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Abstract

Sleep Patterns and Morning Heart Rate Variability Among Daytime Workers in Korea

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Objectives: This study was performed to evaluate the sleep patterns in a population of Korean labor workers and to assess the activity of the autonomic nervous system in relation to sleep habits.

Methods: A sampler of 1238 daytime workers (male 911, female 327) completed questionnaires on sleep habits and their short term heart rate variability(HRV) was also examined. We used the SA-2000 (medi-core) instrument for 5 minutes for each participant in the morning and performed basic physical examinations including height, weight, and blood pressure.

Results: Bed time and wake up time were negatively correlated with age, while the frequencies of waking up through the night and in the early morning showed positive correlation with age. We found that bed time and wake up time during weekdays, sleep latency during weekdays, frequency of waking up through the night, and the degree of sleepiness all varied significantly according to the average nightly amount of sleep within the last week. There was a positive correlation between wake up time at weekdays with mean heart rate. However, the other variables of sleep habits and pattern did not show significant correlation with HRV.

Conclusion: Among Korean daytime workers, sleep phases become advanced with aging. In spite of the aging processes, general sleep health seems to be maintained among the healthy worker group. However, short-term HRV was not useful parameter to measure the alternation of autonomic nervous system resulting from the difference of sleep habits and pattern.

Key Words: Sleep, Heart Rate Variability(HRV), Daytime workers

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(Synopsis of Psychiatry, 1988).

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(Synopsis of Psychiatry, 1988).

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(Synopsis of Psychiatry, 1988),

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가 , 가 18 65

(Nakata et al., 2005; Metlaine et al., 2005).

가 5

가 HRV

(Choi , 1992; Jung & Shon, 1996; Sohn , 1997; Yang 1997; Yoon , 1999; Hong , 2000; Song , 2000; Ohayon & Hong, 2002).

가 1238

241 (19.47%) 997 (80.53%),

가 , 가

(Heart Rate Variability; HRV)가

2.

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(Pomeranz et al.,1985). SA-2000E(medi-core, 2002)

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(Verrier et al., 1996), (Penzel et al., 2000) (Hall et al., 2004)가

가 (Kageyama et al., 1998)

SDNN(Standard Deviation of all normal R-R interval), LF(Low Frequency component), HF(High Frequency component) , LF HF

가 가

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9 p<0.05) 1

Epworth Sleepiness Scale(Johns, 1991) (Appendix 1).

3. 가 30 27.7%
 32.8% 25.8%
 (chi-square test, p=0.052).

SPSS-windows(version 11.5) 40 31.8%가 가 30
 22.3% 40
 (chi-square test, p<0.01).

HRV Table 2 1
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1. 가 6 30 7 30 6 30 BMI(Body Mass Index)가

911 , 327 , 2.
 42.24±9.15 (: 42.48±8.89 , :
 41.56±9.80) 가 HRV
 Table 1

r= .1210(p= .006)
 (Table 3).

가 1 (r=-0.231, p<0.01),
 (r=-0.226, p<0.01), (r=-
 0.244, p<0.01), (r=-0.439, p<0.01)
 (r=0.093, p<0.01) (r=0.162, 23 34
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Appendix 1. Epworth Sleepiness Scale

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Table 1. Comparison of variables showing sleep habits between male and female

	Male (n=911)	Female (n=327)	Total (N=1238)
weekdays			
Bed time (O 'Clock hour:min)	23:32 ± 1:32*	23:40 ± 2:10	23:34 ± 1:43
Sleep latency (min)	18 ± 34	23 ± 32	19 ± 34
Wake up time (O 'Clock hour:min)	6:29 ± 1:24*	6:47 ± 2:09	6:34 ± 1:39
weekend			
Bed time (O 'Clock hour:min)	23:33 ± 1:32*	23:41 ± 2:11	23:35 ± 1:43
Wake up time (O 'Clock hour:min)	7:33 ± 1:46	7:45 ± 1:45	7:36 ± 1:46
Estimated sleep time (hour:min)	6:56 ± 1:04*	7:02 ± 1:10	6:58 ± 1:06
Waking up at night (frequency/last week)	0.97 ± 1.02*	1.12 ± 1.16	1.01 ± 1.03
Early morning awakening (frequency/last week)	2.00 ± 1.35	2.10 ± 1.50	2.06 ± 1.40
Scores of ESS	14.46 ± 3.75	14.22 ± 3.73	14.40 ± 3.74

Mean ± SD

ESS : Epworth Sleepiness Scale

*p < 0.05(t-test)

Table 2. Measurement of ANCOVA of sleep time group

	F	P	Post-hoc*
weekdays			
Bed time (O 'Clock hour:min)	20.61	<0.01	B,C
Wake up time (O 'Clock hour:min)	10.67	<0.05	A,B,C
Sleep latency (min)	0.85	<0.05	A
Waking up at night (frequency/last week)	0.31	n.s.	
Early morning awakening (frequency/last week)	2.10	n.s.	
Scores of ESS	0.54	<0.05	A
BMI (kg/m ²)	0.81	<0.05	A
Systolic BP(mmHg)	0.12	n.s.	
Diastolic BP(mmHg)	0.21	n.s.	
MHR(beats/min)	0.70	<0.01	B,C
SDNN(msec)	4.48	n.s.	
LF/HF ratio	0.45	n.s.	
Ln LF(msec ²)	3.70	n.s.	
Ln HF(msec ²)	3.69	n.s.	

ESS : Epworth Sleepiness Scale, BMI : Body Mass Index, MHR : Mean Heart Rate, SDNN: Standard deviation of all normal R-R interval, LF: Low Frequency component, HF: High Frequency component, Ln : natural logarithm

Group1 : <6 hours and a half (n=459)

Group2 : 6 hours and a half -7hours and a half (n=486)

Group3 : >7hours and a half (n=293)

*The post-hoc test was done by least significant difference between Group1, Group2 and Group3 after ANCOVA(covariate : age)

A : significant difference between Group 1 and Group 2(p<0.05)

B : significant difference between Group 1 and Group 3(p<0.01)

C : significant difference between Group 2 and Group 3(p<0.01)

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 27.7% Vorona (2005) 가
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 Quan(1987) 가 (ACNielsen, 2005)
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 HRV
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 가 (time domain analysis methods)
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Table 3. Partial correlation coefficients controlling age between variables showing sleep habits and HRV

	Bed time at weekdays	Wake up time at weekdays	Sleep latency at weekdays	Frequency of waking up through a night within the last week
MHR	-0.055	0.121**	0.082	0.002
SDNN	0.053	-0.069	-0.012	-0.012
LF/HF ratio	0.003	0.001	-0.061	-0.070
Ln LF	0.045	-0.048	-0.010	-0.072
Ln HF	0.315	-0.041	0.035	0.015

MHR : Mean Heart Rate, SDNN: Standard deviation of all normal R-R interval, LF: Low Frequency component, HF: High Frequency component, Ln : natural logarithm

*: p < .05, **: p < .01

NN (standard deviation of the NN interval, SDNN) . SDNN RR

HRV , HRV

() (Woo, 2004). (High

가 가 가

Frequency component, HF), (Low Frequency component, LF) . HF 0.15 - 0.4Hz

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HF

HF

(Heart Math Research Center, 1996). LF 가

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(John,

(Friedman & Thayer, 1998; Task Force of The European Society of Cardiology and The North American Society of Pacing and Electrophysiology, 1996).

1971).

가

(ambulatory sleep monitor)

가

$r = .1210(p = .006)$

LF/HF ratio Ln LF, Ln HF

SDNN,

가 Hall

(2004)

가

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가

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LF/HF ratio가 가

Kageyama (1998) 223

가

HRV

HRV

Kageyama (1998)

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