

Working Time Society consensus statements: Psychosocial stressors relevant to the health and wellbeing of night and shift workers

Frida Marina FISCHER^{1†*}, Aline SILVA-COSTA², Rosane Harter GRIEP^{3†},
Michael H. SMOLENSKY⁴, Philip BOHLE⁵ and Lucia ROTENBERG^{3†}

¹Department of Environmental Health, School of Public Health, University of São Paulo, Brazil

²Department of Collective Health, Federal University of Triângulo Mineiro, Brazil

³Laboratory of Health and Environment Education, Oswaldo Cruz Institute, Brazil

⁴Department of Biomedical Engineering, Cockrell School of Engineering, The University of Texas at Austin, USA

⁵Faculty of Health Sciences, The University of Sydney, Australia

Received after WTS symposium comments: September 19, 2017

Received after editors' revisions: December 24, 2017

Received after external review: June 29, 2018

Received after expert panel (Final accepted): July 24, 2018

Published online in J-STAGE January 31, 2019

Abstract: This consensus report summarizes the negative impact of work-related psychosocial factors and job stressors on the health and wellbeing of shift workers. Psychosocial factors may (a) directly affect work schedules or (b) mediate or moderate relationships between work schedules, circadian factors, and health. In this paper, prominent psychosocial models (e.g. *Job Strain* and *Effort-Reward Imbalance*) are used to help assess detrimental effects, including pathophysiologic outcomes. Several studies indicate the psychosocial environment can be more problematic for shift workers compared to regular day workers. This is likely due to shift worker's experiencing greater risks of low job control, high physical work demands, lower support from supervisors, and greater levels of over-commitment. Workplace violence is another frequently encountered psychosocial stressor for shift workers more likely to be in regular contact with the general public, such as police officers, security personnel, professional drivers, and other service employees being at elevated risk. A large body of literature confirms night and irregular shift schedules increase risk for injury. Non-diurnal schedules can trigger and worsen such incidents, especially under unsafe conditions. The problem of workplace violence for shift workers, in terms of severity and consequences, is probably underestimated, especially when present among other occupational stressors. Practical considerations and recommendations for action to mitigate the detrimental effects of psychosocial stressors on night and shift workers are presented.

Key words: Work-related psychosocial stressors, Workplace violence, Shift and night work

[†]F. M. Fischer, R. H. Griep, and L. Rotenberg are Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) award recipients, respectively, No. 304375/2017-9, No. 301807/2016-7, and No. 311822/2018-5. R.H. Griep is also recipient of the Researcher of the State of Rio de Janeiro (FAPERJ) scholarship award. Funders of these awards exerted no influence on the content, consensus statements, or recommendations of the manuscript.

*To whom correspondence should be addressed.

E-mail: fischer.frida@gmail.com

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Consensus Statements

At-work psychosocial stressors

It is difficult to establish workers' tolerance to multiple workplace psychosocial factors when exposures usually occur simultaneously as a result of work schedule characteristics or other occupational conditions. Socio-demographic variables, such as unemployment rate and worker sex/gender, age, family income, or residence, can differentially mediate work attendance—absenteeism and presenteeism. Employees required to work a similar shift schedule in the same or different setting or company may experience dissimilar health effects, both in terms of the frequency and severity of symptoms and overall quality of life. We recommend establishment of:

- 1) Multidisciplinary professional teams to evaluate and implement interventions that can reduce/minimize negative effects of multiple job stressors, including at-work violence and other psychosocial ones.
- 2) Continuous health and psychosocial monitoring procedures to assess psychosocial risks at work. Examples are focus group (or similar technique) sessions, individual interviews, and periodic surveys.
- 3) Standardized investigative protocols to study multiple job stressors and evaluate their interactions and health outcomes.
- 4) Occupational health programs that focus on improving psychosocial factors and work schedule characteristics to enhance the health and wellbeing of night and shift workers. Key targets for intervention could be work-related psychosocial stressors, including workplace violence.
- 5) Comprehensive workplace violence prevention programs that include improvement of working time arrangements. Examples provided in prior literature include “arranging working time in consultation with the workers concerned, avoiding too long working hours, avoiding massive recourse to work overtime, providing adequate rest periods, creating autonomous or semi-autonomous teams dealing with their own working time arrangements, keeping working time schedules regular and predictable, keeping, as far as possible, consecutive night shifts to a minimum”⁵⁷⁾.
- 6) Joint solutions that respect the rights of workers to avoid exclusion or misperceptions about violence at work, and to adapt safeguards, such as legislation and corporate practices, to prevent violence against workers.
- 7) Public policies that highlight the multiple stressors that simultaneously affect the health and wellbeing of shift workers in order to more effectively prevent acute and chronic negative effects of shift work, *per se*, as well as the negative effects of associated workplace psychosocial factors. The model proposed by Chappell & Di Martino⁵⁶⁾ integrates individual, situational, organizational, and socioeconomic factors that reflect the complexity of workplace violence and indicates avenues for health promotion and research.

Consensus statements review expert panel: Masaya TAKAHASHI¹(Chair), Janet BARNES-FARRELL², Maureen DOLLARD³, Friedhelm NACHREINER⁴

¹National Institute of Occupational Safety and Health, Japan

²University of Connecticut, USA

³University of South Australia, Australia

⁴GAWO, Germany

Full consensus among panel members on all statements.

Introduction

This consensus paper focuses on workplace psychosocial stressors relevant to the health and wellbeing of night and shift workers. It is one of several consensus papers developed by the Working Time Society, commissioned

by the International Commission on Occupational Health¹⁾ published in this dedicated journal issue. Each consensus report describes the current state of knowledge, identifies health and safety risks, and offers recommendations for effective interventions and future research. Additionally, each one is accompanied by key consensus statements,

developed through procedures outlined in Wong *et al*¹⁾. Collectively, the reports provide guidance to a broad international audience of researchers, industry members, labor representatives, policy makers, workers, and other interested stakeholders on managing fatigue and ensuring health and safety of employees routinely engaged in non-standard work schedules, including night and shift work.

The findings of numerous investigations published since the 1950s suggest people employed in non-standard, i.e. other than daytime Monday to Friday work schedules are at higher risk for poorer health outcomes than those employed in standard schedules²⁻⁵⁾. The literature primarily focuses on negative effects of single characteristics of atypical work schedules, such as circadian disruption, socio-family conflicts, or preventative interventions. However, research is rarely devoted to the potential collective deleterious effects of both organizational shift structure plus psychosocial and job stressors. The latter stressors tend to differ quantitatively and qualitatively according to work schedule and give rise to differential risks for permanent day versus permanent night or rotating shift employees. The objective of this paper is to describe workplace psychosocial stressors relevant to the health and wellbeing of night and shift workers.

Workplace Psychosocial Factors

Work-related psychosocial factors encompass those variables specific to psychological and sociological phenomena that may have detrimental pathophysiologic outcomes⁶⁾. Many are embodied in theoretical models of stress, and include job demands, skill discretion, autonomy, and control (*Job Strain*⁷⁾, *Social Support*⁸⁾ and *Effort-Reward Imbalance*⁹⁾). Others include organizational constraints, interpersonal conflict, role conflict, role ambiguity¹⁰⁾, job insecurity and other aspects of precariousness, such as disempowerment¹¹⁻¹⁴⁾, unfair pay¹⁵⁾ and harassment and violence¹⁶⁾. Psychosocial variables are also widely included in applications of the Job Demands-Resources (JD-R) model¹⁷⁾.

Psychosocial factors can directly influence work schedules, with consequent effects on employees' health and wellbeing. 'Flexible work arrangements', which fall within the broader category of employee control and autonomy, are an important example. They can be defined as policies and practices that provide workers with a degree of control over how, where, or when they are employed¹⁸⁻²⁰⁾. Flexible arrangements that are oriented to the needs of workers, can have various positive effects on other psychosocial

factors, such as job pressure, as well as worker health and wellbeing^{12, 20-24)}. It is important to note that organizational policies and practices often described as 'flexible', such as the insecure and contingent working arrangements broadly labelled 'precarious work', are mainly intended to provide benefits for employers and often have significant negative effects on workers' health²⁵⁾. In a study of hospitality workers, for example, precarious (casually employed) workers reported substantially more negative work schedules than ongoing ('permanent') workers. Casual workers reported much more unpredictable and irregular hours over which they could exert little control, including highly variable starting and finishing times, daily shifts lasting from 2 to 18 h, and weekly hours ranging from 0 to 73 h. They also reported several negative effects of these arrangements, including irregular exercise, irregular and unhealthy meals, poor sleep, and fatigue²⁶⁾.

Flexible working hours, which give workers greater autonomy to choose working times compatible with their responsibilities and activities outside work, may be particularly beneficial^{23, 27)}. For shift workers, they may provide opportunities to reduce exposure to evening, weekend, or night work if they become problematic for health, domestic, or social reasons. Compared to other flexible working arrangements, they have been most strongly and consistently linked to lower work-life conflict, and associated health and wellbeing benefits, although some research findings are contradictory (see the accompanying article by Arlinghaus *et al.* in this issue of *Industrial Health*).

Inconsistencies between the findings of studies examining the impact of flexible working hours may reflect differences in the types of flexibility examined, outcome variables evaluated, cultural and organizational contexts, and extent to which flexibility is actually used by workers^{20, 28)}. Hayman²⁸⁾ proposed the concept of 'perceived usability' (p. 328) of flexible work arrangements; that is, the extent to which workers feel they can take advantage of the flexibility formally available to them, may be critical. He found workers who perceived flexible hours to be 'usable' reported less work-life conflict and greater 'work-personal life enhancement'. The extent to which workers can actually influence their work schedules is likely to reflect other psychosocial factors, perhaps most importantly their collective and individual power in the workplace.

It is important to note that some relationships between psychosocial factors and working hours may be bidirectional. For example, most research concerning work schedule characteristics and work-life conflict has set out to examine effects of scheduling on conflict, but

Jansen *et al.*^{29, 30)} demonstrated effects in the opposite direction. In longitudinal studies, they showed that greater work-family conflict among male shift workers was associated with a greater probability of subsequent departure from shift work. Among day workers, greater work-family conflict was associated with a subsequent reduction in working hours, with gender differences in the magnitude and timing of this effect. Of course, these effects are contingent on workers having sufficient control over their working hours, or alternative employment opportunities, to change their work schedules to accommodate non-work preferences or responsibilities. Again, these issues are discussed in more detail in the accompanying paper by Arlinghaus *et al.* in this issue.

In addition to direct effects on work schedules, psychosocial factors may also exert mediating or moderating effects on relationships between working hours, circadian factors, health, and other outcomes. This report examines mediating and moderating effects on workers' health and wellbeing utilizing two highly respected and widely applied models of psychosocial stress; that is, Job Strain^{7, 31)} and Effort-Reward Imbalance⁹⁾. These models define and categorize job stressors potentially harmful to health and offer putative explanations of the relationship between them and health^{32–36)}.

Job strain (demand-control-support) model

This model views job strain as an imbalance between two types of perceived psychosocial stressors: (1) high psychological demand—work overload, very difficult work tasks, insufficient time to execute tasks, and contradictory or conflicting directions from supervisors; and (2) lack of job control—combination of low skill discretion and decision authority, with added effect-modifier of amount of social support from colleagues and immediate supervisors³¹⁾.

Effort-reward imbalance model

This model of job strain is based on negative trade-off between at-work experienced 'costs' and 'gains'. It postulates work effort is spent as part of a contract of social reciprocity in the form of financial (adequate salary), esteem (respect and support), and occupational status control (job promotion prospects, security, and status consistency)⁹⁾. Overcommitment—a set of attitudes, behaviors, and emotions that reflects a person's excessive striving for approval and appreciation—was later included as a factor that may aggravate effects of effort-reward imbalance.

Despite recognition workplace psychosocial factors

can aggravate the detrimental physical and psychological health effects of certain shift schedules, relatively few night or shift work studies have been conducted. Peter *et al.*³⁷⁾ first reported evidence based on the Effort-Reward Imbalance model of a mediating effect of the psychosocial milieu on the association between shift work and cardiovascular risk factors, such as hypertension and partly atherogenic lipids.

A recent path-modeling study reported job strain, which includes performance pace and intensity of work-related demands, to be a significant mediator of the relationship between shift schedules and sleep quality. Compared to day shift only employees, job strain was higher among permanent night and rotating shift workers, and this was significantly and indirectly associated with compromised sleep quality³⁸⁾.

Several studies have shown rotating and permanent night shift healthcare workers are more likely to experience adverse physical and psychosocial health effects than day shift counterparts^{39, 40)}. More recently Lin *et al.*⁴¹⁾ observed higher overcommitment (but not effort-reward imbalance) among female rotating shift workers than day shift nurses. In this regard, Nabe-Nielsen *et al.*⁴²⁾ reported fixed non-day shift workers have greater exposure than day workers to lower job control, lower support from leaders, and higher physical demands. Some studies of healthcare personnel suggest a span of two days off following the last night shift attenuates sleep disturbances⁴³⁾ and overcommitment⁴¹⁾. However, as noted by Lin *et al.*⁴¹⁾ in their study of nurses in rotating shift work, staffing must be sufficient to achieve an appropriate work schedule with reduced frequency of night shifts.

Tenkanen *et al.*⁴⁴⁾, in a study of employees of several occupations, reported job strain (besides that emanating from circadian time structure disruption) contributes to higher risk of coronary heart disease of shift, compared to day, workers. Likewise, the Danish Work Environment Cohort Study showed among all groups of shift compared to permanent day employees no significant difference in demands, lower decision latitude, and higher conflicts⁴⁵⁾. The authors concluded shift work is associated with other environmental factors that might cause heart disease. Yet, in oil rig workers, no difference was detected in psychological demands or control between slow-rotating and permanent day shift personnel⁴⁶⁾. This topic certainly deserves more attention as there is lack of evidence-based information on the combined effects of night/shift employment and psychosocial work factors on employee wellbeing⁴⁰⁾.

Working hours constitute a critical job demand for many employees, and as more detailed knowledge develops in the future, the JD-R model may provide an additional, and more flexible framework for examining relationships between particular work scheduling variables, psychosocial factors, and health and wellbeing outcomes. As JD-R is designed to be adaptable to specific work contexts, measures of key elements of the model are not fixed^{17, 47, 48}). Consequently, it may be more effectively tailored to explore and measure psychosocial job demands and resources specifically relevant to work scheduling and shift workers that are associated with negative health and wellbeing outcomes. For example, frequency of night work, physical workload (demands), and social support from supervisors (a resource) might be examined in relation to sleep characteristics, rather than limiting attention only to more generic variables, such as control or effort, of the job strain and effort-reward imbalance models.

In summary, the few studies identified in the literature indicate that persons engaged in night and shift work are usually disadvantaged in terms of their workplace psychosocial environment compared to persons who work only on day shifts. They are more prone to low job control, high physical demands, low social support from supervisors, and high overcommitment. Finally, although few studies deal with psychosocial factors other than those described by the two main theoretical models—demand-control-social support and effort-reward imbalance—association is suggested between psychosocial factors, strain, and health outcomes that is work-schedule influenced. However, we wish to stress there has been limited research on the relationships between night/shift work and these variables compared to other work organizations and psychosocial factors that affect the health and wellbeing of shift workers.

Workplace Violence

Violence at work has devastating effects. Employment in settings where violence is frequent can lead to feelings of insecurity, risk, and distress, reduced work ability⁴⁹), plus adverse health outcomes, mainly mental illnesses, disability, and premature death⁵⁰). At-work violence is an important and complex negative psychosocial concern that entails individual, relational, cultural, and environmental interactions as factors⁵¹). Workers operating in environments characterized by poor between-employee relationships, insufficient staffing, high workload, difficult goal achievement, and unmet clients' demands are particularly susceptible to violence^{52, 53}). It can be surreptitious, par-

ticularly if linked to inter-team competition for limited rewards^{54, 55}), and thus encouraged by the management so as to affect the entire work community⁵¹). The comprehensive interactive model of workplace violence of Chappell and Di Martino⁵⁶) integrates individual, situational, organizational, societal, and socioeconomic factors.

The World Health Organization⁵¹) defines workplace violence as: "The intentional use of power, threatened or actual, against another person or against a group, in work-related circumstances, that either results in or has a high degree of likelihood of resulting in injury, death, psychological harm, maldevelopment, or deprivation". Workplace violence includes different forms of violence: physical assault, homicide, verbal abuse, bullying or mobbing, and sexual, racial, and psychological harassment⁵⁷).

Use of digital devices today for communication about workplace matters, both during working hours and off time, is prevalent, and this increases risk for cyberbullying⁵⁸⁻⁶⁰). Cyberbullying is a relatively new source of psychosocial stress, which often accompanies at-work face-to-face bullying, with negative consequences not only of presenteeism and work engagement but mental and physical wellbeing and health⁵⁸).

Search of the PUBMED database (May 29, 2018) reveals 10,247 publications that address at-work violence, including bullying, incivility, and/or harassment and more recently, cyberbullying. Combining the search terms of "violence at work" and "shift work" identifies 126 publications.

A large body of literature confirms atypical, shift, night, and irregular schedules increase risk for work injuries, which according to Chappel and Di Martino⁵⁷) ought to be classified as a special type of workplace violence. Non-diurnal schedules are associated with elevated risk for work-related injury accidents—especially under unsafe conditions^{61, 62}). A study of auto plant day and shift employees of distinct work schedules conducted during the 1970s found higher turnover and high dismissals to be associated with at-work injuries and short-term absenteeism among shift employees compared to dayworkers⁶³).

Violence at work tends to be of greater risk during night duty, especially for police officers, security personnel, and professional drivers⁵⁷). Thus, at least some forms of shift work may be associated with higher vulnerability for violence at work, which indicates the work schedule in certain occupations can be an important risk factor for compromised health and wellbeing of employees.

Violence at work is also very common among health-care personnel as documented in the extensive review

by Cooper and Swanson⁶⁴). An in-depth study conducted on nurses in Sweden⁶⁵ identified various associated occupational and lifestyle risk factors, including night work. Rotating shift work was also one of the predictors of violence against nurses in Chinese psychiatric hospitals⁶⁶. A recent publication⁶⁷ also found shift work correlated with workplace violence among Hong Kong nurses.

In addition to the direct comparisons between day and shift workers, it must be borne in mind that certain occupations suffer the effects of shift work superimposed with workplace violence. The burden of shift work on biological and social function is particularly apparent in health-care workers, who are also at elevated risk to violence perpetrated by patients, patients' relatives, and sometimes co-workers and supervisors^{64, 68–70}. Healthcare, compared to all other service, workers are at much higher risk of violence from patients and clients⁶⁴. There is evidence this is an important occupational problem worldwide, e.g. in Brazil^{71, 72}, China^{70, 73}, Australia, Bulgaria, Lebanon, Portugal, South Africa, Thailand⁷¹, and Japan⁷⁴. Proper assessment of cyberbullying as a problem among working adults, particularly night shift personnel⁷⁵, and organizational policies to prevent it are urgently awaited^{76, 77}.

Violence at work might amplify the traditionally considered health effects of shift work. Workplace violence, in terms of its severity and consequences, is probably underestimated, especially when it co-exists with other stressors that affect workers' health⁷⁸.

References

- 1) Wong S, Dawson D, Van Dongen HPA (2019) International consensus statements on non-standard working time arrangements and occupational health and safety. *Ind Health* **57**, 135–8.
- 2) Itani O, Kaneita Y, Tokiya M, Jike M, Murata A, Nakagome S, Otsuka Y, Ohida T (2017) Short sleep duration, shift work, and actual days taken off work are predictive lifestyle risk factors for new-onset metabolic syndrome: a seven-year cohort study of 40,000 male workers. *Sleep Med* **39**, 87–94. [[Medline](#)] [[CrossRef](#)]
- 3) Kerkhof GA (2018) Shift work and sleep disorder comorbidity tend to go hand in hand. *Chronobiol Int* **35**, 219–28. [[Medline](#)] [[CrossRef](#)]
- 4) Torquati L, Mielke GI, Brown WJ, Kolbe-Alexander T (2018) Shift work and the risk of cardiovascular disease. A systematic review and meta-analysis including dose-response relationship. *Scand J Work Environ Health* **44**, 229–38. [[Medline](#)] [[CrossRef](#)]
- 5) Wong IS, Smith PM, Mustard CA, Gignac MA (2015) Health and occupational outcomes among injured, nonstandard shiftworkers. *J Occup Environ Med* **57**, 1244–9. [[Medline](#)] [[CrossRef](#)]
- 6) Hemingway H, Marmot M (1999) Clinical Evidence: psychosocial factors in the etiology and prognosis of coronary heart disease: systematic review of prospective cohort studies. *West J Med* **171**, 342–50. [[Medline](#)]
- 7) Karasek R (1979) Job demands, job decision latitude, and mental strain: implications for job redesign. *Adm Sci Q* **24**, 285–308. [[CrossRef](#)]
- 8) Karasek R, Baker D, Marxer F, Ahlbom A, Theörell T (1981) Job decision latitude, job demands, and cardiovascular disease: a prospective study of Swedish men. *Am J Public Health* **71**, 694–705. [[Medline](#)] [[CrossRef](#)]
- 9) Siegrist J (1996) Adverse health effects of high-effort/low-reward conditions. *J Occup Health Psychol* **1**, 27–41. [[Medline](#)] [[CrossRef](#)]
- 10) Nixon AE, Mazzola JJ, Bauer J, Krueger JR, Spector PE (2011) Can work make you sick? A meta-analysis of the relationships between job stressors and physical symptoms. *Work Stress* **25**, 1–22. [[CrossRef](#)]
- 11) Benach J, Vives A, Amable M, Vanroelen C, Tarafa G, Muntaner C (2014) Precarious employment: understanding an emerging social determinant of health. *Annu Rev Public Health* **35**, 229–53. [[Medline](#)] [[CrossRef](#)]
- 12) Bohle P, Quinlan M, Kennedy D, Williamson A (2004) Working hours, work-life conflict and health in precarious and “permanent” employment. *Rev Saude Publica* **38** Suppl, 19–25. [[Medline](#)] [[CrossRef](#)]
- 13) Burgard SA, Brand JE, House JS (2009) Perceived job insecurity and worker health in the United States. *Soc Sci Med* **69**, 777–85. [[Medline](#)] [[CrossRef](#)]
- 14) Garcia-Rojas IJ, Choi B, Krause N (2015) Psychosocial job factors and biological cardiovascular risk factors in Mexican workers. *Am J Ind Med* **58**, 331–51. [[Medline](#)] [[CrossRef](#)]
- 15) Falk A, Menrath I, Verde PE, Siegrist J (2011) Cardiovascular consequences of unfair pay. Discussion paper series 5720.
- 16) Kortum E, Leka S, Cox T (2011) Perceptions of psychosocial hazards, work-related stress and workplace priority risks in developing countries. *J Occup Health* **53**, 144–55. [[Medline](#)] [[CrossRef](#)]
- 17) Bakker AB, Demerouti E (2007) The Job Demands—Resources model: state of the art. *J Manag Psychol* **22**, 309–28. [[CrossRef](#)]
- 18) Hill EJ, Hawkins AJ, Ferris M, Weitzman M (2001) Finding an extra day a week: the positive influence of perceived job flexibility on work and family life balance. *Fam Relat* **50**, 49–58. [[CrossRef](#)]
- 19) Lambert AD, Marler JH, Gueutal HG (2008) Individual differences: factors affecting employee utilization of flexible work arrangements. *J Vocat Behav* **73**, 107–17. [[CrossRef](#)]
- 20) Masuda AD, Poelsmans SAY, Allen TD, Spector PE (2012) Flexible work arrangements availability and their

- relationship with work-to-family conflict, job satisfaction, and turnover intentions: a comparison of three country clusters. *Appl Psychol* **61**, 1–29. [[CrossRef](#)]
- 21) Angrave D, Charlwood A (2015) What is the relationship between long working hours, over-employment, under-employment and the subjective well-being of workers? Longitudinal evidence from the UK. *Hum Relat* **68**, 1491–515. [[CrossRef](#)]
 - 22) Bohle P, Willaby H, Quinlan M, McNamara M (2011) Flexible work in call centres: working hours, work-life conflict & health. *Appl Ergon* **42**, 219–24. [[Medline](#)] [[CrossRef](#)]
 - 23) Costa G, Sartori S, Åkerstedt T (2006) Influence of flexibility and variability of working hours on health and well-being. *Chronobiol Int* **23**, 1125–37. [[Medline](#)] [[CrossRef](#)]
 - 24) Russell H, O’Connell PJ, McGinnity F (2009) The impact of flexible working arrangements on the work-life conflict and work pressure in Ireland. *Gen Work Organ* **16**, 73–97. [[CrossRef](#)]
 - 25) Quinlan M, Bohle P (2015). Job quality: The impact of work organisation on health. In: Knox A and Warhurst C (Eds.), *Job quality in Australia*, 63–83, The Federation Press, Sydney.
 - 26) Bohle P, Quinlan M, Kennedy D, Williamson A (2004) Working hours, work-life conflict and health in precarious and “permanent” employment. *Rev Saude Publica* **38** Suppl, 19–25. [[Medline](#)] [[CrossRef](#)]
 - 27) Berg P, Bosch G, Charest J (2014) Working-time configurations: a framework for analyzing diversity across cultures. *Ind Labor Relat Rev* **67**, 805–37. [[CrossRef](#)]
 - 28) Hayman JR (2009) Flexible work arrangements: exploring the linkages between perceived usability of flexible work schedules and work/life balance. *Community Work Fam* **12**, 327–38. [[CrossRef](#)]
 - 29) Jansen NWH, Kant I, Kristensen TS, Nijhuis FJN (2003) Antecedents and consequences of work-family conflict: a prospective cohort study. *J Occup Environ Med* **45**, 479–91. [[Medline](#)] [[CrossRef](#)]
 - 30) Jansen NW, Mohren DC, van Amelsvoort LG, Janssen N, Kant I (2010) Changes in working time arrangements over time as a consequence of work-family conflict. *Chronobiol Int* **27**, 1045–61. [[Medline](#)] [[CrossRef](#)]
 - 31) Johnson JV, Hall EM (1988) Job strain, work place social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish working population. *Am J Public Health* **78**, 1336–42. [[Medline](#)] [[CrossRef](#)]
 - 32) Eddy P, Heckenberg R, Wertheim EH, Kent S, Wright BJ (2016) A systematic review and meta-analysis of the effort-reward imbalance model of workplace stress with indicators of immune function. *J Psychosom Res* **91**, 1–8. [[Medline](#)] [[CrossRef](#)]
 - 33) Madsen IE, Nyberg ST, Magnusson Hanson LL, Ferrie JE, Ahola K, Alfredsson L, Batty GD, Bjorner JB, Borritz M, Burr H, Chastang JF, de Graaf R, Dragano N, Hamer M, Jokela M, Knutsson A, Koskenvuo M, Koskinen A, Leineweber C, Niedhammer I, Nielsen ML, Nordin M, Oksanen T, Pejtersen JH, Pentti J, Plaisier I, Salo P, Singh-Manoux A, Suominen S, Ten Have M, Theorell T, Toppinen-Tanner S, Vahtera J, Väänänen A, Westerholm PJ, Westerlund H, Fransson EI, Heikkilä K, Virtanen M, Rugulies R, Kivimäki M (2017) IPD-Work Consortium. Job strain as a risk factor for clinical depression: systematic review and meta-analysis with additional individual participant data. *Psychol Med* **26**, 1–15.
 - 34) Siegrist J, Li J (2016) Associations of extrinsic and intrinsic components of work stress with health: a systematic review of evidence on the effort-reward imbalance model. *Int J Environ Res Public Health* **13**, 432. [[Medline](#)] [[CrossRef](#)]
 - 35) Sui H, Sun N, Zhan L, Lu X, Chen T, Mao X (2016) Association between work-related stress and risk for type 2 diabetes: a systematic review and meta-analysis of prospective cohort studies. *PLoS One* **11**, e0159978. [[Medline](#)] [[CrossRef](#)]
 - 36) Theorell T, Jood K, Järholm LS, Vingård E, Perk J, Östergren PO, Hall C (2016) A systematic review of studies in the contributions of the work environment to ischaemic heart disease development. *Eur J Public Health* **26**, 470–7. [[Medline](#)] [[CrossRef](#)]
 - 37) Peter R, Alfredsson L, Knutsson A, Siegrist J, Westerholm P (1999) Does a stressful psychosocial work environment mediate the effects of shift work on cardiovascular risk factors? *Scand J Work Environ Health* **25**, 376–81. [[Medline](#)] [[CrossRef](#)]
 - 38) Wong IS, Smith PM, Ibrahim S, Mustard CA, Gignac MA (2016) Mediating pathways and gender differences between shift work and subjective cognitive function. *Occup Environ Med* **73**, 753–60. [[Medline](#)]
 - 39) Brown DL, Feskanich D, Sánchez BN, Rexrode KM, Schernhammer ES, Lisabeth LD (2009) Rotating night shift work and the risk of ischemic stroke. *Am J Epidemiol* **169**, 1370–7. [[Medline](#)] [[CrossRef](#)]
 - 40) Conway PM, Campanini P, Sartori S, Dotti R, Costa G (2008) Main and interactive effects of shiftwork, age and work stress on health in an Italian sample of healthcare workers. *Appl Ergon* **39**, 630–9. [[Medline](#)] [[CrossRef](#)]
 - 41) Lin PC, Chen CH, Pan SM, Chen YM, Pan CH, Hung HC, Wu MT (2015) The association between rotating shift work and increased occupational stress in nurses. *J Occup Health* **57**, 307–15. [[Medline](#)] [[CrossRef](#)]
 - 42) Nabe-Nielsen K, Tüchsen F, Christensen KB, Garde AH, Diderichsen F (2009) Differences between day and night workers in exposure to physical and psychosocial work factors in the Danish eldercare sector. *Scand J Work Environ Health* **35**, 48–55. [[Medline](#)] [[CrossRef](#)]
 - 43) Lin PC, Chen CH, Pan SM, Pan CH, Chen CJ, Chen YM, Hung HC, Wu MT (2012) Atypical work schedules are associated with poor sleep quality and mental health in Taiwan female nurses. *Int Arch Occup Environ Health* **85**, 877–84. [[Medline](#)] [[CrossRef](#)]

- 44) Tenkanen L, Sjöblom T, Kalimo R, Alikoski T, Härmä M (1997) Shift work, occupation and coronary heart disease over 6 years of follow-up in the Helsinki Heart Study. *Scand J Work Environ Health* **23**, 257–65. [[Medline](#)] [[CrossRef](#)]
- 45) Bøggild H, Burr H, Tüchsen F, Jeppesen HJ (2001) Work environment of Danish shift and day workers. *Scand J Work Environ Health* **27**, 97–105. [[Medline](#)] [[CrossRef](#)]
- 46) Waage S, Moen BE, Pallesen S, Eriksen HR, Ursin H, Akerstedt T, Bjorvatn B (2009) Shift work disorder among oil rig workers in the North Sea. *Sleep* **32**, 558–65. [[Medline](#)] [[CrossRef](#)]
- 47) Demerouti E, Bakker AB, Nachreiner F, Schaufeli WB (2001) The job demands-resources model of burnout. *J Appl Psychol* **86**, 499–512. [[Medline](#)] [[CrossRef](#)]
- 48) Schaufeli WB, Bakker A (2004) Job demands, job resources, and their relationship with burnout and engagement: a multi-sample study. *J Organ Behav* **25**, 293–315. [[CrossRef](#)]
- 49) Fischer FM, Borges FNS, Rotenberg L, Latorre MR, Soares NS, Rosa PL, Teixeira LR, Nagai R, Steluti J, Landsbergis P (2006) Work ability of health care shift workers: what matters? *Chronobiol Int* **23**, 1165–79. [[Medline](#)] [[CrossRef](#)]
- 50) Health and Safety Executive (HSE) (1996) Violence at work. A guide for employers. HSE, London.
- 51) WHO (1996) Global Consultation on Violence and Health. Violence: a public health priority. World Health Organization, Geneva.
- 52) Cole LL, Grubb PL, Sauter SL, Swanson NG, Lawless P (1997) Psychosocial correlates of harassment, threats and fear of violence in the workplace. *Scand J Work Environ Health* **23**, 450–7. [[Medline](#)] [[CrossRef](#)]
- 53) Maeno M (2011) LER e transtornos psíquicos relacionados ao trabalho: face de uma mesma moeda [Repetitive strain injuries and psychic disorders related to work: face of the same coin]. In: Saúde dos bancários (Health of banking workers), Szelwar LI (Ed.), 2207–230, Publisher Brasil, São Paulo.
- 54) Elliott RH, Jarrett JT (1994) Violence in the workplace: The role of human resource management. *Public Pers Manage* **23**, 287–300.
- 55) Klein S (1996) A longitudinal study of the impact of work pressures on group cohesive behaviors. *Int J Manag* **13**, 68–75.
- 56) Chappell D, Di Martino (2000) Violence at work, 2nd Ed., ILO, Geneva.
- 57) Chappell D, Di Martino (2006) Violence at work, 3rd Ed., ILO, Geneva.
- 58) Privitera C, Campbell MA (2009) Cyberbullying: the new face of workplace bullying? *Cyberpsychol Behav* **12**, 395–400. [[Medline](#)] [[CrossRef](#)]
- 59) Kowalski RM, Toth A, Morgan M (2018) Bullying and cyberbullying in adulthood and the workplace. *J Soc Psychol* **158**, 64–81. [[Medline](#)] [[CrossRef](#)]
- 60) Gardner D, O’Driscoll M, Cooper-Thomas HD, Roche M, Bentley T, Catley B, Teo ST, Trenberth L (2016) Predictors of workplace bullying and cyber-bullying in New Zealand. *Int J Environ Res Public Health* **13**, E448. [[Medline](#)] [[CrossRef](#)]
- 61) Folkard S, Tucker P (2003) Shift work, safety and productivity. *Occup Med (Lond)* **53**, 95–101. [[Medline](#)] [[CrossRef](#)]
- 62) Reinberg A, Smolensky MH, Riedel M, Touitou Y, Le Floc’h N, Clarisse R, Marlot M, Berrez S, Pelisse D, Mauvieux B (2015) Chronobiologic perspectives of black time—accident risk is greatest at night: an opinion paper. *Chronobiol Int* **32**, 1005–18. [[Medline](#)]
- 63) Fischer FM (1986) Retrospective study regarding absenteeism among shiftworkers. *Int Arch Occup Environ Health* **58**, 301–20. [[Medline](#)] [[CrossRef](#)]
- 64) Cooper C, Swanson N (2002) Workplace violence in the health sector. State of art. International Labour Office/International Council of Nurses. World Health Organization/Public Services International Joint Programme on Workplace Violence in the Health Sector, Geneva.
- 65) Arnetz JE, Arnetz BB, Petterson IL (1996) Violence in the nursing profession: occupational and lifestyle risk factors in Swedish nurses. *Work Stress* **10**, 119–27. [[CrossRef](#)]
- 66) Zeng JY, An FR, Xiang YT, Qi YK, Ungvari GS, Newhouse R, Yu DS, Lai KY, Yu LY, Ding YM, Tang WK, Wu PP, Hou ZJ, Chiu HF (2013) Frequency and risk factors of workplace violence on psychiatric nurses and its impact on their quality of life in China. *Psychiatry Res* **210**, 510–4. [[Medline](#)] [[CrossRef](#)]
- 67) Cheung T, Yip PS (2017) Workplace violence towards nurses in Hong Kong: prevalence and correlates. *BMC Public Health* **17**, 196. [[Medline](#)] [[CrossRef](#)]
- 68) Camerino D, Estryng-Behar M, Conway PM, van Der Heijden BIJM, Hasselhorn HM (2008) Work-related factors and violence among nursing staff in the European NEXT study: a longitudinal cohort study. *Int J Nurs Stud* **45**, 35–50. [[Medline](#)] [[CrossRef](#)]
- 69) Needham I, Abderhalden C, Halfens RJG, Fischer JE, Dassen T (2005) Non-somatic effects of patient aggression on nurses: a systematic review. *J Adv Nurs* **49**, 283–96. [[Medline](#)] [[CrossRef](#)]
- 70) Sun P, Zhang X, Sun Y, Ma H, Jiao M, Xing K, Kang Z, Ning N, Fu Y, Wu Q, Yin M (2017) Workplace violence against health care workers in North Chinese hospitals: a cross-sectional survey. *Int J Environ Res Public Health* **14**, 96–106. [[Medline](#)] [[CrossRef](#)]
- 71) Di Martino V (2002) Workplace violence in the health sector—country case studies Brazil, Bulgaria, Lebanon, Portugal, South Africa, Thailand, plus an additional Australian study. International Labour Office/International Council of Nurses. World Health Organization/ Public Services International Joint Programme on Workplace Violence in the Health Sector, Geneva.
- 72) Vasconcellos I, Griep H, Lisboa M, Rotenberg L (2012) Violence in daily hospital nursing work. *Acta Paul Enferm*

- 25, 40–7. [[CrossRef](#)]
- 73) Fujishiro K, Gee GC, de Castro AB (2011) Associations of workplace aggression with work-related well-being among nurses in the Philippines. *Am J Public Health* **101**, 861–7. [[Medline](#)] [[CrossRef](#)]
- 74) Fujiwara K, Tsukishima E, Tsutsumi A, Kawakami N, Kishi R (2003) Interpersonal conflict, social support, and burnout among home care workers in Japan. *J Occup Health* **45**, 313–20. [[Medline](#)] [[CrossRef](#)]
- 75) Ariza-Montes A, Muniz NM, Montero-Simó MJ, Araque-Padilla RA (2013) Workplace bullying among healthcare workers. *Int J Environ Res Public Health* **10**, 3121–39. [[Medline](#)] [[CrossRef](#)]
- 76) Muhonen T, Jönsson S, Bäckström M (2017) Consequences of cyberbullying behaviour in working life: the mediating roles of social support and social organisational climate. *Int J Workplace Health Manag* **10**, 376–90. [[Medline](#)] [[CrossRef](#)]
- 77) D'Souza N, Forsyth D, Tappin D, Catley B (2018) Conceptualizing workplace cyberbullying: toward a definition for research and practice in nursing. *J Nurs Manag* **26**, 842–50. [[Medline](#)] [[CrossRef](#)]
- 78) Barling J (1996) The prediction, experience, and consequences of workplace violence. In: *Violence on the job: Identifying risks and developing solutions*, VandenBos GR and Bulatao EQ (Eds.), 29–49, American Psychological Association, Washington.