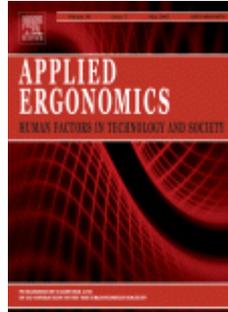


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Stephen M. Popkin, Stephanie L. Morrow, Tara E. Di Domenico, Heidi D. Howarth. *Age is more than just a number : implications for an aging workforce in the US transportation sector. Pages 542-549.*

Abstract: The US workforce is aging. At the same time, there are a record number of open positions in the transportation sector, which has traditionally been a well-paying, but stressful and schedule-dependent, occupation. Due to increasing longevity, need, and ability to work, a possible solution to the transportation workforce shortfall may lie within the retention and recruitment of older workers. This paper uses a socio-technical framework to examine the pertinent, though scant, literature and data related to older workforce demographics and operational needs, the regulatory environment, requisite knowledge, skills and abilities, and application of support technology and training. Although there is evidence of age-related changes in physiology and cognition, the current science remains unable to resolve how an older workforce may most appropriately be applied to transportation to maximize system safety and minimize negative impact to worker well-being.

- **Keywords:** Aging; Transportation; Socio-technical systems

Tucker, S.R. Knowles. *Review of studies that have used the Standard Shiftwork Index : evidence for the underlying model of shiftwork and health. Pages 550-564.P.*

Abstract: The Standard Shiftwork Index (SSI) provides shiftwork researchers with a standardised battery for assessing the impact of shiftwork on psychological and physiological well-being. We review the published SSI literature and evaluate the extent to which the results of these publications support the model underpinning the SSI. A total of 70 SSI publications were identified, of which 41 were selected. The 41 studies were published between 1993 and 2006 and had a combined total of 21,420 respondents. The analysis indicated support for parts of the SSI model, particularly in relation to the impact of shift systems design on individual well-being, as well as the role of individual factors (e.g., personality, coping style). However, evidential support for the model as a whole is incomplete. The findings of the reviewed studies are summarised and methodological limitations are discussed.

- **Keywords:** Shift systems; Health; Sleep
Göran Kecklund, Claire Anne Eriksen, Torbjörn Åkerstedt. *Police officers attitude to different shift*

systems: Association with age, present shift schedule, health and sleep/wake complaints. Pages 565-571.

Abstract: It is often claimed that shift workers give priority to long series of days off and therefore prefer compressed work schedules at the expense of what is optimal for long-term health. The aim of the present study was to evaluate the attitude to six new shift systems among a randomly selected sample of police officers. The results showed that the most popular shift system was a rapidly, forward, rotating schedule with at least 16 h of rest between shifts, despite that it had fewer days off compared with some of the compressed shift systems. However, the individual differences were large and many individuals (32%) disliked the rapidly rotating shift system. Young age was associated with a positive attitude to the rapidly rotating shift system. The attitude to the shift system was also influenced by the present schedule, and shift systems that were similar to the present work hours received more positive evaluation. Sleep and health complaints showed no association with the attitude to the shift systems. In conclusion, the shift workers attitude to the new schedules was partly in agreement with the ergonomic recommendations of the design of three-shift systems that will facilitate sufficient sleep and minimize negative health consequences.

▪ **Keywords:** Work hours; Age; Individual differences **Rebecca Loudoun.**
Balancing shiftwork and life outside work: Do 12-h shifts make a difference? Pages 572-579.

Abstract: Twelve-hour shifts are a popular alternative to 8-h shifts as many consider these shift arrangements superior in terms of facilitating a better social and family life. This view is largely based on anecdotal evidence, however as few studies have examined longitudinal relations between work/non-work conflict and shift length. Using self-report data from 137 machine operators, this study examined whether 8- and 12-h shifts have a differential impact on work/non-work conflict. Relationships between work/non-work conflict and subjective health were also examined. Profile analysis revealed no significant relationships between shift length and work/non-work conflict. Results of regression analyses indicated that work/non-work conflict was positively related to psychological health on 8 and 12-h shifts ($p < .01$) but not to physical health. These results suggest that 12-h shifts did not offer any benefits or disadvantages for workers trying to reconcile their work and non-work life during the 13-month study period.

▪ **Keywords:** Shiftwork; Work/non-work conflict; 8 vs 12-h shifts; Subjective health **Anne Pisarski, Sandra A. Lawrence, Philip Bohle, Christine Brook.**
Organizational influences on the work life conflict and health of shiftworkers. Pages 580-588.

Abstract: This study examined organizational factors affecting the impact of shiftwork on work life conflict and subjective health. A model was proposed in which support from supervisors, support from colleagues, and team identity influence time-based work life conflict through two mediating variables: team climate and control over the working environment. Reduced conflict, in turn, produces enhanced psychological well-being and diminished physical symptoms. A structural equation model based on survey data from 530 nurses supported the proposed model. It also identified unpredicted direct links between team identity and physical symptoms, and between supervisor support and both control over the work environment and psychological well-being. The results indicate that organizational interventions focused on social support, team identity, team climate, and control can diminish the negative effects of shiftwork on work life conflict and health in shiftworkers.

▪ **Keywords:** Shiftwork; Work life conflict; Social support; Team identity; Team climate **Janet L. Barnes-Farrell, Kimberly Davies-Schrils, Alyssa**

McGonagle, Benjamin Walsh, Lee Di Milia, Frida Marina Fischer, Barbara B. Hobbs, Ljiljana Kaliterna, Donald Tepas. *What aspects of shiftwork influence off-shift well-being of healthcare workers?* Pages 589-596.

Abstract: Characteristics of shiftwork schedules have implications for off-shift well-being. We examined the extent to which several shift characteristics (e.g., shift length, working Sundays) are associated with three aspects of off-shift well-being: work-to-family conflict, physical well-being, and mental well-being. We also investigated whether these relationships differed in four nations. The Survey of Work and Time was completed by 906 healthcare professionals located in Australia, Brazil, Croatia, and the USA. Hierarchical multiple regression analyses supported the hypothesis that shiftwork characteristics account for significant unique variance in all three measures of well-being beyond that accounted for by work and family demands and personal characteristics. The patterns of regression weights indicated that particular shiftwork characteristics have differential relevance to indices of work-to-family conflict, physical well-being, and mental well-being. Our findings suggest that healthcare organizations should carefully consider the implications of shiftwork characteristics for off-shift well-being. Furthermore, although our findings did not indicate national differences in the nature of relationships between shift characteristics and well-being, shiftwork characteristics and demographics for healthcare professionals differ in systematic ways among nations; as such, effective solutions may be context-specific.

▪ **Keywords:** Shiftwork; Well-being; Healthcare
Masaya Takahashi, Kazuyuki Iwakiri, Midori Sotoyama, Shigekazu Higuchi, Masako Kiguchi, Mamoru Hirata, Naomi Hisanaga, Teruyo Kitahara, Kazushi Taoda, Katsuo Nishiyama. *Work schedule differences in sleep problems of nursing home caregivers.* Pages 597-604.

Abstract: Nursing home caregivers ($n=775$; 604 women; mean age 33.6 years) were studied to examine how work schedules affect their sleep. The shift group ($n=536$) worked under a rotating two-shift system ($n=365$), a rotating three-shift system ($n=66$), or other types of shifts ($n=78$). The non-shift group included 222 caregivers. Participants completed a questionnaire about working conditions, sleep problems, health, lifestyle, and demographic factors. The two-shift caregivers reported the highest levels of difficulty initiating sleep (DIS, 37.6%), insomnia symptoms (43.0%), and poor quality of sleep (24.9%) among the groups. Adjusted odds ratios for these problems were significantly greater for the two-shift caregivers than for non-shift counterparts: DIS (odds ratio 2.86, 95% confidence interval 1.57–5.20), insomnia symptoms (2.33, 1.36–4.02), and poor sleep quality (2.15, 1.09–4.22). Our data suggest that working under a rotating two-shift system, which has a longer night shift, is associated with an elevated risk of sleep problems for nursing home caregivers.

▪ **Keywords:** Work schedule; Sleep; Caregiving
Jillian Dorrian, Carolyn Tolley, Nicole Lamond, Cameron van den Heuvel, Jan Pincombe, Ann E. Rogers, Dawson Drew. *Sleep and errors in a group of Australian hospital nurses at work and during the commute.* Pages 605-613.

Abstract: There is a paucity of information regarding Australian nurses' sleep and fatigue levels, and whether they result in impairment. Forty-one Australian hospital nurses completed daily logbooks for one month recording work hours, sleep, sleepiness, stress, errors, near errors and observed errors (made by others). Nurses reported exhaustion, stress and struggling to remain (STR) awake at work during one in three shifts. Sleep was significantly reduced on workdays in general, and workdays when an error was reported relative to days off. The primary predictor of error was STR, followed by stress. The primary predictor of extreme drowsiness during the commute was also STR awake, followed by exhaustion, and consecutive shifts. In turn, STR awake was

predicted by exhaustion, prior sleep and shift length. Findings highlight the need for further attention to these issues to optimise the safety of nurses and patients in our hospitals, and the community at large on our roads.

▪ **Keywords:** Sleep loss; Work hours; Nursing **David Darwent, Nicole Lamond, Drew Dawson. *The sleep and performance of train drivers during an extended freight-haul operation.* Pages 614-622.**

Abstract: The sleep and performance of train drivers was monitored across a 106-h rail operation between the Australian cities of Adelaide and Perth. The drivers worked alternating 8-h shift rotations across the operation and rested in specially equipped, crew-van carriages during non-work periods. The crew-van rest opportunities were associated with shorter bedtime spans, less total sleep time, and poorer sleep efficiency than sleeps initiated at home. The duration of crew-van sleeps was primarily dependent on the time of day at which the rest opportunities occurred. Overall, drivers incurred a significant cumulative sleep loss across the duration of the operation. Despite the deficit, drivers were able to sustain vigilance performance across the operation.

▪ **Keywords:** Sleep; Performance; Rail **Sarah M. Jay, Drew Dawson, Sally A. Ferguson, Nicole Lamond. *Driver fatigue during extended rail operations.* Pages 623-629.**

Abstract: Objectives: Relay is an effective mode of freight transportation within Australia. Relay requires two crews to drive the train continuously from one specified destination to another and return with crews working in alternating shifts. The aim of the current investigation was to assess fatigue levels during extended relay operations. **Methods:** Nine drivers participated and data were collected from 16 four-day trips. Fatigue was assessed objectively and subjectively prior to and following each trip and before and after each 8 h shift. **Results:** Analyses revealed a trend for elevated fatigue at the end of each shift. Designated 8 h rest periods appeared sufficient to reduce fatigue to levels recorded prior to departure and prevent accumulation of fatigue across the trip. **Conclusions:** Drivers seemed to cope well with the 8 h rotating sleep/wake regime. While fatigue did not observably accumulate, it is possible that operational measures may better reflect fatigue experienced over the course of each trip.

▪ **Keywords:** Train drivers; Fatigue; Rail **P.M. Conway, P. Campanini, S. Sartori, R. Dotti, G. Costa. *Main and interactive effects of shiftwork, age and work stress on health in an Italian sample of healthcare workers.* Pages 630-639.**

Abstract: Among healthcare workers, shiftwork (mostly if nightwork is also included), ageing and work-related stress may be factors leading to impaired health. Such risk factors may also operate in interaction, resulting in an even increased harm for health. The present study aims at evaluating these relationships in a sample of 1842 hospital workers in Northern Italy. Subjects were mainly women, 33.1% were aged **Chyba!** ≥45 yr, and they were almost evenly distributed between dayworkers and rotating shiftworkers (nights included). Shiftwork was associated with poor sleep, while it was protective against gastrointestinal disorders, poor work ability and job dissatisfaction. Work stress was the risk factor with the highest relevance for poor health. Ageing was associated with lower physical health. Few significant interactions were observed. Shiftwork with nights and high work stress significantly interacted in increasing the risk for poor sleep. The "healthy worker effect" may have played a strong role in study findings.

▪ **Keywords:** Shiftwork; Work stress; Healthcare workers; Ageing **Elaine C. Marqueze, Gustavo P. Voltz, Flávio N.S. Borges, Claudia R.C. Moreno. A**

2-year follow-up study of work ability among college educators. Pages 640-645.

Abstract: The aim of this study was to evaluate work ability among college educators before and after an intervention at the workplace. An administrative restructuring in the workplace started to be implemented in 2005. The work ability index (WAI) was administered to 154 educators before the restructure in 2004 and to 60 educators following the restructure in 2006. A *t*-test comparing the WAI score of the 60 educators who took part in both phases showed a trend of improving work ability ($p=0.06$; mean WAI in 2004 was 41.7 and 43.3 in 2006). The results suggest that the intervention led to an improvement in psychosocial factors, which in turn positively influenced work ability.

▪ **Keywords:** Work ability index; Job satisfaction; Work-related psychosocial factors
Lúcia Rotenberg, Luciana Fernandes Portela, Bahby Banks, Rosane Harter Griep, Frida Marina Fischer, Paul Landsbergis. A gender approach to work ability and its relationship to professional and domestic work hours among nursing personnel. Pages 646-652.

Abstract: The association between working hours and work ability was examined in a cross-sectional study of male ($N=156$) and female ($N=1092$) nurses in three public hospitals. Working hours were considered in terms of their professional and domestic hours per week and their combined impact; total work load. Logistic regression analysis showed a significant association between total work load and inadequate work ability index (WAI) for females only. Females reported a higher proportion of inadequate WAI, fewer professional work hours but longer domestic work hours. There were no significant differences in total work load by gender. The combination of professional and domestic work hours in females seemed to best explain their lower work ability. The findings suggest that investigations into female well-being need to consider their total work load. Our male sample may have lacked sufficient power to detect a relationship between working hours and work ability.

▪ **Keywords:** Paid work; Unpaid work; Long work hours; Work load; Work ability; Women's work; Gender
P. Tucker, A. Dahlgren, T Akerstedt, J Waterhouse. The impact of free-time activities on sleep, recovery and well-being. Pages 653-662.

Abstract: We compared the effects of different types of free-time activity on subjective and objective indices of sleep, recovery and well-being in an experimental field study. Twelve participants spent four consecutive evenings after work in each of three conditions: pursuing quiet leisure activities at home; undertaking active leisure pursuits; doing additional work. Ratings of rest and recuperation, and of satisfaction, were lowest in the additional work condition. There were few other differences between conditions. However, being satisfied with one's evening activities (regardless of which experimental condition was being undertaken) was associated with improved subsequent sleep (self-reported). Evening activities involving lower mental effort were also associated with better-rated sleep, as well as improved recuperation and fatigue the next day. It is concluded that the nature of activity *per se* may be less important than (1) whether the activity accords with individual preference and (2) the cumulative demands of daytime and evening activities.

▪ **Keywords:** Recovery; Fatigue; Sleep
Rebecca Loudoun, Cameron Allan. The effect of time of day on injury patterns amongst adolescents in Australia. Pages 663-670.

Abstract: Labour force participation of adolescents in Australia is growing at an unprecedented rate. This increased participation is coupled with a growing realisation of

the vulnerability of adolescents in the labour market in terms of occupational injury. Despite recent evidence that time of day may be an important determinant of adolescent injuries, the impact of non-standard and night work on adolescent injury rates has received scant attention to date. The current study addresses this shortcoming by examining injury patterns of 3201 working adolescents in Queensland. Results revealed that female adolescents are 2.5 times more likely to sustain an injury on day shift and 4.71 times more likely to sustain an injury on night shift than their adult counterparts when total work hours are taken into consideration. Similar results were found for male adolescents with an injury to work hours ratio of 2.19 on day shift and 3.05 on night shift. These findings point to the value of considering the temporal pattern of adolescent work in future research aimed at minimising injuries at work and improving the work experience of tomorrow's workforce.

- **Keywords:** Adolescents; Shiftwork; Work injuries; Accident and emergency data