

## Job strain and obesity

### Dear Sir

We read with great interest the paper by Nyberg *et al.* [1] on job strain (a work stressor combining low job control and high psychological job demands) in relation to body mass index (BMI) using 13 European cohort studies. First of all, we think that the authors' brief characterization of the existing literature as being null or mixed does not give appropriate weight to the consistency of studies that have reported significant associations between job strain and obesity. Several longitudinal studies [2–4] have supported that job strain, by itself or in combination with low social support at work, is associated with obesity in working populations. Ishizaki *et al.* [2] reported that whilst the cumulative (baseline and follow-up) exposure of job strain was not associated with increased BMI, it was associated with increased waist circumference in Japanese workers. Choi *et al.* [3] found a dose–response association between the cumulative exposure of job strain and abdominal obesity (based on waist circumference) in US workers (the MIDUS study). Brunner *et al.* [4] also found a dose–response association between the frequency of iso-strain (the combination of job strain and low social support at work) and obesity (based on both BMI and waist circumference) in British workers (Whitehall II Study). Furthermore, the authors reported elsewhere [5] that job strain was longitudinally associated with leisure-time physical inactivity in their European cohort data.

Secondly, we think that the authors may have underestimated the association between job strain and obesity in their longitudinal analyses. The authors found a moderate, but significant association between job strain and obesity ( $\text{BMI} \geq 30 \text{ kg m}^{-2}$ ) in their cross-sectional analyses with 13 cohort data, but not in their longitudinal analyses with four cohort data (Belstress Study, Whitehall II Study, Finnish Public Sector Study and Health and Social Support Study). However, the results of their longitudinal analyses seem to be biased towards the null due to several biases: differential attrition rate by job strain status, confounding effect of smoking and short follow-up period. The authors did not report in the paper whether they examined a differential attrition rate by job strain status during the follow-up period in each of the four cohort data in their

longitudinal analyses. We found elsewhere [6] that considerably more people in the job strain group at baseline than in the nonjob strain group dropped out during the follow-up period in the Belstress Study, one of the four cohort studies. Thus, the longitudinal association between job strain and obesity in the paper may have been underestimated. Another problem is that the results of their longitudinal analyses were controlled for only age, gender and socio-economic status. We believe the authors should have presented the longitudinal results in which smoking status was controlled for as they described in the method section of the paper and in the cross-sectional analysis. Current smoking was more prevalent amongst workers in the job strain group than in the nonjob strain group in another paper by the authors using the same data base [7]. Also in the same paper [7], current smokers at baseline in the job strain group were less likely to quit smoking at follow-up. It is well known that cigarette smoking reduces weight [8], and smoking cessation is associated with weight gain [9, 10]. Therefore, their longitudinal association between job strain and obesity without adjustment for smoking status (current smokers, ex-smokers and never-smokers) both at baseline and at follow-up may have been underestimated. In addition, the short follow-up period (median of 4 years) of the four cohort studies, resulting in a very low (<6%) obesity incidence rate, could be another reason for the null association between job strain and obesity in their longitudinal analysis. The follow-up periods of the Finnish Public Sector Study (2–4 years) and the Health and Social Support Study (5 years) were <6 years [11]. This concern makes sense considering that most people gain weight gradually, for example, on average, 0.5–1.0 kg per year in US general populations [12]. Also the follow-up periods of all three positive longitudinal studies [2–4] on job strain and obesity were 6 years or longer. In contrast, the follow-up periods of all three null longitudinal studies [13–15] on job strain and obesity were 5 years or shorter, except for one very long follow-up (26 years) study [16]. We do not know whether the authors conducted a sensitivity test of their longitudinal findings in a subsample of subjects having a follow-up period of  $\geq 6$  years.

Thirdly, we think that the authors did not provide evidence for the association between job strain and weight loss in their longitudinal analyses. Although the authors interpreted that their longitudinal findings were consistent with their cross-sectional findings in terms of a U-shaped relationship between job strain and BMI, their claim was not demonstrated in the paper because the analyses of the cross-sectional and longitudinal data were substantially different. The authors reported that job strain was more prevalent in both obese and underweight workers than in normal-weight workers in their cross-sectional analyses. However, whilst they tested the association between the cumulative exposure of job strain and new cases of obesity amongst normal-weight and overweight workers at baseline in their longitudinal analyses ( $N = 42\,222$ , Table 2) [1], there was no test of the association between the cumulative exposure of job strain and new cases of weight loss (changes in BMI categories: obesity to overweight; overweight to normal weight; or normal weight to underweight) in their longitudinal analyses, especially the transition from normal weight to underweight, which would be most equivalent to the finding reported in the cross-sectional analysis. The dual effect of job strain on weight (gain and loss) was initially suggested by Kivimäki *et al.* [13] as a reason for mixed findings in the literature on the association between job strain and BMI. However, it was not supported later in a methodologically superior Japanese study [2]. In the Japanese study, the cumulative exposure of job strain was examined in relation to the change in BMI after controlling for baseline BMI, whilst in the study by Kivimäki *et al.* [13], only one-time (baseline) job strain was examined. The U-shaped relationship between job strain and underweight in their cross-sectional analyses may be due to pre-existing chronic diseases of subjects as they described in the discussion section of the paper.

Finally, we disagree with the conclusions the authors made that 'it is unlikely that intervention to reduce job strain would be effective in combating obesity at a population level'. We think that more longitudinal and intervention studies are needed to further elucidate the role of adverse psychosocial working conditions including, but not limited to, job strain in the aetiology of obesity in working populations [17]. We also think that current evidence for the association between job strain and obesity, although limited, indicates great potential as an effective public health strategy for prevention

of obesity in working populations. Additionally, recent policies on Total Worker Health from NIOSH in the United States [18, 19] suggest that workplace health promotion programmes (to reduce smoking, encourage healthy eating, physical activity reduce weight, etc.) may be more effective when they also 'address the physical and organizational work environment' [20, 21].

#### Conflict of interest statement

The authors have no conflict of interest to declare.

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