

ASSOCIATION BETWEEN CHRONOTYPE AND SOCIAL FACTORS IN SHIFT WORKERS

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ABSTRACT

Most biological and behavioral parameters are synchronized to 24-hour periods by light/dark cycle. Subjects who live under the same environmental conditions can present individual differences that affect the expression of circadian rhythm. Thus, this study identified and analyzed the association between chronotype with sociodemographic variables and the different work shifts. The study was about shift workers from a wholesale company in Poços de Caldas, Brazil. The following tools were used: sociodemographic characteristics and Munich Chronotype questionnaire. Ninety-four shift workers participated in the study. About 40.43% of shift workers had the chronotype moderately morning, followed by the intermediate type. It was also demonstrated that there is a significant association between sociodemographic variables and shift with different chronotypes. The study observed with this work that there are significant associations between age, marital status, having children and working shifts with determining chronotype these workers, and the morningness subjects are working on the night shift. These individuals may become vulnerable to diseases related to sleep deprivation, such as depression, low immunity, hypertension and obesity.

KEYWORDS: Shiftwork, Circadian rhythm, Morningness /Eveningness, Sleep, Workers

INTRODUCTION

Chronobiology is a specific scientific area that studies biological rhythms according to daytime variations due to the endogenous regulation of the circadian system, which is influenced by environmental light/dark changes. The most important structure of this system is the suprachiasmatic nucleus (SQN) located in the hypothalamus, where the biological clock is (Campos et al., 2001).

Most biological and behavioral parameters are synchronized to 24-hour periods by light/dark cycle (Pedrazzoli et al., 2007). Therefore, subjects who live under the same environmental conditions can present individual differences that affect the expression of circadian rhythm, such as different phase relations on zeitgeber period (Ronneberg et al., 2003).

Individual preferences on sleeping habits or the best time to perform activities are associated with chronotypes, which are considered a personal trace, in which the circadian phase can be shown by body temperature minimum change before waking up, which occurs earlier on the morningness

chronotype than on the eveningness Adan & Natale, 2002; Adan & Sanches, 2001).

Study Objectives

The present study aimed to identify the chronotype of the shift workers of a wholesale company, to assess the worker sleep during working days and off days and also to verify the associations between sociodemographic variables and the different work shifts with the chronotypes.

MATERIALS AND METHODS

Study Design and Subjects

A descriptive, quantitative and exploratory study was carried out with shift workers in a wholesale company (manufactured products) in Poços de Caldas, Brazil. The amount of 109 shift workers was invited to participate in the study, but only 94 met the inclusion criteria. The work was divided into three shifts: the first starting at 07h45min and finishing at 18h45min; the second starting at 14h and finishing at 23h30min; and the night shift starting at 18h and finishing at 3h on the next day, subjects had preference for night shift due to the increase in salary. The study was approved by the Research Ethics Committee of the Faculty of Medical Sciences at the State University of Campinas - UNICAMP, Brazil, protocol number 890/2010. The study did not sample analysis, and the sample was a convenience.

Protocol

Demographic data were collected using structured questionnaire and chronotype identified by the Munich Chronotype Questionnaire (MCTQ) (Ronneberg et al., 2003).

The MCTQ was used to analyze the actual timing of daily sleep (and activity). It is a tool to collect primary sleeping times, such as go to bed and wake up times, plus the time becoming fully awake, as well as sleep latency and inertia. The MCTQ also asks the subjects to rate themselves in one of the seven following chronotypes: extreme early, moderate early, slightly early, normal, slightly late, moderate late, extreme late (Ronneberg & Mellow, 2003). The significance level for the statistical test was 5% (Conover, 1971; Levandovski, 2011).

Statistical Method

The study used Statistical Package for software SPSS, version 17.0. Tests performed included normality tests (Kolmogorov and chi-square) and Fisher's Exact Test ($p < 0.05$) on nonparametric variables.

RESULTS

The individual characteristics were as follows: male gender with ages between 25 and 45 years (56.38%), marital status: 51.06% married and 50% of them have children. Approximately 64.89% of workers reported having leisure

time, 63.83% said they do some kind of physical activity and 15.96% of workers were reported as being smokers.

The work shift from 18h to 3h was what had greater representation of workers (48.94%), and working days of 5 days had a higher percentage (56.38%) (Table 1). Age, marital status, to have children or not, and shifts worked had significant association with ratings of the questionnaire MCTQ and are described in Table 2.

Figure 1 shows that the average sleep duration in working days is less than the median duration of sleep on off days, showing a deficit in sleep hours for most workers.

Table 1: Individual characteristics of shift workers

Variables		N	%
AGE (YEARS)	<25	30	31
	>25-45	53	56.38
	>45	11	11.70
Marital status	Married	48	51.06
	Single	42	44.68
	Divorced	3	3.19
	Widower	1	1.06
Leisure activity	No	33	35.11
	Yes	61	64.89
Physical activity	No	34	36.17
	Yes	60	63.83
Children	No	47	50
	Yes	47	50
Shift work	07h45min – 18h45min	31	32.98
	14h – 23h30min	17	18.09
	18h – 3h	46	48.94
Days worked per week	05	53	56.38
	06	39	41.49
	07	02	2.13
Smoker	No	79	84.04
	Yes	15	15.96
Total		94	100

Table 2. Distribution of individual characteristics associated with chronotype according to MCTQ

Variables		Extreme Early %	Moderate Early %	Normal %	Moderate Late %	p-values
Age (year)	<25	3.33	20.00	50.00	26.67	<0.0001
	25-45	7.55	49.06	37.74	5.66	
	>45	36.36	54.55	9.09	0.00	
Marital status	Married	14.58	52.08	31.25	2.08	0.0014
	Others	4.35	28.26	45.65	21.74	

Children	No	6.38	25.53	46.81	21.28	0.0011
	Yes	12.77	55.32	29.79	2.13	
Shift work	7h45min-18h45min	9.68	61.29	12.90	16.13	0.0115
	14h-23h30min	5.88	23.53	58.82	11.76	
	18h-3h	10.87	32.61	47.83	8.7	

Fisher's Exact Test ($p = <0.05$)

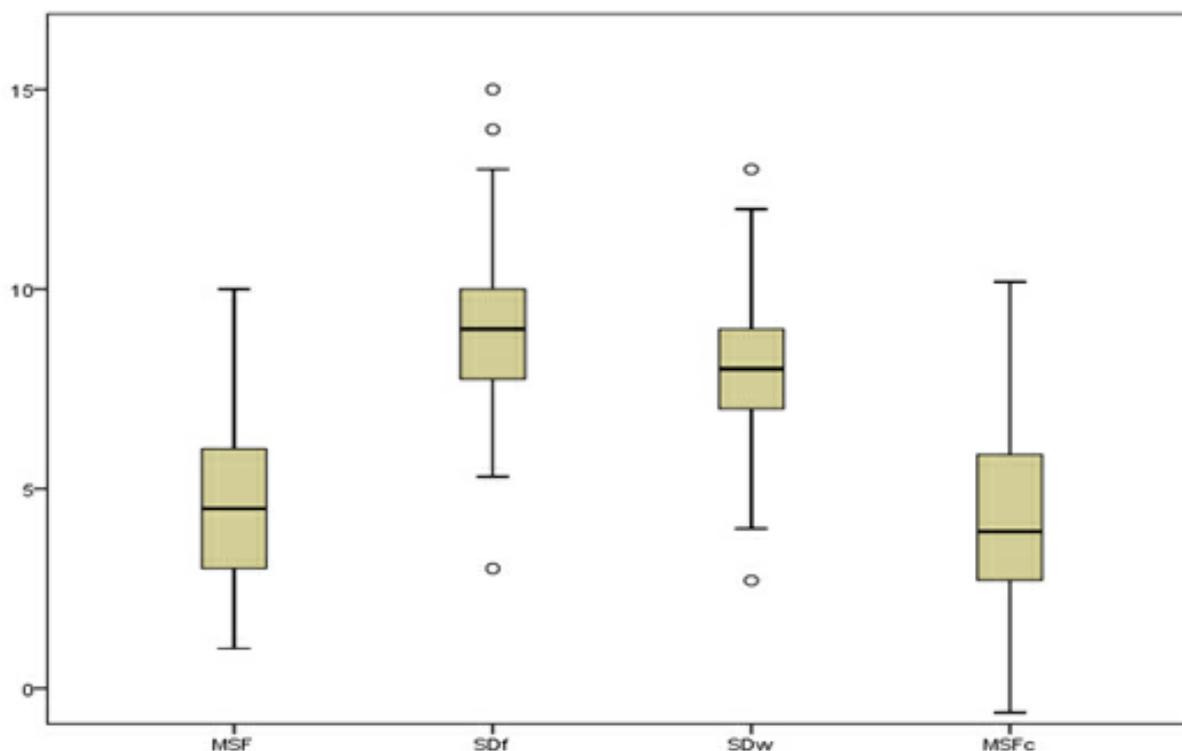


Figure 1. Distribution of midpoint of sleep on free days, with no correction (MSF); Sleep duration in days off (SDF); Sleep duration in working days (SDw); Corrected midpoint on free days (MSFc).

DISCUSSION

The analysis using MCTQ showed that age is a significant factor, since most subjects older than 45 years were classified as morningness chronotype. Aging could be associated with sleeping early at night, a shorter phase of sleep, and waking up earlier than usual, showing a morningness trend when the subjects are getting older (Carrier et al., 1997). The subjects who were married or had children showed significant answers, being classified as moderate morningness.

Regarding the shift work, the questionnaires used showed different results on the chronotype classification. According to Zavada et al. (Zavada et al., 2005) the evaluation of shift work chronotype, in the working days and the off days should be considered separately, as well as time and exposure to light. These factors are important for the evaluation of shift workers sleep. Moreover, MCTQ showed that the debt is accumulated sleep on weekdays, reinforcing its use in shift workers.

When the association between chronotype and variable shift work was studied, the results showed that chronotypes match the shift worked, i.e., the highest percentage of individuals with intermediate chronotype is the period from

14h to 23h30, individuals moderate morning in the period of 7h45min to 18h45min. However, when considering the chronotype third shift workers (18h - 3h), observed percentage of individuals with moderate morning and intermediate chronotype. This profile indicates that a number of workers considered is developing its activity in shift work that does not suit their chronotype calling attention to major health care of the same, since this behavior influences the natural physiological characteristics of the human body and can interfere with health workers.

CONCLUSIONS

It was observed with this work that the morningness subjects are working on the night shift. These individuals may become vulnerable to diseases related to sleep deprivation, such as depression, low immunity, hypertension and obesity. Thus, it is extremely important for the development of actions to promote health in the workplace. It is emphasized that the MCTQ was efficient for research in shifts.

Recommendations for further studies

The development of actions to promote health in the workplace, we suggest that future research explore the

actions of employees in these companies' shifts.

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