 'not at all' or 'some or a little of the time'), all devised for the PATH through Life Study [52] and job strain, defined as per Karasek's job strain model [45]. Job insecurity (as assessed by feelings of insecurity, lack of marketability and inequality) has been shown to have an important impact on physical and mental health [53]. Other characteristics of work–life balance have also been shown to negatively impact on mental well-being and sleep quality [54]. Job demands and control were measured using 4 and 15 items, respectively, adapted from the Whitehall study [55]. Median splits were used to define cut-offs for high demands ($\geqslant 7$) and low control ($\geqslant 14$) and those reporting *both* high demand and low control defined as experiencing 'job strain'. Social stressors were defined using the social support scales of Schuster et al., [49] including the effects of positive and negative interactions with both family and friends. As there are important distinctions between the presence of supportive interactions (i.e., positive support) and the presence of negative interactions (i.e., negative support) within one's social network, and that the source of such support (family vs. friends) is an important consideration regarding the impact on mental health [49], participants reported levels of positive friend support, positive family support, negative friend support and negative family support. Items assessing positive interactions included 'How often do friends make you feel cared for?', while negative interactions included 'How often do they criticise you?', each rated on a four-point scale. Mean responses to two positive and three negative items each for friends and family were calculated. Physical and mental health were measured via the SF 12, a 12-item health survey comprising of mental and physical health components [56].

Analyses were adjusted for other potential confounders assessed 4 years prior to the outcome: age, gender, years of education, have a partner (married or de facto), have children and employment status (full-time employed, part-time employed or part-time seeking full-time).

2.4. Statistical analyses

The outcome variable was presence of sleep disturbance across the 8-year follow-up period, classified as none (not observed at any time points), intermittent (1–2 time points), or chronic (all three time points). Multinomial logistic regressions were used to model the effects of work and social stressors on sleep disturbance, with intermittent sleep disturbance used as the reference category. As the focus of the analysis was to identify individual characteristics that predicted shifts from no to intermittent disturbance, and from intermittent to chronic disturbance, intermittent sleep disturbance was selected to be the reference category in the regression model. Four regressions were performed, adjusting for (i) background variables and work stressors; (ii) background variables and social stressors; (iii) background variables; work stressors and social stressors; and (iv) background variables, work stressors, social stressors and SF-12 physical and mental health [56]. SPSS version 20 was used for all analyses.

3. Results

Frequency of reporting sleep disturbance at each time point is shown in Table 1. At each time point, 32–35% of participants reported two or more symptoms of sleep disturbance, which included sleeping poorly, difficulty falling asleep or waking early. Over the three time points, there were 780 (40.1%) classified with no sleep disturbance, 907 (46.6%) with intermittent sleep disturbance, and 259 (13.3%) with chronic sleep disturbance.

Sample characteristics are presented in Table 2, broken down by presence of sleep disturbance. Row percentages in the table reflect the percentage of participants within each category having no/intermittent/chronic sleep disturbance. Participants with sleep disturbance were significantly less likely to be partnered than those without sleep disturbance. Likewise, participants who reported sleep disturbance were significantly more likely to have reported job insecurity, job unmarketability, job strain or rarely relaxing than those who did not report sleep disturbance. Participants with sleep disturbance had significantly less education, less positive support from friends and family, more negative support from friends and family and poorer physical and mental health than those without sleep disturbance. The chronic sleep disturbance group reported the lowest levels of education, support and health. However, there were no significant associations between sleep disturbance and age, gender, having children, employment status, household responsibilities or pay inequality.

The multinomial logistic regression models predicting odds of sleep disturbance are presented in Table 3 (no sleep disturbance vs. intermittent sleep disturbance) and Table 4 (chronic sleep disturbance vs. intermittent sleep disturbance), the latter representing those factors that distinguished people experiencing chronic sleep disturbance from those who experienced sleep disturbance only intermittently. The lightly shaded variables in the tables represent work stressors while the heavily shaded variables represent social stressors. Likelihood ratio tests indicated that the nominal regression models significantly fit the sleep disturbance outcome (work strain model $\chi^2 = 92.1$, $df = 26$, $p < 0.001$; social support model $\chi^2 = 99.8$, $df = 22$, $p < 0.001$; combined model $\chi^2 = 142.7$, $df = 34$, $p < 0.001$; full model $\chi^2 = 331.1$, $df = 38$, $p < 0.001$). Factors that significantly increased the odds of experiencing intermittent sleep disturbance were having an insecure job, having an unmarketable job, rarely taking time to relax, having less positive support from friends, having more negative support from family, and poor physical or mental health. The effects of job insecurity, taking time to relax, positive friend support, and negative family support were attenuated to non-significance after adjustment for physical and mental health.

Table 1
Sleep disturbance across the three time points (0, 4 and 8 years) as defined by endorsement of 2–3 Goldberg sleep items.

	Endorsed 0–1 Goldberg sleep items		Endorsed 2–3 Goldberg sleep items		Missing		*N*
Wave 1	1489	(65.5%)	786	(34.5%)	0	(0.0%)	2275
Wave 2	1388	(61.0%)	734	(32.3%)	153	(6.7%)	2122
Wave 3	1220	(53.6%)	758	(33.3%)	297	(13.1%)	1978

Table 2
Descriptive statistics for the analysis sample (n = 1,946) based on presence of sleep disturbance.

	No sleep disturbance		Intermittent sleep disturbance		Chronic sleep disturbance		χ^2	p
	Freq	(Percent)	Freq	(Percent)	Freq	(Percent)		
Gender								
Male	394	(40.8%)	448	(46.4%)	123	(12.7%)	0.74	0.692
Female	386	(39.3%)	459	(46.8%)	136	(13.9%)		
Have children								
Yes	671	(40.3%)	772	(46.4%)	220	(13.2%)	0.34	0.842
No	109	(38.5%)	135	(47.7%)	39	(13.8%)		
Have a partner								
Yes	646	(41.4%)	721	(46.2%)	193	(12.4%)	8.91	**0.012**
No	134	(34.7%)	186	(48.2%)	66	(17.1%)		
Employment status								
Full-time	606	(40.2%)	717	(47.5%)	185	(12.3%)		
PT seeking FT	12	(41.4%)	13	(44.8%)	4	(13.8%)	7.00	0.136
Part-time	162	(39.6%)	177	(43.3%)	70	(17.1%)		
Responsible for at least 75% of household duties								
Yes	370	(38.7%)	449	(46.9%)	138	(14.4%)	2.73	0.255
No	410	(41.5%)	458	(46.3%)	121	(12.2%)		
Job insecurity								
Yes	204	(32.7%)	314	(50.3%)	106	(17.0%)	24.47	**<0.001**
No	575	(43.6%)	592	(44.8%)	153	(11.6%)		
Job unmarketability								
Yes	210	(32.7%)	323	(50.3%)	109	(17.0%)	25.23	**<0.001**
No	568	(43.7%)	583	(44.8%)	150	(11.5%)		
Pay inequality								
Yes	108	(37.5%)	137	(47.6%)	43	(14.9%)	1.30	0.521
No	670	(40.5%)	769	(46.5%)	215	(13.0%)		
Relax rarely								
Yes	516	(37.2%)	672	(48.4%)	200	(14.4%)	17.99	**<0.001**
No	264	(47.3%)	235	(42.1%)	59	(10.6%)		
Job strain								
Yes	232	(35.5%)	313	(47.9%)	108	(16.5%)	13.16	**0.001**
No	548	(42.4%)	594	(45.9%)	151	(11.7%)		
	No sleep disturbance		Intermittent sleep disturbance		Chronic sleep disturbance		F	p
	Mean	(SD)	Mean	(SD)	Mean	(SD)		
Age	42.73	(1.47)	42.58	(1.50)	42.57	(1.44)	2.30	0.100
Years of education	14.70	(2.18)	14.60	(2.25)	14.26	(2.26)	3.80	**0.023**
Positive support from friends	4.93	(1.24)	4.70	(1.30)	4.63	(1.26)	8.47	**<0.001**
Negative support from friends	2.69	(1.55)	2.87	(1.56)	3.31	(1.59)	15.44	**<0.001**
Positive support from family	5.36	(1.09)	5.19	(1.20)	5.03	(1.24)	9.43	**<0.001**
Negative support from family	4.19	(2.00)	4.53	(2.03)	5.03	(2.09)	17.39	**<0.001**
SF-12 physical component score	53.49	(5.60)	51.95	(7.39)	49.51	(9.76)	31.90	**<0.001**
SF-12 mental component score	52.80	(7.09)	48.86	(9.91)	44.37	(10.41)	95.83	**<0.001**

Notes: Bold values indicate $p < 0.05$; FT: full-time; PT: part-time.

Factors that significantly increased the odds of experiencing chronic sleep disturbance were having no partner, being in part-time but seeking full-time employment, being more highly educated, and reporting more negative support from family and friends (Table 4). The effect of having a partner was not significant after adjusting for family/friend support, while the effect of negative family support became non-significant after adjusting for physical and mental health. The factors not significantly associated with increased odds of either intermittent or chronic sleep disturbance in the models were gender, age, having children, responsibility for household tasks, inequitable pay, job strain, and positive support from family. When the full model was re-estimated with no sleep disturbance set as the reference category, no additional job stress effects emerged, although job unmarketability was significantly associated with higher odds of chronic sleep disturbance (odds ratio (OR) = 1.46, p = 0.023).

To further explore the null effect of job strain on sleep disturbance, job demands and job control were investigated as continuous predictors in separate analyses (not shown). Participants with low control jobs were found to have significantly greater odds of intermittent sleep disturbance, while participants with highly demanding jobs were found to have significantly greater odds of chronic sleep disturbance. However, after controlling for physical and mental health, these associations were greatly attenuated and became non-significant.

4. Discussion

The current study first hypothesised that job strain would be significantly related to chronic, as opposed to intermittent, sleep disturbance. This hypothesis was not supported: although job strain showed a relatively strong univariate association with sleep disturbance, this association was not significant in either logistic regression analysis. The reason for this is unclear. This may reflect the operationalisation of job strain in the current study, as both demands and control were constructed using median splits and were therefore binary in nature. The use of median splits may have also led to an oversimplification of the nature of job strain, capturing those in the upper 50% of job demands and in the lower 50% of job control rather than 'high' demands and 'low' control, per se.

Table 3
Multinomial logistic regression models predicting odds of intermittent sleep disturbance compared to no sleep disturbance.

	Work strain model		Social support model		Combined work/social		Full model	
	OR	*p*	OR	*p*	OR	*p*	OR	*p*
Intercept		0.063		0.005		0.025		<0.001
Gender = male	0.915	0.487	0.877	0.257	0.853	0.237	0.924	0.566
Have children	0.984	0.920	0.953	0.756	0.944	0.718	0.992	0.961
Have partner	0.803	0.154	0.797	0.100	0.779	0.110	0.858	0.338
Employment status								
FT employed								
PT employed	0.784	0.558	0.858	0.708	0.767	0.525	0.887	0.779
PT seeking FT	0.869	0.324	0.869	0.304	0.858	0.287	0.864	0.322
Age	0.941	0.072	0.936	0.050	0.942	0.075	0.937	0.063
Years of education	0.981	0.407	0.973	0.232	0.979	0.362	0.971	0.213
Responsible for household tasks	0.981	0.895			0.946	0.694	0.929	0.609
Job insecurity	1.414	**0.002**			1.353	**0.008**	1.200	0.117
Job unmarketability	1.445	**0.001**			1.414	**0.002**	1.328	**0.012**
Pay inequality	1.008	0.954			1.017	0.904	0.946	0.714
Rarely take time to relax	1.443	**0.001**			1.368	**0.005**	1.215	0.091
Job strain	1.100	0.381			1.045	0.691	0.960	0.717
Friend positive support			0.883	**0.004**	0.908	**0.031**	0.952	0.286
Friend negative support			1.036	0.309	1.026	0.472	1.001	0.971
Family positive support			0.935	0.149	0.947	0.250	0.987	0.787
Family negative support			1.068	**0.016**	1.053	0.068	1.011	0.702
SF-12 physical							0.949	**<0.001**
SF-12 mental							0.940	**<0.001**

Notes: Bold values indicate $p < 0.05$; FT: full-time; PT: part-time.

Table 4
Multinomial logistic regression models predicting odds of chronic sleep disturbance compared to intermittent sleep disturbance.

	Work strain model		Social support model		Combined work/social		Full model	
	OR	*p*	OR	*p*	OR	*p*	OR	*p*
Intercept		0.926		0.870		0.807		0.163
Gender = male	1.075	0.694	1.141	0.436	1.073	0.716	1.148	0.489
Have children	0.988	0.955	0.924	0.723	0.888	0.601	0.987	0.956
Have partner	0.655	0.039	0.729	0.087	0.673	0.056	0.714	0.114
Employment status								
FT employed								
PT employed	1.084	0.891	1.109	0.860	1.117	0.852	1.363	0.608
PT seeking FT	1.683	0.007	1.613	0.010	1.690	0.007	1.596	0.020
Age	0.994	0.898	0.991	0.851	0.992	0.875	0.992	0.877
Years of education	0.937	0.042	0.925	0.016	0.922	0.014	0.916	0.009
Responsible for household tasks	0.872	0.494			0.850	0.426	0.829	0.370
Job insecurity	1.163	0.316			1.081	0.615	0.937	0.687
Job unmarketability	1.208	0.201			1.181	0.266	1.098	0.543
Pay inequality	0.998	0.994			0.966	0.861	0.862	0.475
Rarely take time to relax	1.252	0.196			1.185	0.334	1.090	0.636
Job strain	1.306	0.075			1.226	0.180	1.130	0.436
Friend positive support			0.993	0.911	1.017	0.790	1.072	0.280
Friend negative support			1.148	0.004	1.142	0.007	1.115	0.031
Family positive support			0.979	0.729	0.979	0.740	1.030	0.651
Family negative support			1.102	0.015	1.093	0.027	1.056	0.179
SF-12 physical							0.962	<0.001
SF-12 mental							0.960	<0.001

Notes: Bold values indicate $p < 0.05$; FT: full-time; PT: part-time.

Nevertheless, the follow-up analysis using continuous measures of demands and control resulted in similar findings. It is possible that other job stress elements simply have a greater impact on sleep disturbance than job strain itself, and that the overlapping nature of these concepts meant that job strain failed to reach significance in the current study. It is also possible that job strain increases the risk of chronic sleep disturbance when compared with no sleep disturbance, but not for intermittent sleep disturbance compared with no sleep disturbance, or chronic sleep disturbance compared with intermittent sleep disturbance, which were the analyses in the current paper.

There were, however, other interesting differences between the two models in terms of job stress factors. In the case of chronic sleep disturbance compared with intermittent sleep disturbance, no job stress variables were significant, either when assessed alongside demographic variables only or when combined with social support, physical health or mental health measures. This indicates that chronic sleep disturbance may not differ markedly from intermittent sleep disturbance when it comes to the influence of job stress. In the case of intermittent sleep disturbance compared with no sleep disturbance, however, job insecurity, job unmarketability and rarely taking time to relax were significant predictors initially, with job unmarketability remaining significant in the final model. These findings indicate that certain elements of job stress significantly increase one's risk of experiencing intermittent sleep disturbance and that one of these elements, namely job

unmarketability (i.e., the perceived ability to regain similar employment if a current job was lost), contributes over and above the influences of physical and mental health status. An increase of one standard deviation in unmarketability increases the odds of intermittent sleep disturbance by 25%.

Potential mechanisms to explain these differences are unclear. It is possible that this is related to the fact that job stress, at least for a full-time worker, is likely to be experienced as relatively chronic due to the fact that a person's job consumes a large amount of time. It is known that sleep disturbance often dissipates as the precipitating stressor either is habituated to or goes away naturally. Although habituation and subsequent remediation of sleep disturbance may occur for chronic stressors such as job stress, individuals who do not habituate to job stress may go on to experience more serious physical and mental health problems. The present analysis suggests that initial mental health accounted more robustly for sleep problems than job-related stressors, and that the impact of health status – both physical and mental – was significantly greater for chronic, as opposed to intermittent, sleep disturbance. This latter point might also explain why no job stress variables increased the risk of chronic, as opposed to intermittent, sleep disturbance: health status was particularly important in the case of chronic sleep disturbance.

Other notable differences between intermittent versus no sleep disturbance and chronic versus intermittent sleep disturbance related to employment status and years of education. These did not increase risk of intermittent sleep disturbance but did significantly increase risk of chronic sleep disturbance compared with intermittent sleep disturbance. Specifically, a person who was in part-time employment but looking for full-time employment had 60% greater odds of experiencing chronic sleep disturbance, as opposed to intermittent sleep disturbance, than a person in full-time employment. This must be interpreted with caution, given that the number of people falling into this category was relatively small ($n = 29$), but may be due to the stresses associated with job seeking [57] and the stigma of underemployment [58]. Similarly, each additional year of education made a person approximately 8.5% less likely to experience chronic sleep disturbance than intermittent sleep disturbance, indicating a protective effect similar to that found in relation to depression [59].

The second hypothesis that physical and mental health status would account for a significant amount of the variance in both models was supported. In the final models for both intermittent versus no sleep disturbance and chronic versus intermittent sleep disturbance, physical and mental health status were highly significant, $p < 0.001$. Moreover, the fact that both physical and mental health status were highly significant in the model comparing chronic to intermittent sleep disturbance indicates that health status plays a greater role in chronic sleep disturbance than it does in sleep disturbance that is only experienced intermittently. These findings demonstrate, in a general sense, the confounded relationships between job stressors and sleep disturbance. These may indicate that any effects of job stress on sleep disturbance are mediated by the well-supported but small- to moderate-sized effects of job stress on physical [21] and mental [22] health. Alternatively, it is possible that there is a protopathic bias in that people with poorer health report more work-related job stress and are also at risk of future sleep problems. It would be interesting to further explore these possible explanations empirically, and to test whether the role of health status increases along with the chronicity of sleep disturbance.

Third, it was hypothesised that social support would significantly relate to both intermittent and chronic sleep disturbance. Initial models supported this. Positive friend support and negative family support were initially significant for intermittent sleep disturbance, and negative family and friend support was significant when comparing chronic and intermittent sleep disturbance. However, only when comparing chronic and intermittent sleep disturbance did a social support factor – namely, negative friend support – remain significant in the final model. In other words, feeling criticised by friends, having demands placed on oneself by friends and feeling that friends create tension and arguments were associated with an increased risk of chronic, as opposed to intermittent, sleep disturbance. This indicates that negative interactions with friends play a greater role in the development and maintenance of chronic sleep disturbance than it does in intermittent sleep disturbance.

This study benefitted greatly from the strengths associated with a large-sample, population-based longitudinal study, in particular, the ability to investigate a large, representative sample of the population with measurement of multiple risk factors of sleep disturbance. However, there are limitations to the findings of this research. Most importantly, the fact that participants were interviewed only once every 4 years meant that only point prevalence data was obtained, and inferences regarding the chronic nature of, in this instance, sleep disturbance, may not be as robust as if more frequent time points were used. Although this study enabled investigation of long-term relationships between job stress and sleep disturbance, it is possible that the effects of job stress occur more acutely. Specifically, after 4 or 8 years, individuals may have changed job circumstances, such that the effect of the initial job stress diminished over time. Nevertheless, the significant effects suggest that there may exist long-term independent effects of job marketability, which may be independent of the job one is in at any one time, social support, mental health, and physical health on the presence of sleep disturbance.

Furthermore, despite potential fluctuation of sleep disturbance between each measurement, the 8-year assessment may have been more likely to capture chronic sleep disturbance than shorter-term assessments. A further shortcoming of this research was the use of sleep-related items from the Goldberg Depression and Anxiety Scales to measure sleep disturbance rather than a validated 'stand-alone' sleep measure. Assessment of a broad range of risk factors in population-based longitudinal studies is resource-intensive and often precludes the use of lengthier clinical measures. Finally, it is important to note that the included job-stress analyses focussed on Karasek's job strain model. Although Karasek's model is the predominant model of job stress, alternative models exist [60–62], and may shed further light on the role of job stress in sleep disturbance. Future research should aim to further elucidate the relationships found in the current study, with greater focus on the mechanisms and directionality by which job characteristics may impact sleep disturbance. Ideally the differences between intermittent and chronic sleep disturbance should be assessed using ongoing assessment of sleep and validated sleep scales. Nevertheless, the findings of the present study indicate that intermittent and chronic sleep disturbance differ systematically with regard to a number of demographic and social support-related factors, that job stress is not one of these distinguishing factors despite contributing to intermittent sleep disturbance, that physical and mental health status play a highly significant role, and that this is even more pronounced in the case of chronic sleep disturbance.

Conflict of interest

The ICMJE Uniform Disclosure Form for Potential Conflicts of Interest associated with this article can be viewed by clicking on the following link: http://dx.doi.org/10.1016/j.sleep.2014.04.007.

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