

ALTERNATING SHIFT-WORK PATHOLOGY

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Abstract: Alternating shift work is a way of time organizing the professional activity of workers or work teams. In alternating shift work, biological overload may occur related to the de-synchronization phenomenon and to the discrepancy between certain functions of the human organism. The non-correlation between the biological rhythm and the professional one may lead to occupational accidents. Cronobiologically speaking, the adaptation of circadian biological rhythms is done progressively over a week and it is also lost progressively.

Rezumat: Munca în schimburi alternante reprezintă o modalitate de organizare în timp a activității profesionale a muncitorilor sau a echipelor de muncitori. În munca în schimburi alternante apar suprasolicitări de ordin biologic legate de fenomenul de desincronizare din cadrul activității profesionale și de neconcordanță între unele funcții ale organismului. Necorelarea ritmului biologic cu cel profesional poate genera accidente de muncă. Din punct de vedere cronobiologic, adaptarea ritmurilor circadiene biologice se face progresiv pe parcursul unei săptămâni de lucru și se pierde de asemenea progresiv.

INTRODUCTION

Alternating shift work is a way of time organizing the professional activity of workers or work teams. In alternating shift work, biological overload may occur related to the de-synchronization phenomenon and to the discrepancy between certain functions of the human organism.(1) Body strain occurs when it passes from one shift to another, as efforts are being made in order to adapt to the biological rhythms.(2)

PURPOSE OF THE STUDY

This article aims at presenting issues related to body strain that occurs when it passes from one shift to another, as efforts are being made in order to adapt to the biological rhythms.

MATERIAL AND METHOD

This approach has been imposed for the following reasons:

- technical – widespread of automated and mechanized production that requires continuous surveillance,
- economic – increasing work productivity by using tools within the 24 hours of the day; higher production needs, employer's desire to avoid additional expenses by hiring more workers, higher production needs, the employees' desire to earn more money, night work being accompanied by financial compensation,
- social – the need for public services for night shifts which provide emergency medical assistance, police, fire, transport etc.

Occupational health issues are related to the correlations and non correlations of the biological rhythms and rhythms of work.(3)

1. Biological rhythms (circadian, monthly, annually) refers to the evolution, curve of certain biological indicators for a clearly defined period of time (core body temperature, heart

rate, respiratory rate, blood levels of certain minerals and hormones).(4)

2. Professional rhythms correspond to the temporal organization of the professional activity (normal work day, night work, alternating shift work).

3. Extraprofessional rhythms required by the social, family needs.

The physiological mechanism of variations of different physiological functions during the day has at its basis the conditioned reflex connections formed during life in the processes of adaptation to the external environmental conditions. Alternating shift work rate reverses the normal wake-sleep cycle. Normally, the biological rhythms (blood pressure, heart rate, respiratory rate, core temperature, serum calcium, excitation-inhibition cortical processes) are in accordance with the day work, especially with that performed in the morning, in shift I.(5)

When moving from one work shift to another, the body is being overstressed because:

- efforts are being made by the body to change to the new professional rhythm (requiring a change in the biological and circadian rhythms);
- efforts are made to maintain these new adaptations during the reverse shift;
- efforts are being made when reversing from night shift in the morning shift.

The average adjustment time is 5 day on average, time necessary from the biological point of view in order that the adrenal secretion glands to reverse.(6) Biological rhythm synchronization to the new professional rhythm is correlated with:

- type of professional activity: employees engaged in predominantly musculoskeletal osteoarticular work adapt more easily than those who performed professional activities that are predominantly sensory;

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- age – young workers adapt more easily than the older ones;
- sleep – physiological and psychological functions synchronize with the new professional rate depending largely on achieving a satisfactory diurnal sleep for those working in the night shift, both quantitatively (number of hours of sleep) and qualitatively (deep sleep, regardless of noise environment).

The sleep that meets these characteristics is related to the type of occupation, age. Deep sleep, with high recovery capacity is observed mainly in the young people, the quality of sleep is lost with age (this explains why older workers adjust to alternating shift work harder). Easy sleep with low recovery capacity is seen in workers in control, supervision, decision making positions, so activities requiring higher human functions. Night work is defined by the Labour Code as the work performed between the hours of 22:00 and 6:00. Night work is the work performed at least 3 hours during the working day or at least 30% of monthly working time (article 122). Young people under 18 cannot perform night work, and pregnant women and nursing confined women are not obliged to perform night work (article 125).(4)

Health effects:

- neuro-psychiatric effects: immediate cognitive impairment – reduced alertness, ability to adapt to new situations, decreased mental performance, especially complex mental processes involving many variables, with an increased number of errors and increased response time to stimuli memory impairment – also resulting in an increased risk of accidents at work.(7)
- late neuro-psychological effects: sleep debt, fatigue cumulative tiredness to exhaustion, sleep disturbances (difficulty falling asleep, restless sleep and superficial, fatigue on awakening), the consequence is the abuse of coffee, work incentives, sedative or hypnotic drugs for the sleep period.

Pathology related to alternating shift work:

1. Disorder of sleep – in terms of quality and quantity. There is a significant link between insomnia and work absenteeism. The effects of alternating shift work on sleep are worker-specific. This link is prominent in 60% of workers working at night, as well as in 11% of those who work only in the morning shift.

The ability to adapt depends on:

- the satisfaction offered by this type of work (better salary etc.);
 - the acceptance of family;
 - the well-being resulting from alternating shift work.
2. Chronic fatigue and sleepiness.
 3. Neuro-psychiatric disorders (irritability, nervousness, decreased alertness, dizziness, headache, depressed mood, anxiety) that occur or exacerbate when moving from one shift to another. The frequency is of 70%, compared with 53% for those who work only in the morning shift. These are commonly encountered in the elderly.(9)
 4. Digestive disorders and weight gain (dyspepsia, epigastralgia, regurgitation, flatulence, anorexia, constipation) or stress occurring when moving from one shift to another. Their frequency varies between 45-72%. It is observed in young workers. In their pathogenesis, an important role is played by the meal hours' gap, which in turn, modifies the gastric secretion and the appetite. In the night shift, food errors have been found, such as: exclusive consistent intake, excess coffee to increase work capacity.
 5. Increase of cardiovascular risk through metabolic changes and intervention of other co-factors: inactivity, obesity, metabolic syndrome.

6. Effects on the reproductive system (especially in women), reduced fertility, miscarriages, fetal growth retardation and prematurity.
7. Release and/or exacerbation of preexisting chronic diseases (cardiovascular, gastrointestinal, mental etc.).
8. Early aging.
9. Breast cancer (International Centre for Research on Cancer CIRC/IARC rated the work associated with the disruption of the circadian cycles in the second category, that is high risk for cancer).

RESULTS AND DISCUSSIONS

For a better adaptation to this type of work, it is necessary that an employee be given the choice of whether or not to work in night shifts. It takes the human body about a week to regulate the circadian rhythm, but this progress is also lost when the person alternates from night to day or vice versa. Successive cycles within 2-3 days of work are recommended.(6) During the night, physical tasks are better supported and performed than the intellectual ones, so the inclusion of fewer complex mental tasks in the night shifts is recommended, given the risk of errors and accidents. Exposure to bright light (60 lux at the workplace) allows vigilance maintenance and sleepiness delay (via inhibition of melatonin secretion).(2) Eating three balanced meals, limiting caffeine intake (coffee, cola, tea) and taking a light meal 3-4 hours after the beginning of the shift will improve vigilance; keeping a regular schedule regarding bedtime and awakening hours, maintaining a sleep duration of at least 5-6 hours a night after work and creating an environment conducive to sleep are recommendations to be taken. The most common is the weekly rotation, most physiologists agree that this schedule does not allow workers to adjust their physiological rhythm of waking periods required as the minimum adjustment range is 4-5 days and this increases with age, resulting in a great degree of fatigue.(8) The lack of correlation between the biological rhythm in a professional environment can ultimately lead to accidents. They occur for technical reasons or by decreasing attention and/or other higher brain functions due to sleep disorders, chronic fatigue or circadian rhythms change. Toxins present in the working environment can alter the circadian rhythms and thus biological events may occur: decreased working capacity, indifference etc., passing from reversible functional disturbances to pathological manifestations.

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