

## SHIFTWORK INTERNATIONAL NEWSLETTER

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Published by Tsuyoshi Kawakami and Kazutaka Kogi  
Institute for Science of Labour  
2-8-14, Sugao, Miyamae-ku, Kawasaki 216, Japan  
(Fax: +81-44-977-7504; E-mail: [t.kawakami@isl.or.jp](mailto:t.kawakami@isl.or.jp), [k.kogi@isl.or.jp](mailto:k.kogi@isl.or.jp))

and Johannes Gaertner and Michael Kundi  
Arbeitszeitlabor, TU-Wien, Abteilung für CSCW  
Argentinierstr. 8, A-1040 Wien, Austria  
(Fax: +43-222-504-2478; E-mail: [Johannes.Gaertner@tuwien.ac.at](mailto:Johannes.Gaertner@tuwien.ac.at))

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### EDITORIAL

Web-site for shiftwork research and practice is now available. Please visit us !  
Johannes Gaertner and Michael Kundi developed the new version of the Web-Site for SIN. Not only the contents of regular SIN issues, but also pieces of information by SIN readers and other information sources are included. The address of the web site of the SIN is: [Http://128.130.176.47/](http://128.130.176.47/)

### Call for more inputs

The editors of SIN intend to deliver any information concerning shift and night work and changes in shiftwork conditions from various parts of the world. The editors would like to ask for kind contribution from the SIN readers including reports of innovative experiences for improving shift and night work. Short articles describing new developments, new methods, newly organized meetings and recent topics are most welcome. Your submission should be sent to the following editors:

- Hardcopy issues of the Shiftwork International Newsletter:  
 Tsuyoshi Kawakami and Kazutaka Kogi  
 Institute for Science of Labour  
 2-8-14, Sugao, Miyamae-ku  
 Kawasaki 216-8501, Japan  
 E-mail: [t.kawakami@isl.or.jp](mailto:t.kawakami@isl.or.jp),  
[k.kogi@isl.or.jp](mailto:k.kogi@isl.or.jp)
- Web-site for shiftwork research and practice:  
 Johannes Gaertner and Michael Kundi  
 Arbeitszeitlabor, TU-Wien –Abteilung fur  
 CSCW  
 Vienna, Austria  
 Fax: +43-222-504-2478  
 E-mail: [Johannes.Gaertner@tuwien.ac.at](mailto:Johannes.Gaertner@tuwien.ac.at)

### Subscription of the SIN

The Shiftwork International Newsletter (SIN) may be subscribed in either of the two ways:

- (1) the participants of each of the International Symposium on Night and Shiftwork paying the full registration fees become SIN subscribers for two years as the subscription fees are included in the symposium registration. (Therefore, the participants of the 14<sup>th</sup> International Symposium in Wiesensteig automatically get this copy);
- (2) SIN may also be subscribed by transferring US \$35 (for two years) directly to the editors' account (direct transfer is necessary because bank drafts of a small amount of \$35 cannot be accepted by the bank: see below !):

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You may request a free membership if you have financial hardship or difficulty in obtaining foreign currency.

**Unfortunately we have problems in cashing a check of small amount, such as US\$35, due to commission paid to the bank, direct submission of the subscription fee during the next International Symposium on Night and Shiftwork in Santos, in 2003 would be, in fact, most appreciated.**

We apologize for your inconvenience. Of course, all payments have surely been registered and kept in our mailing list without paying any additional charge.

## **Working Time Research Abstracts from the Hayama Symposium Japan: Part II of two parts (From Journal of Human Ergology, Vol.30)**

### **P R E F A C E**

There are diversifying forms of work associated with rapid technological, economic and social changes. A clear trend is seen towards flexible working time arrangements in responding to various business needs and workers' preferences. Managing shiftwork systems thus requires a comprehensive approach looking into the interactions of phase-shifted work schedules with business performance and with safety, health and well-being of workers. Shiftwork is considered today as one of the most important work-related stress factors. It is therefore necessary to explore practical measures to improve the management of shiftwork learning from positive advances.

"Innovative strategies in managing shiftwork" was the main theme of the 15th International Symposium on Night and Shiftwork held in Hayama, Japan, from 10-13 September 2001. The symposium was one of the international symposia serially organized since 1969 under the auspices of the Scientific Committee on Shiftwork of the International Commission on Occupational Health. About 180 participants from 28 countries attended the Hayama symposium.

This special issue of the Journal of Human Ergology contains a selection of papers presented at this symposium. A group of reviewers from the Scientific Committee undertook the task of reviewing these papers. The papers covered the seven themes of the symposium: (1) innovative shiftwork management; (2) risk management at shiftwork; (3) sleep/wake rhythm adjustment and health; (4) shiftwork and industrial development; (5) shiftwork and well-being; (6) shiftwork of health care workers; and (7) support for shift scheduling.

In the meeting, the strategies in managing shiftwork were discussed based on recent experiences in different countries. Innovative measures in work scheduling and in improving work life conditions of shiftworkers were a focus of the discussion. Many examples of these innovative measures were presented during the sessions. The management of safety and health risks associated with shiftwork was examined in detail, and the need for improving not only the work schedules but also the job content and the working environment of shiftworkers was stressed throughout the symposium sessions.

The discussion about the themes centered around the support for managers and shiftworkers in managing these risks and enhancing the quality of life for shiftworkers. As discussed in the symposium, such support seemed particularly useful for workers in high-risk jobs, elderly shiftworkers, women working nightshifts as well as workers in health care and other services working

irregular shifts. The need for providing guidelines about workable solutions was suggested with respect to safety and health risks and management procedures including participatory steps. The support through interactive computer-aided shift scheduling seemed promising along with these guidelines.

A particular attention was paid to the conditions of shiftworkers in industrially developing countries. These workers are working in difficult conditions and there are gaps in improving their conditions of work. The need for improving both work schedules and general workplace conditions in the process of industrial development was pointed out. Concrete support for enterprise-level measures and for participatory programs was emphasized.

The papers in this special issue highlighted the recent progress in orienting these various support measures towards improving conditions of shiftwork in different industries and countries on a more equitable basis. Many of the papers pointed to the existing gaps in achieving the necessary improvements. These papers also indicated the need to address these gaps as part of effective strategies for managing shiftwork.

During the symposium, the participants agreed to inaugurate the Working Time Society as a new international scientific body for promoting the study on working time arrangements and measures to improve them. The society will work in close collaboration with the Scientific Committee on Shiftwork. It is hoped that the new society will advance the international exchange of study results and the development of guidelines for solving working time issues including shiftwork issues discussed during this symposium.

The organizing committee of the symposium and the editors of this special issue would like to thank the authors for their papers. We hope this special issue will serve as a useful basis for future discussion concerning workable strategies for improving conditions of shiftwork.

Editors

K. Kogi and T. Sasaki

Scientific Committee on Shiftwork of the International Commission on Occupational Health

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## **SLEEPINESS IN A POPULATION OF ITALIAN SHIFTWORK POLICEMEN**

Sergio GARBARINO<sup>A,B</sup>, Fabrizio DE CARLI<sup>D</sup>, Barbara MASCIALINO<sup>B</sup>, Manolo BEELKE<sup>B</sup>, Lino NOBILI<sup>B</sup>, Sandro SQUARCIA<sup>C</sup>, Maria Antonietta PENCO<sup>C</sup> and Franco FERRILLO<sup>B</sup>

<sup>A</sup>Center of Neurology and Medical Psychology, Health Service of the State Police, Department of the Interior, <sup>B</sup>Center of Sleep Medicine, University of Genoa, <sup>C</sup>Department of Physics, University of Genoa, <sup>D</sup>Center for Cerebral Neurophysiology, National Council of Research, Italy

The aim of this study was to evaluate the effects of shiftwork on sleepiness, sleep disorders and sleep related accidents in a population of policemen. Data concerning age and physical characteristics, working conditions, sleep problems and accidents were collected by a questionnaire. Sleepiness was evaluated by the Epworth Sleepiness Scale (ESS) while the presence of sleep disorders was evaluated by a score (SD-score) drawn from indicators of insomnia, breathing disorders, periodic limb movements-restless leg syndrome and hypersomnia. The effects of age, gender, body mass index, working condition and seniority on ESS, SD-score and accidents were analysed by linear and logistic regression. Participants were 1280 policemen: 611 shiftworkers and 669 non-shiftworkers. The ESS scores were not higher in shiftworkers than in non-shiftworkers, but the SD-score was found to be significantly influenced by shiftwork condition and seniority. The occurrence of sleep-related accidents was found to have been significantly increased for shiftworkers and related to the presence of indicators of sleep disorders. The sleepiness could be underestimated or even overcome by the influence of stressing conditions. However our data should alert occupational health physicians for the diagnosis and prevention of possible lurking intrinsic sleep disorders likely to influence health problems and risk of accidents in shiftworkers.

## **SHIFTWORK LOCUS OF CONTROL EFFECTS IN POLICE OFFICERS**

Lawrence SMITH<sup>A</sup> and Carl MASON<sup>B</sup>

<sup>A</sup>Shiftwork Research Group, School of Psychology, Leeds, UK

<sup>B</sup>Work Scheduling Unit, Merseyside Police HQ, Canning Place Liverpool, UK

Personality and experientially-based differences are suggested to moderate the negative effects of shiftworking. This investigation was one of a series of studies aimed at examining the relationship between internal locus of control (internality) and commonly reported outcomes of exposure to shiftworking. The study concentrated on whether or not shiftwork-specific internality appeared to be associated with better experiences for two groups of shiftworkers on different shift rotas. The Shiftwork Locus of Control (SHLOC) scale was completed by each group along with a range of outcome measures (including: sleep disturbance, alertness on shift, psychological well-being, disturbance of social and family life, and fatigue). The analyses controlled for age, shiftwork experience and years of service effects. The results showed that for the majority of outcome variables, the higher internality was associated with significantly lower levels of shiftwork problems, especially when compared to the low internality group. The findings of

this study further support the use of shiftwork-specific locus of control in shiftwork research as an indicator of potentially better tolerance, and possibly as part of an occupational health monitoring process to aid the targeting of interventions.

### **DAYTIME CARDIAC AUTONOMIC ACTIVITY DURING ONE WEEK OF CONTINUOUS NIGHT SHIFT**

Alexandra L. HOLMES, Helen J. BURGESS, Kirsty McCULLOCH, Nicole LAMOND, Adam FLETCHER, Jill DORRIAN, Gregory ROACH and Drew DAWSON  
Centre for Sleep Research, The University of South Australia, Woodville, Australia

Shift workers encounter an increased risk of cardiovascular disease compared to their day working counterparts. To explore this phenomenon, the effects of one week of simulated night shift on cardiac sympathetic (SNS) and parasympathetic (PNS) activity were assessed. Ten (5m; 5f) healthy subjects aged 18-29 years attended an adaptation and baseline night before commencing one week of night shift (2300-0700h). Sleep was recorded using a standard polysomnogram and circadian phase was tracked using salivary melatonin data. During sleep, heart rate (HR), cardiac PNS activity (RMSSD) and cardiac SNS activity (pre-ejection period) were recorded. Night shift did not influence sleep quality, but reduced sleep duration by a mean of  $52 \pm 29$  min. One week of night shift evoked a small chronic sleep debt of 5 h  $14 \pm 56$  min and a cumulative circadian phase delay of 5 h  $\pm 14$  min. Night shift had no significant effect on mean HR, but mean cardiac SNS activity during sleep was consistently higher and mean cardiac PNS activity during sleep declined gradually across the week. These results suggest that shiftwork has direct and unfavourable effects on cardiac autonomic activity and that this might be one mechanism via which shiftwork increases the risk of cardiovascular disease. It is postulated that sleep loss could be one mediator of the association between shiftwork and cardiovascular health.

### **BLOOD PRESSURE AND HEART RATE VARIABILITY IN WORKERS OF 8-HOUR SHIFTS**

Mina HA<sup>A</sup>, Jaiyong KIM<sup>B</sup>, Jungsun PARK<sup>C</sup> and Ho Keun CHUNG<sup>C</sup>

<sup>A</sup>Dankook University College of Medicine, Cheonan, Korea

<sup>B</sup>Korea Institute for Health and Social Affairs, Seoul, Korea

<sup>C</sup>Occupational Safety & Health Research Institute, Incheon, Korea

This study examined the effects of shiftwork on the cardiovascular system. The blood pressure (BP) and heart rate variability (HRV) of 134 male workers, who worked 8-hour shifts with rapid rotation of shifts at 3-day intervals, were examined for all the three shifts. In addition, the job stress was measured by Karasek's JCQ 49-item questionnaire and the circadian type was assessed by the morningness-eveningness questionnaire. The smoking and alcohol drinking habits, marital status and past medical history were also obtained. The method of analyzing the measured data based on a mixed model was used to illustrate the association between the shiftwork duration and the BP or HRV. The average age of workers was 29 years (between 25-44). Among them, 77.9% were current smokers, 50%

showed the passive type of job strain in Karasek's model. The mean shiftwork duration was 5.21 years (range 5.4 months - 10 years). In the circadian type, none of them belonged to a definitely morning type or a definitely evening type. In the multivariate analysis adjusted by age, job strain, shift, circadian rhythm and smoking, the blood pressure showed significantly increasing trends according to shiftwork duration in both the systolic and diastolic BP. The heart rate variability also showed a significantly decreasing trend according to the shiftwork duration in both the parasympathetic and sympathetic functions ( $p < 0.05$ ). These results suggest that there are negative health effects arising from shiftwork on the cardiovascular system.

### **HEART RATE VARIABILITY DURING LONG TRUCK DRIVING WORK**

Shuji SATO<sup>A</sup>, Kazushi TAODA<sup>C</sup>, Masanori KAWAMURA<sup>B</sup>, Kinzou WAKABA<sup>A</sup>,  
Yasuma FUKUCHI<sup>B</sup> and Katsuo NISHIYAMA<sup>C</sup>

<sup>A</sup>Department of Occupational Health, Kin-I-Kyo Sapporo Hospital, Sapporo, Japan

<sup>B</sup>Chair of Health and Sports Science, Graduate School of Education, Hokkaido University, Sapporo, Japan, <sup>C</sup>Department of Preventive Medicine, Shiga University of Medical Science, Otsu, Japan

We recorded ambulatory electrocardiograms of 6 long distance truck drivers during their work period in order to observe the affect of autonomic nervous function and symptoms while doing their work. We also recorded their work patterns every minute. The RR50 value and the LFP/HFP ratio were calculated every two minutes based on R-R interval data. RR50 was significantly higher during taking naps than during other periods of work shifts, while, the LFP/HFP ratio showed significantly lower during taking naps than during other periods of work shifts. RR50 in the morning was significantly higher than that in the afternoon. On the contrary, the LFP/HFP ratio showed opposite tendency. Only on the times of driving, RR50 was significantly higher in the morning than that in the afternoon. On the other hand, the LFP/HFP ratio showed an opposite tendency. These results show that the parasympathetic nervous activities were more dominant than sympathetic nervous activities in the morning during the subjects were doing long distance truck driving including midnight work. Driving while in high parasympathetic nervous activity levels may add to cardiovascular stress and lead to drowsiness. And this may result in disrupted attention. It is necessary to decrease work time and improve working conditions of truck drivers working long-hour shifts.

### **ULTRADIAN RHYTHMS IN PROCESSING SPEED OF LATERALLY EXPOSED WORDS AND PICTURES**

Irena ISKRA-GOLEC  
Jagiellonian University, Kraków, Poland

The study was designed to find out the cerebral hemispheres oscillations in stimuli processing during the 24-hour period of wakefulness in isolated subjects remaining in a monotonous environment. Stimuli processing speed from the 24-

hour constant routine periods (06.00-06.00 h) of a larger experiment were analysed for the purpose of this paper. Parallel sets of words and pictures were exposed laterally using a purpose-designed computer program. The subjects reacted to pictures or words by pressing appropriate buttons. The significant dominant ultradian rhythms (around 4h) in the processing speed of words addressed to the right hemisphere were found and of pictures addressed to the left hemisphere. Longer significant dominant periodicities (around 12 h) appeared in the processing speed of words addressed to the left hemisphere and of pictures (around 8 h) addressed to the right hemisphere. Ultradian rhythmicity of the central nervous system functioning is suggested.

### **CIRCADIAN TEMPERATURE RHYTHMS IN CLOCKWISE AND COUNTER-CLOCKWISE RAPIDLY ROTATING SHIFT SCHEDULES**

Thomas NESTHUS, Crystal CRUZ, Albert BOQUET, Cristy DETWILER, Kali HOLCOMB and Pamela DELLA ROCCO

Federal Aviation Administration Civil Aerospace Medical Institute, Oklahoma City, USA

The purpose of this study was to examine the circadian temperature rhythm in clockwise (CW) and counter-clockwise (CCW) rapidly rotating shift schedules. Arguments against the CCW rotation of shifts are that they result in shortened sleep and promote greater disruption of circadian rhythms. The 3-week study included a week of day shifts (0800-1600) and 2 weeks of shiftwork. The CW 2-2-1 schedule rotated from two early mornings (0600-1400) to two evenings (1400-2200) to one midnight shift (2200-0600) allowing 24 hours off at each shift rotation and a 48-hour weekend. The CCW schedule rotated from two evenings to two early mornings to one midnight shift allowing only 8 hours off at each shift rotation and an 80-hour weekend. Analysis of the 72-hr periods at the end of each workweek, including the midnight shifts and recovery periods during weeks 2 and 3 were compared to the same 72-hour period at the end of week 1 (baseline). A cosine function that fit the temperature curves by minimizing the sums of squares produced parameters that underwent analysis of covariance procedures. Significant differences were found between rotation conditions for amplitude and acrophase. An attenuation of amplitude and a delay in the acrophase was found for the counter-clockwise condition. Features inherent in this schedule might explain these effects, particularly, the increased opportunity for "sleeping in" at the beginning of the week and an expanded (2-shift) workday at the end of the week.

### **PHYSIOLOGICAL EFFECTS OF SHIFT WORK ON HOSPITAL NURSES**

Hazuki YAMAUCHI, Mieko IWAMOTO and Noriaki HARADA  
Yamaguchi University School of Medicine, Ube, Japan

**Objective:** The purpose of this study was to assess the physiological effects of shift work on the urinary excretion rates of norepinephrine, 6-sulfatoxymelatonin and estriol in hospital nurses. **Method:** Twenty-four hour urine specimens were examined on a daytime/nighttime basis for each work shift of pregnant and non-

pregnant subjects. The urinary norepinephrine and 6-sulfatoxymelatonin were measured by enzyme-linked immunosorbent assay and estriol by radio-immunoassay. Results: Urinary norepinephrine level during the night work was higher than the night levels of the days off and the day shift. Urinary 6-sulfatoxymelatonin level during the night work was lower than the night levels of the days off and the day shift. Urinary estriol level of pregnant subjects showed no differences among work shift and also between daytime and nighttime. Conclusions: Urinary excretion rates of norepinephrine and 6-sulfatoxymelatonin were affected by shift work both for non-pregnant and pregnant subjects. It was unlikely that urinary estriol levels in the pregnant subjects were significantly affected by shift work.

### **A WEEK OF SIMULATED NIGHT WORK DELAYS SALIVARY MELATONIN ONSET**

Gregory D. ROACH, Helen BURGESS, Nicole LAMOND, Jill DORRIAN,  
Alexandra HOLMES, Adam FLETCHER, Kirsty McCULLOCH and Drew  
DAWSON

The Centre for Sleep Research, The University of South Australia, Adelaide,  
Australia

In most studies, the magnitude and rate of adaptation to various night work schedules is assessed using core body temperature as the marker of circadian phase. The aim of the current study was to assess adaptation to a simulated night work schedule using salivary dim light melatonin onset (DLMO) as an alternative circadian phase marker. It was hypothesised that the night work schedule would result in a phase delay, manifest in relatively later DLMO, but that this delay would be somewhat inhibited by exposure to natural light. Participants worked seven consecutive simulated 8-hour night shifts (23:00-07:00h). By night 7, there was a mean cumulative phase delay of 5.5 hours, equivalent to an average delay of 0.8 hours per day. This indicates that partial circadian adaptation occurred in response to the simulated night work schedule. The radioimmunoassay used in the current study provides a sensitive assessment of melatonin concentration in saliva that can be used to determine DLMO, and thus provides an alternative phase marker to core body temperature, at least in laboratory studies.

### **THE EFFECT OF A CHANGE IN SLEEP-WAKEFULNESS TIMING, BRIGHT LIGHT AND PHYSICAL EXERCISE INTERVENTIONS ON 24-HOUR PATTERNS OF PERFORMANCE, MOOD AND BODY TEMPERATURE**

Irena ISKRA-GOLEC<sup>A</sup>, Magdalena FAŁROWICZ<sup>A</sup>, Tadeusz MAREK<sup>A</sup>, Giovanni COSTA<sup>B</sup>, Simon FOLKARD<sup>C</sup>, Jean FORET<sup>D</sup>, Michael KUNDI<sup>E</sup> and Lawrence SMITH<sup>F</sup>

<sup>A</sup>Jagiellonian University, Kraków, Poland, <sup>B</sup>University of Verona, Verona, Italy,

<sup>C</sup>University of Wales, Swansea, UK, <sup>D</sup>University Le Mirail, Toulouse, France,

<sup>E</sup>University of Vienna, Austria, <sup>F</sup>University of Leeds, Leeds, UK

Experiments consisting of baseline, bright light and physical exercise studies were carried out to compare the effect of a 9-hour delay in sleep-wakefulness timing, and the effects of bright light and physical exercise interventions on 24-hour patterns of performance, mood and body temperature were examined. Each study comprised a 24-hour constant routine at the beginning followed by 3 night shifts and 24-hour constant routine at the end. Performance on tasks differing in cognitive load, mood and body temperature was measured during each constant routine and the interventions were applied during the night shifts. The 24-hour pattern of alertness and performance on the tasks with low cognitive load in post-treatment conditions followed the change in sleep-wakefulness timing while more cognitively loaded tasks tended to show a reverse trend when compared to pre-treatment conditions. There was a phase delay around 4 hours in circadian rhythms of body temperature in post-treatment conditions.

### **PSYCHOPHYSIOLOGICAL EFFECTS OF A BRIEF NOCTURNAL LIGHT EXPOSURE**

Jeffrey N. WHITMORE<sup>A</sup>, Jonathan FRENCH<sup>B</sup> and Joseph R. FISCHER<sup>C</sup>

<sup>A</sup>Air Force Research Laboratory, Brooks AFB, USA, <sup>B</sup>Micro Analysis and Design, Orlando, USA

<sup>C</sup>Veridian Engineering, Brooks AFB, USA

This study compared the effects of a brief pulse (60-minute) of three full spectrum light intensities (1000, 500 and 30 lux) and two green light intensities (1000 and 500 lux) administered between 0200 and 0300 hrs. Ten participants were involved in this repeated measures study. Each participant experienced one condition every week for five weekends. Sessions began at 1800 hours and ended at 0600 hours the following day. Outside of the 60-minute exposure period, each session was spent in 30 lux white light. Oral temperature, salivary melatonin, cognitive performance and subjective mood were sampled throughout the sessions. Analysis revealed that all of the experimental light conditions significantly reduced salivary melatonin concentrations immediately following the pulse. This effect was not maintained beyond the duration of the light pulse. There was no significant effect on oral temperature. There were also no significant effects on cognitive performance and subjective mood, though some positive trends were observed. These results argue that brief, moderate intensity, pulses of either green or full spectrum light are sufficient to suppress the normal nocturnal rise in melatonin. However, the level of suppression obtained does not translate into significant improvement in cognitive performance or subjective mood.

### **THE EFFECTS OF BRIGHT LIGHT AND NIGHTTIME MELATONIN ADMINISTRATION ON CARDIAC ACTIVITY**

Tracey SLETTEN, Helen BURGESS, Natasha SAVIC, Saul GILBERT and Drew DAWSON

The Centre for Sleep Research, University of South Australia, Adelaide, Australia

Although melatonin has an important physiological role in the facilitation of sleep, its precise mechanism of action is not clear. To investigate the potential contribution of melatonin to influence cardiac autonomic activity in the evening, 16 young healthy subjects participated in a repeated measures design where cardiac autonomic activity, heart rate and blood pressure were examined during three experimental conditions. An initial baseline condition involved dim light exposure (< 10 lux), permitting the normal nocturnal rise in endogenous melatonin. In other sessions, subjects were exposed to bright light (> 3000 lux) to suppress melatonin secretion and administered a placebo or melatonin (5 mg) capsule at the estimated time of increase in endogenous melatonin (wake time + 14 hours). Heart rate, pre-ejection period (a measure of cardiac sympathetic activity) and respiratory sinus arrhythmia (a measure of parasympathetic activity) were not significantly altered in response to the three melatonin levels. While melatonin had no effect on diastolic blood pressure, systolic blood pressure was maximally decreased by  $6 \pm 1.93$  mmHg (mean  $\pm$  SEM,  $p < 0.005$ ) 150 minutes after exogenous melatonin. The results indicate that melatonin does not directly modulate cardiac autonomic activity, but may rather act directly on the cardiovascular system.

## **EVALUATION OF A FATIGUE MODEL USING DATA FROM PUBLISHED NAPPING STUDIES**

Adam FLETCHER and Drew DAWSON

The Centre for Sleep Research, The University of South Australia, Woodville, Australia

The authors have previously published the development and empirical validation of a work-related fatigue model. However, published work has not involved data from napping studies. The aim of this paper is to determine how closely the model predicts changes in subjective and objective measures from data published from napping studies. The regression results between the model outputs and logical reasoning, multiple sleep latency test scores, self-rated alertness, profile of mood state fatigue, visual vigilance and reaction time were all strong to very strong ( $R^2 = 0.4-0.9$ ). Only digit symbol substitution revealed moderate ( $R^2 = 0.1-0.2$ ) regression values. The outputs of the model reflect changes due to naps of varying duration and timing measured at varying periods following a nap. Together with the outputs from previous investigations, these results further support the potential use of the fatigue model in operational settings. This appears to be true in settings that utilise napping as well as those that do not.

## **SHIFTWORK, AGE AND WELL-BEING: RECENT DEVELOPMENTS AND FUTURE PERSPECTIVES**

Mikko HÄRMÄ and Irja KANDOLIN

Finnish Institute of Occupational Health, Helsinki, Finland

The working population is aging fast in most European countries and in the USA. The health and well-being of an elderly shift worker depends on the interaction of

several individual, medical, psychosocial and job-related factors. These factors are related to the biological ageing process, but also to changes in one's individual life situation and the needs of the ageing shift worker. The evidence of good age-specific solutions in working hours is limited, but the few published intervention studies support the use of individual flexibility, rapid forward rotating shift systems, and earlier shift start-end times in three-shift work. In addition to the development of shift schedules, the counter-measures to improve the health and well-being of ageing shift workers should be focused on the improvement of occupational health care and the promotion of appropriate coping mechanisms for the aging.

## **DIFFERENT JOB DEMANDS OF NIGHTSHIFTS IN HOSPITALS**

Charles GADBOIS  
Laboratoire d'Ergonomie EPHE, Paris, France

It is now recognized that the effects of nightwork result jointly from desynchronization of circadian rhythms and from the job content. In scheduling nightwork, use should be made of the shift systems most compatible with the biological rhythms and social patterns of the workers concerned, and specific measures should be implemented to reduce demands on nightworkers. Job content is of particular importance in the hospital sector, where demands vary greatly from one department to another. Above all, the tasks accomplished by those on nightshift differ markedly from those of daytime workers: nightwork is limited to scheduled health care jobs that cannot be deferred until the morning, and to management of incidents. Yet staffing levels at night are reduced. Certain daytime resources are lacking at night, and the working conditions, generally defined with reference to the activities of daytime personnel fail to take into account the specific features of nightwork which are largely ignored by the management. On the basis of various studies conducted in French hospitals (extensive questionnaire surveys, ergonomic analyses in different departments), these features of nightwork and the corresponding need for appropriate responses, in terms of shift systems and job content, are reviewed and discussed.

## **BELIEFS ABOUT AGE AND PHYSICAL DEMANDS OF WORK IN SHIFTWORKERS**

Ljiljana KALITERNA<sup>A</sup>, Zvezdana PRIZMIĆ LARSEN<sup>B</sup> and Tihana BRKLJAČIĆ<sup>A</sup>  
<sup>A</sup>Institute of Social Sciences Ivo Pilar, Zagreb, Croatia  
<sup>B</sup>Washington University, St. Louis, USA

The aim of the study was to investigate the differences between shiftworkers and non-shiftworkers in terms of several aspects of aging. Our interest was in particular focused on the differences observed in the assessment of subjective age, and physical, mental and social demands of work. Subjects were workers in a medical setting, 54 shiftworkers and 53 non-shiftworkers of the comparable chronological age. Subjective age measures included cognitive age, desired age and beliefs about age. The results showed that shiftworkers, compared to non-shiftworkers, reported being more physically tired by their work and that their work

required more physical effort. No differences were found in reports of mental and social effort or tension produced by work. According to our data on subjective age measures, the subjects in either group felt approximately five years younger than their chronological age, desired to be ten years younger and believed that the person who is two years younger than them is most successful in its job. There were no differences between shift- and non-shiftworkers in terms of cognitive age, but shiftworkers were inclined to choose younger age as their desired age, and believed that younger people are more successful in their work.

## **AGE AND THE SUBJECTIVE EXPERIENCE OF SHIFTWORK**

Lawrence SMITH<sup>A</sup> and Carl MASON<sup>B</sup>

<sup>A</sup>Shiftwork Research Group, School of Psychology, University of Leeds, UK

<sup>B</sup>Work Scheduling Unit, Merseyside Police HQ, Canning Place Liverpool, UK

The objective of this study was to examine age related effects of shiftwork albeit difficult to tease apart the natural effects of aging, and lifestyle or behaviour, or job done, over time and the shifts a person works. This is an issue of concern because the numbers of shiftworkers over 45 are increasing. Participants were 306 police officers who had worked a new rota for approximately 6 months. Three age groups were compared (1=20-32.9, 2=33-39.9, 3=40+) using a range of shiftwork-related measures and multivariate analysis of covariance (controlling for shiftwork experience and other individual differences). Younger officers tended to report significantly better attitudes towards their shiftwork, better adjustment to night-bound shifts, greater job satisfaction and organisational commitment, lower fatigue and longer sleep durations. Older shiftworkers reported significantly higher morningness and lower sleep need than the younger officers. This concurred with existing research that implicates such variables in the mechanism(s) involved in age-related tolerance to shiftwork. It was also evident that the older group tended to resort to greater caffeine intake on all shifts. The findings offer tentative support for the position that age can be linked to depleted shiftwork tolerance but the issue of establishing the relative impacts of aging, lifestyle, behaviour, work type and the rota worked remains to be a challenge.

## **EVALUATION OF A FAST FORWARD ROTATING SHIFT SCHEDULE IN THE STEEL INDUSTRY WITH A SPECIAL FOCUS ON AGEING AND SLEEP**

Tarja HAKOLA and Mikko HÄRMÄ

Finnish Institute of Occupational Health, Helsinki, Finland

The aim of this study was to explore the effect of a change in the speed and direction of shift rotation on the sleep and wakefulness of younger and older workers. A continuous three-shift schedule was changed from a slow backward rotating (EEE–MMMNNN– – – –) to a fast forward rotating system (MMEENN– – – –). Sixteen subjects (mean age 42 years) were studied before and one year after the change in schedule. Two age groups were compared: ten younger men (mean age 35 years) and six older men (mean age 53 years). The effects of the new work schedule were evaluated by a questionnaire (modified SSI), and on-site

registrations with an actigraph and sleep log for one shift cycle (10–15 days) before and after the new schedule. After the change in schedule, subjective sleep problems decreased and alertness increased during the morning shifts. The change in schedule influenced sleep differently in the two agegroups. Both the subjective and objective quality of sleep improved among the older workers. The results indicate that a fast forward rotating shift schedule is more suitable for older workers than a slower backward rotating system.

**SEARCHING FOR PREVENTIVE MEASURES OF CARDIOVASCULAR  
EVENTS IN AGED JAPANESE TAXI DRIVERS  
- THE DAILY RHYTHM OF CADIOVASCULAR RISK FACTORS DURING A  
NIGHT DUTY DAY-**

Makoto HATTORI and Yasushi AZAMI  
Johoku Hospital, Kanazawa, Japan

Previous studies have shown that Japanese taxi drivers are exposed to more risk factors and have a higher mortality rate due to cardiovascular disease than other occupational groups. We investigated the effect of night taxi driving with a view to preventing acute events of cardiovascular disease among aged taxi drivers. Twenty-nine taxi drivers (41-67 years old) were examined for urine normetanephrine/creatinine, von Willebrand factor, anti-thrombin  $\alpha_2$ , t-plasminogen activator-plasminogen activator inhibitor 1-complex, hematocrit, blood glucose and blood pressure in the morning and at midnight during a duty day and in the following morning. At the same time, the blood pressure and blood glucose of 46 taxi drivers (43-67 years old) in the morning after a night duty with little sleep and in the morning after daytime work and subsequent night sleep were compared. The results obtained indicate that the aggravation of sympathetic nervous system functions with disturbed circadian rhythms, increased blood coagulation and blood concentration, endothelial injury and the elevation of blood glucose at midnight or the next morning were induced by their night work. These conditions are supposed to favour acute vascular events in aged taxi drivers. Preventive measures considered include social support for anticoagulant food and water intake, short exercise and walking as well as taking a rest and a nap during night work.

**WORK SCHEDULES IN HEALTH CARE IN FRANCE :  
VERY FEW CHANGES BETWEEN 1991 AND 1998, ACCORDING TO  
NATIONAL DATA**

Madeleine ESTRYN-BEHAR<sup>A</sup>, Lydie VINCK<sup>B</sup> and Jean-François CAILLARD<sup>C</sup>  
<sup>A</sup> Médecine du travail, Hôpital Saint-Louis, Paris, France  
<sup>B</sup> DARES Dpt . Conditons de Travail 20 bis, Paris , France  
<sup>C</sup> Service Central de médecine du travail, Hôtel-Dieu, Paris , France

It is important to know whether working time schemes offer, following the adoption of the 1990 ILO Night Work Convention, a better use of the actual knowledge in

moderating the adverse effects of shiftwork for both sexes. The last two national studies on a representative sample, about working conditions in France (1991, 1998), show an increase of night work among female nursing staff. Long hours of work are becoming more common for nurses. The percentage of women health care workers not working the same number of days every week increased, with work weeks of 7 days or more. Few positive aspects exist such as a reduction in the proportion of those having to work 17 Sundays or more and a reduction of shifts beginning before 7 a.m. for female nurses. New negotiations, starting in 2001, should be an opportunity for improvements.

### **GENDER AND SLEEP IN NIGHTWORKERS : A QUANTITATIVE ANALYSIS OF SLEEP IN DAYS OFF**

Lúcia ROTENBERG, Luciana F. PORTELA and Renata A. DUARTE  
Laboratory of Education on Environment and Health, Department of Biology,  
Oswaldo Cruz Institute, Fiocruz, Rio de Janeiro, Brazil

Differences in sleep patterns between workdays and days off contribute to shiftwork effects on workers' health and well-being. But regardless of shift schedules, female workers face more difficulties in fulfilling their sleep need because of housework. This study analyzes gender differences concerning sleep in days off by comparing sleep patterns in male and female nightworkers, analyzing sleep as related to the presence of children and testing the association of sleep features between workdays and days off. Male (n=16) and female (n=30) workers at a plastic plant, working from 10 p.m. to 6 a.m., on weekdays, filled sleep logs for seven consecutive weeks. Male and female samples did not differ in length of night sleep or in total length of sleep. For both samples, sleep length/day in days off increased, but the difference was larger among females. Also important were the relations between sleep in workdays and days off, specially among women. Among female workers, the results indicated that workers with children tended to sleep less in Saturday mornings, suggesting a negative effect of motherhood on sleep not restricted to workdays. The general results indicate that sleep need on the one hand, and social factors on the other determine the actual amount of sleep.

### **EFFECTS OF SHIFT CHANGES ON FEMALE WORKERS AT A DISH FACTORY**

Toshio HIROSE<sup>A</sup>, Yumiko TADA<sup>A</sup> and Mitsuko HASEGAWA<sup>B</sup>  
<sup>A</sup> Sendai Nishikicho Clinic and Occupational Health Center, Sendai, Japan  
<sup>B</sup> Miyagi University, School of Nursing, Sendai, Japan

This study investigated the effects of working night shifts on social and family life by examining changes in workers' daily life before and after a change in their shifts. Subjects were 40 women aged 27-59 years, working at a dish factory. During the health examination of night workers in autumn of 2000, the subjects were directly interviewed about changes in their lives induced by the shift change. Question parameters consisted of 8 items including 30 sub-items related to social

and family life, such as sleep, rest, meals, sports, family time, hobbies, neighborhood association and social activities. The subjects selected one of four response categories: “becoming worse”, “no change”, “becoming better” and “difficult to determine.” With regard to the percentage of “becoming worse”, meal-related items ranked high in all of the shift types. “Family time” and “hobbies” showed high percentages in the subjects transferring from day shifts to night shifts, and in those transferring from early-morning shifts to night shifts. “Rest”, “sports” and “hobbies” showed high percentages in the subjects transferring from night shifts to midnight shifts. Decreased sleeping hours were confirmed in all of the shift types, while the subjects tended to sleep more soundly. As the workers transfer to shifts at earlier hours, they were obliged to make sacrifices in various aspects of their social and family life. Therefore, much assistance in this regard should be given to them.

### **THE IMPACT OF UNWAGED DOMESTIC WORK ON THE DURATION AND TIMING OF SLEEP OF FEMALE NURSES WORKING FULL-TIME ON ROTATING 3-SHIFT ROSTERS**

Gemma CLISSOLD, Peter SMITH and Bruce ACUTT  
Faculty of Business and Law, Central Queensland University, Rockhampton,  
Australia

The study examined the impact of family type on the timing and duration of sleep of 16 experienced female shiftworkers working a rotating 3-shift roster. The nurses lived in one of three domestic lifestyle arrangements: single with no child care responsibilities (N=4), partnered with no child care responsibilities (N=5) and partnered with child care responsibilities (N=7). Self report sleep diaries were used to collect data over a period of 28 days, following which each nurse took part in a conversational interview. Comparisons of the roster mean sleep durations between groups show that nurses who do not have the added unwaged workload of child care, record significantly more sleep than nurses with such responsibilities. Analysis of the data by shift type shows a significant difference for afternoon shift: nurses with child care responsibilities record a significantly earlier rise time and a significantly shorter total sleep duration. The interview data further highlights how sleep patterns are related to the time constraints of both domestic and waged work.

### **EFFECTS OF STRESS ON PSYCHOPHYSIOLOGICAL PARAMETERS OF ELECTRICITY DISTRIBUTION NETWORK CONTROLLERS IN UKRAINE**

Natalia BOBKO  
Institute for Occupational Health, Kiev, Ukraine

The purpose was to reveal the effects of stress on the parameters of cognitive performance and cardiovascular system activities in controllers working 12-hour shifts. Sixteen controllers were studied, and altogether 384 subject observations were acquired. A 5-point scale was used to estimate the perceived level of stress experienced by the controllers. Increased heart rate and heart activity-related

haemodynamic parameters were found with an increase in perceived stress. Decreases found in heart rate, circulatory minute volume, and Kerdo's vegetative index over the shift became less pronounced with increased stress. Better attention was found under the average level of stress that was found on the first day shift. An effect of stress on short-term memory was not revealed. As a whole, the most pronounced changes were found during the first day shift and less pronounced changes appeared during the first night shift. Effects of stress were not found in changes of the studied parameters during the second consecutive day or night shift. Thus, increased stress causes the activation of some psychophysiological functions (attention and cardiac activity) that are indispensable for high work efficiency under increased production demands. However, the necessary activation could not be maintained during the second consecutive 12-hour shifts, probably because of accumulated fatigue, and also night work. On the other hand, too high stress may lead to the excessive activation of cardiac activity and deterioration of attention.

### **DAILY AND YEARLY BURNOUT SYMPTOMS IN ISRAELI SHIFT WORK RESIDENTS**

Orna TZISCHINSKY<sup>A, B</sup>, Dov ZOHAR<sup>A</sup>, Rachel EPSTEIN<sup>A</sup>, Nela CHILLAG<sup>A</sup>  
and Peretz LAVIE<sup>A</sup>

<sup>A</sup>Center for Work Safety and Human Engineering, Technion – Israel Institute of Technology, Haifa, Israel, <sup>B</sup>Emek Yezreel Academic College, Emek Yezreel, Israel

Burnout is a syndrome of physical and emotional exhaustion that develops among individuals who are open to public demands. In view of their heavy work load and sleep deprivation, we decided to evaluate the impact of long working hours on burnout and psychological status among a sample of residents during the first 2 years of their residency. Seventy-eight residents participated in the study, all residents completed self-administered questionnaires, and their sleep-wake cycle was monitored by a wrist-worn actigraph for a period of 5-7 days. The questionnaires included a short form suitable for Experience Sampling Method (ESM), and a longer background Questionnaire. The results revealed that sleep duration, Work Load and the interaction between them, explain the Negative Mood the day after the night shift. However, positive mood, and fatigue were not affected by sleep duration or workload. In general, after one year of residency, residents become more stressed, less involved in the job, and had a high level of burnout and psychosomatic symptoms. However, after the second year, the burnout symptoms were almost the same as at the beginning except for the level of stress that remained high. Sleep duration was unrelated to the burnout symptoms.

### **EFFECTS OF SUPERVISOR SUPPORT AND COPING ON SHIFTWORK TOLERANCE**

Anne PISARSKI<sup>A</sup> and Philip BOHLE<sup>B</sup>

<sup>A</sup>School of Management, University of Queensland, Brisbane, Australia, <sup>B</sup>School of Industrial Relations and Organisational Behaviour, University of New South Wales, Sydney, Australia

This study examines the effects of supervisor support and coping on work/non-work conflict and health in shiftwork. It describes a model of shiftwork tolerance that is tested on samples from two populations of shiftworkers. The samples - of nurses and ambulance workers - differed by occupation, gender and shift schedule. Quantitative (survey questionnaire) and qualitative methods (in-depth interviews) were used to triangulate results and to yield richer data on psychosocial variables. Structural equation modelling, using EQS, was used to describe the common path relationships observed within both samples of shiftworkers. The results demonstrated important relationships between social support from supervisors, coping strategies, work/non-work conflict and symptoms that transferred robustly between the two populations of shiftworkers.

### **WORK ACTIVITIES OF PRACTICAL NURSES AND RISK FACTORS FOR THE DEVELOPMENT OF MUSCULOSKELETAL DISORDERS**

Mariana B.L. GONÇALVES, Frida Marina FISCHER, Márcio LOMBARDI JR. and Regiane M. FERREIRA  
 Department of Environmental Health, School of Public Health, University of São Paulo, São Paulo, Brazil

Musculoskeletal and emotional disorders are important causes of reported diseases, causing medical absences, and eventually earlier decrease of work ability. This paper reports the results of a study carried out among practical nurses working at the Orthopedics and Trauma Institute. The objectives of the study were: (a) to describe the routine activities performed during day and night shifts, and (b) to compare the work activities performed in different wards during these shifts. A Brazilian version of the Work Ability Index - WAI (TUOMI et al., 1994) was answered by 83 practical nurses. Forty-three of them (52%) reported pains or musculoskeletal diseases, either based on their own opinion or diagnosed by a physician. These nurses were invited to join the second phase of the study and twenty-nine accepted it. All work activities performed in 29 shifts were observed and recorded. The results showed that day shifts were far more demanding in terms of the number of activities related to patients' care than afternoon and night shifts. Also, body postures associated with day work activities demanded important physical efforts. The number of nurses in charge during night shifts was substantially lower than during day shifts. This could lead to an overload and affect the health of the nurses.

### **CAN WE CONSIDER MEDICAL RESIDENTS AS SHIFT WORKERS?**

Rachel EPSTEIN<sup>A</sup>, Orna TZISCHINSKY<sup>B,A</sup>, Paula HERER<sup>A</sup> and Peretz LAVIE<sup>A</sup>  
<sup>A</sup>Research Center for Work Safety and Human Eng., Technion Haifa, Israel  
<sup>B</sup>Emek Yezreel Academic College, Yezreel Valley, Israel

Although medical residents are characterized by long working hours, night shifts and high levels of work load, it is unclear if their work schedule can be classified as shift work, or if it has a similar impact on residents' well-being. The present

paper compared the profile of complaints about sleep or daytime functioning of medical residents to that of rotating shift workers and day workers, of similar ages. Sixty-one residents (aged:  $32.2 \pm 2.2$  years), after 2 years of residency, participated in the study. The two control groups with a similar age range (26-40 years) were chosen, and included 94 rotating shift workers and 146 day workers. All subjects completed self-administered questionnaires on their sleep habits, and their sleep-wake cycle was monitored by a wrist-worn actigraph. Ten percent of the residents complained about difficulties falling asleep, 34% complained about morning tiredness, 14% complained about mid-sleep awakening, and 20% about prolonged fatigue. The residents slept significantly less than the day workers, and their sleep efficiency was significantly higher. When examining their subjective complaints profile, residents complained more than day workers and their answers were more similar to those of rotating shift workers, therefore they can be considered to be characterized as shift workers.

### **TIME OF DAY TYPE OF FOOD - RELATION TO MOOD AND HUNGER DURING 24 HOURS OF CONSTANT CONDITIONS**

Arne LOWDEN<sup>A</sup>, Ulf HOLMBÄCK<sup>B</sup>, Torbjörn ÅKERSTEDT<sup>A</sup>, Anders FORSLUND, Jeanette FORSLUND<sup>B</sup> and Maria LENNERNÄS<sup>B</sup>

<sup>A</sup>Institute for Psychosocial Medicine/Karolinska Institutet, Stockholm, Sweden

<sup>B</sup>Dep. of Medical Sciences, Nutrition, Uppsala University, Uppsala, Sweden

A six-day high-carbohydrate meal (HC; 65 E% (energy percent) carbohydrates, 20 E% fat and 15 E% protein) and a six-day high-fat meal (HF; 40 E% carbohydrates, 45 E% fat and 15 E% protein) were given to seven healthy subjects in a crossover design. On the last day subjects were kept awake for 24 hours in a metabolic laboratory while substrate utilisation and energy expenditure were measured by indirect calorimetry. The subjects were given isocaloric meals every four hours. Results showed that hunger decreased at night ( $F=4.2$ ,  $p<0.05$ ) and linearly increased after meal intake. Macronutrient composition (fat/carbohydrates) seemed to be of less importance for hunger. Hunger and thirst were found to be strongly associated with gastrointestinal substances, for hunger the strongest being a negative correlation with triacylglycerol (partial correlation=-0.39). It is suggested that it might not be necessary for shift workers to eat full portions at night but that satiation will occur with less food. Possibly lack of adjustment of nocturnal food intake might be one reason why overweight is common in shift work populations.

**A CROSS-SECTIONAL STUDY OF THE HEALTH EFFECTS OF WORK SCHEDULES ON 3212 HOSPITAL WORKERS IN FRANCE: IMPLICATIONS FOR THE NEW FRENCH WORK SCHEDULES POLICY**

Claude-Michèle POISSONNET<sup>A</sup>, Yuriko IWATSUBO<sup>B</sup>, Mireille COSQUER<sup>B</sup>,  
Marie-Antoma

QUERA SALVA<sup>C</sup>, Jean-François CAILLARD<sup>B</sup> and Momque VERON<sup>B</sup>

<sup>A</sup>Service de Médecine de Prévention, Hôpital des Gardiens de la Paix,  
Paris, France,

<sup>B</sup>Service Central de Médecine du Travail de l'Assistance-Publique Hôpitaux de  
Paris, Paris, France, <sup>C</sup>Service de Réanimation Médicale, Hôpital Raymond-  
Poincaré, Garches, France

This study was designed to investigate the effects of work schedules on the health of hospital workers at the Assistance Publique - Hôpitaux de Paris (AP-HP). Out of 40 hospitals, 17 volunteered to participate in this study. The Standard Shiftwork Index and a questionnaire concerning physicians' work schedules were used. Ten thousand questionnaires were distributed anonymously to hospital workers between March and April 1999. Professional categories comprised head nurses, nurses, nursing auxiliaries, hospital agents, midwives and full time physicians. Departments included internal and geriatric medicine, general paediatrics, orthopaedic and general surgery, operating and emergency rooms, and anaesthesiology and intensive care units. 3250 questionnaires were returned. Demographics for the respondents were: 79.2% female, average age  $38.1 \pm 9.1$  years old. Eleven work schedules were identified. One fourth of the personnel had fixed morning work schedules. The highest level of job satisfaction was found in personnel working in paediatrics while dissatisfaction was strongest in the gerontology and, emergency room personnel. General Health Questionnaire (GHQ) scores were high for head nurses, operating room nurses and junior doctors as well as for personnel with rotating and flexible shifts. This study will be used to make recommendations concerning the reduction of working time for French hospital workers.

**SICKNESS ABSENCE AND SHIFT WORK AMONG JAPANESE FACTORY WORKERS**

Yuko MORIKAWA<sup>A</sup>, Katsuyuki MIURA<sup>A</sup>, Masao ISHIZAKI<sup>A</sup>,

Hideaki NAKAGAWA<sup>A</sup>, Teruhiko KIDO<sup>B</sup>, Yuchi NARUSE<sup>C</sup> and Koji NOGAWA<sup>D</sup>

<sup>A</sup>Kanazawa Medical University, Ishikawa, Japan, <sup>B</sup>Kanazawa University, Ishikawa,  
Japan,

<sup>C</sup>Toyama Medical and Pharmaceutical University, Toyama, Japan,

<sup>D</sup>Chiba University, Chiba, Japan

To investigate the effect of shift work on long-term sickness absence (more than 7 calendar days), an 8-year follow-up study was carried out in a factory in Japan. The participants were male employees aged 18-54 years who were engaged in manufacturing sites. Shift patterns were classified by the number of non-daytime working days during the previous one-year. The causes of sickness absence were

classified into three groups, 1) causes except injury, diseases of the musculoskeletal system and connective tissue, 2) injury, 3) diseases of the musculoskeletal system and connective tissue. The analysis of long-term sickness absences was based on the first occurrence. The age-adjusted incidence of sickness absence among shift workers who were on non-daytime shifts more than two-thirds of working days during the previous one year was significantly higher than that among other workers. After adjusting for confounding factors, a significant high risk still existed for this group of workers taking sickness absence for all causes and causes except for injury and the musculoskeletal disorders. These findings suggest that shift workers who are engaged on a particular shift schedule are more likely to take leave due to sickness.

### **COMPARISONS OF PSYCHOSOMATIC HEALTH AND UNHEALTHY BEHAVIORS BETWEEN CLEANROOM WORKERS IN A 12-HOUR SHIFT AND THOSE IN AN 8-HOUR SHIFT**

Yuichi YAMADA<sup>A</sup>, Maki KAMEDA<sup>B</sup>, Yuka NOBORISAKA<sup>A</sup>, Hisa SUZUKI<sup>A</sup>,  
Maki HONDA<sup>B</sup> and Seiji YAMADA<sup>B</sup>

<sup>A</sup>Department of Hygiene, Kanazawa Medical University, Uchinada, Japan,

<sup>B</sup>Panasonic LCD Division, Kawakita, Japan, <sup>C</sup>Matsushita Science Center of Industrial Hygiene, Kadoma, Japan

The General Health Questionnaire (GHQ12) and physical fitness tests were administered to 338 workers in clean rooms producing electronic parts in 12-h shifts. The results were compared to those in 95 workers in 8-h shifts and 284 daytime management, clerical and engineering workers. The 12-h shift workers complained of poor health, dissatisfaction with life and poor recuperation from fatigue more than the 8-h shift workers although the rates of complaints were highest in the daytime workers. The GHQ scores were similar in the two shift groups, and much better than those in the daytime workers. However, the 12-h shift workers showed significantly lower fitness levels than the 8-h shift workers, and the levels were even worse than the daytime workers who had higher mean age and BMI levels compared with the shift workers. The tendency to have sedentary freetime activities and larger alcohol and cigarette consumption were observed in the 12-h shift workers. The 12-h shift work may have contributed to the unhealthy behaviors resulting in lower physical fitness levels. Health promotion services at the workplace should devote greater attention to long-hour shift workers, together with devising the ways to improve working conditions and environments for reducing fatigue at work.

### **HEALTH CONDITIONS OF BUS DRIVERS IN A 6 YEAR FOLLOW UP STUDY**

Giovanni COSTA<sup>A</sup>, Samantha SARTORI<sup>A</sup>, Patrizia FACCO<sup>B</sup> and Piero APOSTOLI<sup>B</sup>

<sup>A</sup>Department of Medicine and Public Health, Verona, Italy

<sup>B</sup>Institute of Occupational Medicine and Industrial Hygiene, Brescia, Italy

The bus drivers of a public bus company, working in a fast rotating 4 shift system from 05.00 to 24.30, were examined in 1993 (230 persons) and 1999 (266 persons). The comparison between the two years showed no significant differences for all the parameters evaluated by the Standard Shiftwork Index and medical examination. In both surveys work organisation was considered “efficient-fairly good” by most workers, who were mostly satisfied with their job. Work load was rated significantly higher for “afternoon” and “morning” shifts, during which most accidents at work and “in itinere” occurred. Night sleep was reduced by 3 hours on “early” shift and about 2 hours on “morning” shifts. The most prevalent health troubles dealt with low back pain, gastritis, headache and haemorrhoids. Neuroticism was the trait more correlated with poorer health conditions, whereas shiftwork exposure appeared as a significant predictor of risk of critical Effort/Reward Imbalance and minor psychological disorders. Both extrinsic and intrinsic efforts significantly increased with age, but not reward. The comparison of the same cohort of 108 persons examined both in 1993 and in 1999 showed a significant increase of low back pain, gastrointestinal troubles, haemorrhoids and lipids disorders.

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## **Theoretical Issues in Ergonomics Science Special Issue: Shift work**

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### **FACTORS INFLUENCING HEALTH OF WORKERS AND TOLERANCE TO SHIFT WORK**

Giovanni Costa

Dipartimento di Medicina e Sanita Pubblica, universita of Verona, Servizio di  
Sorveglianza  
Sanitaria, Istituti Biologici II, Strada Le Grazie 8, 37134 Verona, Italy

*Keywords:* Shift work; night work; individual differences; health; work tolerance.

Shift and night work are a well recognized risk factors for health and well-being, but the outcomes are not always in agreement and sometimes contradictory, due to both different working and living conditions of the groups examined, and to different approaches and methods used. Moreover, variations in historical and epidemiological relevance of the disorders, health perception and surveillance, as well as combined effects with other individual and social risk factors make the problem multifaceted and difficult to interpret properly. Consequently, also tolerance to shift and night work is a complex phenomenon, related to several

aspects pertaining to different domains, dealing with personal characteristics and coping strategies, family and social conditions, working situations and, particularly, working hours organization. The result of their interactions depends not only on the specific load of each factor, but also on their temporal occurrence and duration in the worker's life. Thus, it is necessary to clarify as much as possible the interactions among individual aspects, social conditions and work organization, for an effective promotion of shift workers' health and well-being. The aim of the paper is to review the main factors that can intervene on such aspects trying to present 'lights and shadows' on this context.

## **PARTICIPATORY APPROACHES TO STRATEGY AND RESEARCH IN SHIFT WORK INTERVENTION**

Hans J. Jeppesen

Department of Psychology, University of Aarhus, Asylvej 4, 8240 Risskov,  
Denmark

*Keywords:* Participation; intervention; shift work; shift schedules; health and safety;  
prevention

Participation and alterations of shift schedules from a health and safety perspective are in focus. The paper elucidates the questions concerning what participatory approaches in particular have to give to the design of shift schedules and whether special conditions in shift schedule designing give participatory intervention approaches a special relevance. Reviewing intervention studies in shift work uncovers that a participatory approach is emphasized in several papers but only seldom descriptions of the participatory processes as pre-conditions, stages and dynamics are found. A specific participatory approach is appraised, and examples of general research operationalizations are provided, but it is underlined that it has to take place according to the organizational context of the intervention. In conclusion, it is assessed that shift work contains special issues like differences in attitudes and interests among the employees, negative adaptation, interplay between work time and social time that makes the potentials of participatory intervention research particularly applicable in changing shift schedules.

## **ERGONOMIC CRITERIA FOR THE EVALUATION OF SHIFT SCHEDULES**

MICHAEL KUNDI

Institute of Environmental Health,  
University of Vienna, Kinderspitalgasse 15, A-1095, Vienna, Austria

*Keywords:* Shiftwork: night work; shift schedules; evaluation; health risks.

Evaluation and design of working time arrangements gain importance due to economical changes and overall reduction of working time. Especially outside the industrial area, a variety of innovative arrangement of working time have been established. These processes underline the need for ergonomic criteria for the evaluation and design of shift schedules. There is general agreement that, due to varying side conditions, it is impossible to devise the one best shift schedule. Planning of shift schedules must reconcile diverse intentions and goals. Although the one best shift schedule does not exist, under the pre-condition of certain organizational, staff- and work-related features, different schedules could be ergonomically compared. A proposal is presented based on theoretical consideration following the lines of destabilization theory comprising of 10 comparative laws and 10 related principles for design and evaluation of working time arrangements. Because of varying and complex conditions found in the diverse economical sectors down to single plants and facilities, these principles must be complemented by a co-operative implementation strategy.

## **WORKWARE DECISION SUPPORT SYSTEMS: A COMPREHENSIVE METHODOLOGICAL APPROACH TO WORK-SCHEDULING PROBLEMS**

DONALD I. TEPAS

Connecticut Transportation Institute, University of Connecticut, U-202, Storrs, CT  
06269-5202, USA

*Keywords:* Work schedules; shiftwork; decision support systems; usability; workware; knowledge information systems; flexible manufacturing; continuous operations.

Around-the-clock continuous operations are expanding as global business activity, government de-regulation, flexible manufacturing and lean operation become more common. These developments often require night work, long work hours and/or irregular work schedules. As a result of these requirements, decisions about work schedule assignments are frequently made with little knowledge, information and/or warning. Some of the resulting work-scheduling practices undoubtedly increase operation and worker exposure to health and safety risks. To counter these work-scheduling problems, a comprehensive work schedules knowledge information system is outlined. Within this model, a *Workware Warehouse* is proposed as an Internet gateway where decision support systems are readily and freely available. This model suggests a new paradigm for work-scheduling ergonomics, one where designing, filling and maintaining a *Workware Warehouse* is the primary focus of the human factors professional.

## INTERNAL LOCUS OF CONTROL AND SHIFTWORK EFFECTS

LAWRENCE SMITH and IRENA ISKRA-GOLEC

Shiftwork Research Group, School of Psychology, University of Leeds,  
Leeds LS2 9JT, UK

Chair of Management Psychology and Ergonomics, Institute of  
Management, Jagiellonian  
University, 31-056 Cracow, Poland

*Keywords:* Shiftwork; locus of control; individual differences.

A range of situational, biological and psychological individual differences have been suggested to modify the impact of shift and night work. This paper discusses the development and application of a construct firmly based in the psychological/behavioural domain. The overall aim is to offer a theoretical standpoint with practical implications. Locus of Control theory has an extensive research history. In line with the evolution of thinking about this construct in terms of application in a context-specific sense, this paper describes the origins of internally-oriented Shiftwork Locus of Control (SHLOC) and presents its relationship with typically reported shiftwork-related outcomes. The SHLOC measure has been shown to be psychometrically robust and has demonstrated consistent patterns of relationships with shiftwork related variables that include sleep quality, fatigue, alertness, interference with family and social life, psychological well-being and perceived stress. In general, higher shiftwork-specific internality is associated with more positive outcomes (e.g. better sleep quality, lower fatigue, higher alertness) than lower shiftwork-specific internality. These findings hold true across a range of shiftwork situations and occupational groups. The construct has practical potential as an addition to shiftworker monitoring procedures that may be used to identify those individuals who may be more susceptible to the negative effects of shiftworking and, there by, could benefit from targeted intervention.

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### **Would you like to be one of the future editors of the Shiftwork International Newsletter?**

Shiftwork International Newsletter is the official newsletter of the Scientific Committee on Night and Shiftwork of the ICOH and the Working Time Society (WTS). If you are coming to the Santos meeting in Brazil from the 17th - 21th November, you will automatically subscribe this newsletter for two additional years.

Kazu Kogi and Tsuyoshi Kawakami, who have done an excellent job by publishing the SIN paper version, have now reported that they would like to give up their editorship after the Santos meeting in Brazil.

So, we must look for new volunteers for the SIN editors. Up to now, SIN has included mostly abstracts from shiftwork and working time meetings, as well as news and announcements on issues related to our society, its meetings and different issues related to working hours and well-being. SIN is dependent on the activity (and productivity!) of the WTS members.

If you are interested in volunteering yourself as a future editor for SIN, please contact me BEFORE the Santos meeting on the 17th November. I can also try to answer any practical questions on your future duties by contacting and discussing these questions with the SIN Web-site editors (Johannes Gaertner and Michael Kundi) and the WTS board members.

So, please consider this possibility for international co-operation and please contact me on your plans before the Santos meeting on the 17<sup>th</sup> November !

With kind regards,

Mikko Härmä  
Publications committee, WTS

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## **ORGANISE AND HOST THE XVIII INTERNATIONAL SYMPOSIUM ON NIGHT & SHIFTWORK**

Dear Friends and Colleagues,

The Board of the WTS/ICOH Shiftwork committee is looking for preliminary proposals to organise and host the XVIII Int Symp Night & Shiftwork which should be held 2007. We hope to decide which proposal to accept at the XVI meeting next month in Santos, Brazil.

If you feel that you could offer to organise this 2007 meeting please let me or Don Tepas [<mailto:tepas@rcn.com>] know as soon as possible. I should warn you that it is very hard work, but that the Board would give you as much assistance as they could. The symposia typically attract about 250 researchers from over 30 different countries. In the past groups that have held one of the symposia have undoubtedly increased their international profile!

I should also point out that the XVII symposium (2005) is being organised by Ben Jansen and colleagues in the Netherlands and that we look forward to learning more details in Santos.

Finally, I am sure you will all wish to join me in thanking Frida-Marina Fischer and her colleagues for all the hard work they have done so far in organising the forthcoming (XVI) symposium in Santos!

I look forward to seeing many of you there !  
Best wishes,

Simon Folkard