

교대근무지에서 야간 광 노출에 따른 수면양상 및 기분상태 변화

Changes in Sleep Patterns and Mood States of
Shift Workers Following Nocturnal Light Exposure권기범¹ · 윤인영¹ · 강상범¹ · 정도연²Ki-Bum Kwon,¹ In-Young Yoon,¹ Sang-Bum Kang¹ and Do-Un Jeong²

■ ABSTRACT

Objectives: We intended to observe changes in sleep patterns and mood states of night - shift workers following light exposure. We also estimated the degree of tolerance of light exposure. By studying these, we investigated the possibility of applying light therapy to night - shift workers for improving their adaptation.

Methods: Twelve night - shift nurses working at Yong - In Mental Hospital volunteered to participate in this study. The study consisted of 3 parts : 1) night - shift control study ; 2) light exposure study ; 3) day - shift control study. All the nurses accomplished 3 parts of the study, each of which continued for 3 days, except one nurse who did not participate in day - shift control study. During light exposure study, nurses were exposed to bright light for 4 hours from 1AM to 5AM. Sleep patterns were evaluated with wrist actigraphy and automatic sleep analysis program. Mood states and side effects of light exposure were assessed with self - report scales.

Results: Sleep period time, total sleep time, and sleep efficiency were increased following light exposure compared with night - shift control study. Light exposure study showed no difference from day - shift control study in above - mentioned sleep parameters. Daily fluctuation of sleep efficiency was less prominent during light exposure study than during night - shift control study. During light exposure study, the subjects felt more elated and energetic in the evening after daytime sleep than during night - shift control study. None of the subjects complained of severe side effects related to light exposure on the third day of light exposure. Tolerance of side effects was noted to develop with the repetition of light exposure.

Conclusion: Light exposure improved the daytime sleep of night - shift workers to the level of normal nighttime sleep, making the subjects more elated and energetic. Side effects of light exposure were found to be tolerable. Light exposure seems to be safely applicable to night - shift workers for their adaptation. **Sleep Medicine and Psychophysiology 1999 ; 6(1) : 68-75**

Key words: Light exposure · Sleep patterns · Mood states · Light exposure side effects.

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(01 - 1995 - 160 - 0)

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연구대상 및 방법

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6) 광노출 부작용에 관한 평가 (eye irritation), (irritability), (mood elevation), (tension) (17)가 30가 10가 3가

7) 통계적 분석 SPSSPC ver. 8.0 (repeated measures ANOVA) paired t - test 3 3 (two - way repeated measures ANOVA) 4가 8가 8가 (semantic differential feeling and mood scales, SDFMS)(16)가 (elated - depressed), (relaxed - anxious), (confident - unsure), (energetic - fatigued), (good natured - grouchy) 5가 3가 7 5 3 3 5, 1 7 (1). 7.1 (±5.4), 6.2 (±5.2), 3.7 (±3.0) 304 (±65), 394 (sleep latency, SL), (sleep period time, SPT), (±94), 411 (±74) (total sleep time, TST), (sleep efficiency, SE) 가 (p<0.05). (p<0.05) 3 가 3 가 280 (±74), 376 (±56), 394 (±62)

3) 주간근무 대조연구 3 3

4) 기분상태 평가 4가 8가 8가 (semantic differential feeling and mood scales, SDFMS)(16)가 (elated - depressed), (relaxed - anxious), (confident - unsure), (energetic - fatigued), (good natured - grouchy) 5가 3가 7 5 3 3 5, 1 7 (1). 7.1 (±5.4), 6.2 (±5.2), 3.7 (±3.0) 304 (±65), 394 (sleep latency, SL), (sleep period time, SPT), (±94), 411 (±74) (total sleep time, TST), (sleep efficiency, SE) 가 (p<0.05). (p<0.05) 3 가 3 가 280 (±74), 376 (±56), 394 (±62)

Table 1. Comparison of sleep parameters among 3 studies

| Subjects | SL (Min) | | | SPT (Min) | | | TST (Min) | | | SE (%) | | |
|----------|----------|------|-----|-----------|-----|-----|-----------|-----|-----|--------|------|------|
| | NC | LE | DC | NC | LE | DC | NC | LE | DC | NC | LE | DC |
| 1 | 9 | 5 | 0.8 | 344 | 375 | 367 | 320 | 375 | 341 | 89.8 | 98 | 91.8 |
| 2 | 20 | 12 | 2.2 | 208 | 448 | 456 | 207 | 361 | 450 | 89.2 | 81 | 97.9 |
| 3 | 3.7 | 3.3 | 3.7 | 310 | 418 | 396 | 301 | 417 | 389 | 88.3 | 98.4 | 96.8 |
| 4 | 12 | 13 | 10 | 461 | 513 | 563 | 405 | 477 | 476 | 86.2 | 89.6 | 82.7 |
| 5 | 10 | 1.3 | 8.3 | 259 | 406 | 341 | 238 | 396 | 339 | 90.5 | 96 | 96.2 |
| 6 | 7.3 | 16.3 | 2 | 169 | 255 | 334 | 135 | 252 | 308 | 78.7 | 91.4 | 90.7 |
| 7 | 2 | 2.7 | 2.2 | 275 | 402 | 315 | 267 | 398 | 314 | 87 | 96.9 | 98.1 |
| 8 | 3 | 2.7 | 2.2 | 362 | 424 | 484 | 340 | 401 | 471 | 90.6 | 93.4 | 96.7 |
| 9 | 2.7 | 5.3 | 2 | 245 | 337 | 412 | 241 | 331 | 403 | 96.3 | 96.3 | 96.9 |
| 10 | 3 | 8.7 | 6 | 296 | 385 | 404 | 286 | 372 | 397 | 94.6 | 94.4 | 96 |
| 11 | 5.7 | 1.7 | 1.3 | 414 | 372 | 448 | 340 | 355 | 444 | 80.9 | 95.3 | 98.5 |
| Mean | 7.1 | 6.5 | 3.7 | 304 | 394 | 411 | 280 | 376 | 394 | 88.4 | 93.7 | 94.6 |
| S.D. | 5.4 | 5.2 | 3.0 | 65 | 94 | 74 | 74 | 56 | 62 | 5.2 | 5.0 | 4.7 |

SL: sleep latency, SPT: sleep period time, TST: total sleep time, SE: sleep efficiency, S.D.: standard deviation, NC: night-shift control study, LE: light exposure study, DC: day-shift control study

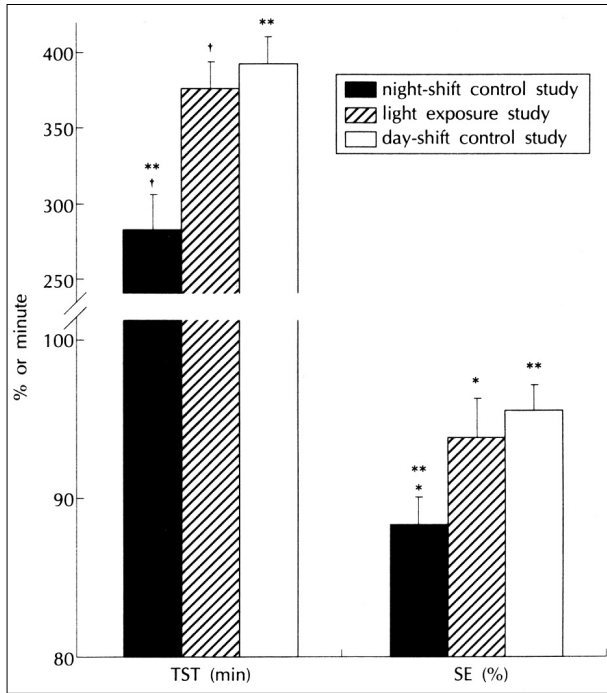


Fig. 1. Comparison of sleep parameters among 3 studies. TST: total sleep time, SE: sleep efficiency. * $p < 0.05$, ** $p < 0.01$, † $p < 0.01$.

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 (± 5.2), 93.7% (± 5.0), 88.4%
 94.6% (± 4.7)

($p < 0.05$)
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Table 2. Mean daily changes of sleep parameters between 2 studies (N = 12)

| Sleep parameters | Night-shift control study | | | Light exposure study | | |
|------------------|---------------------------|------------|-----------|----------------------|-----------|-----------|
| | Day 1 | Day 2 | Day 3 | Day 1 | Day 2 | Day 3 |
| SL(Min) | 10.7(14.5) | 9.6(11.9) | 7.1(10.7) | 8.9(12.5) | 3.8(4.1) | 7.8(7.0) |
| SPT(Min) | 320(112) | 283(84) | 296(113) | 423(103) | 363(120) | 395(79) |
| TST(Min) | 302(107) | 252(76) | 273(87) | 404(96) | 349(101) | 378(70) |
| SE(%) | 88.1(9.9) | 84.4(13.0) | 90(7.3) | 93(7.3) | 93.9(6.9) | 92.9(5.2) |

SL: sleep latency, SPT: sleep period time, TST: total sleep time, SE: sleep efficiency
Numbers in parenthesis denotes standard deviation

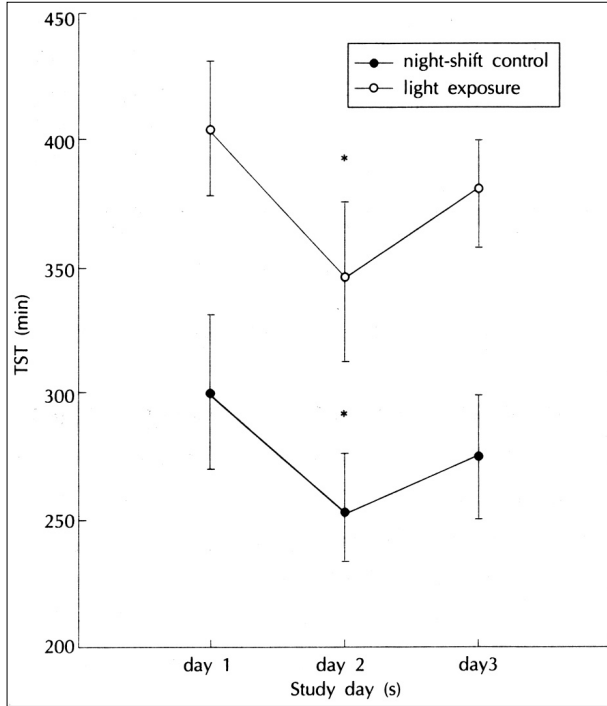


Fig. 2. TST changes in relation to study days and light exposure. TST: total sleep time, * $p < 0.05$ between night-shift control study and light exposure study.

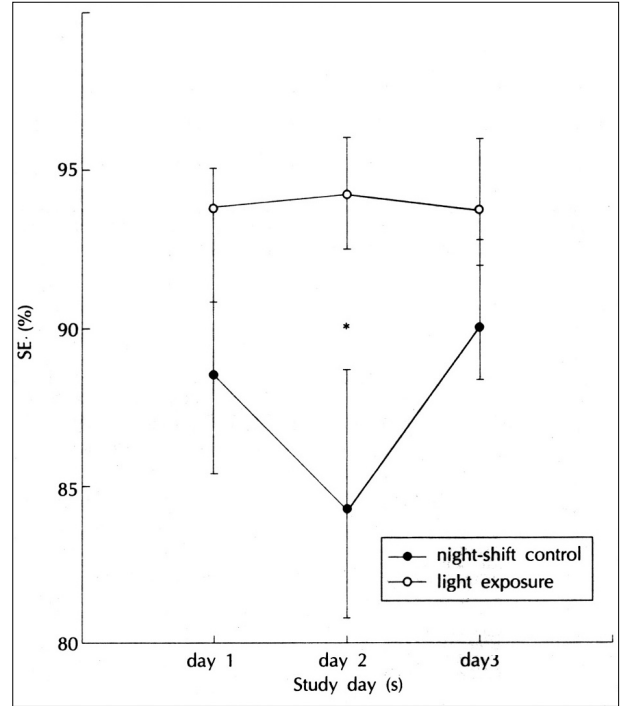


Fig. 3. SE changes in relation to study days and light exposure. SE: sleep efficiency, * $p < 0.05$ between night-shift control study and light exposure study.

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4. 광 노출에 따른 부작용

3 3 가
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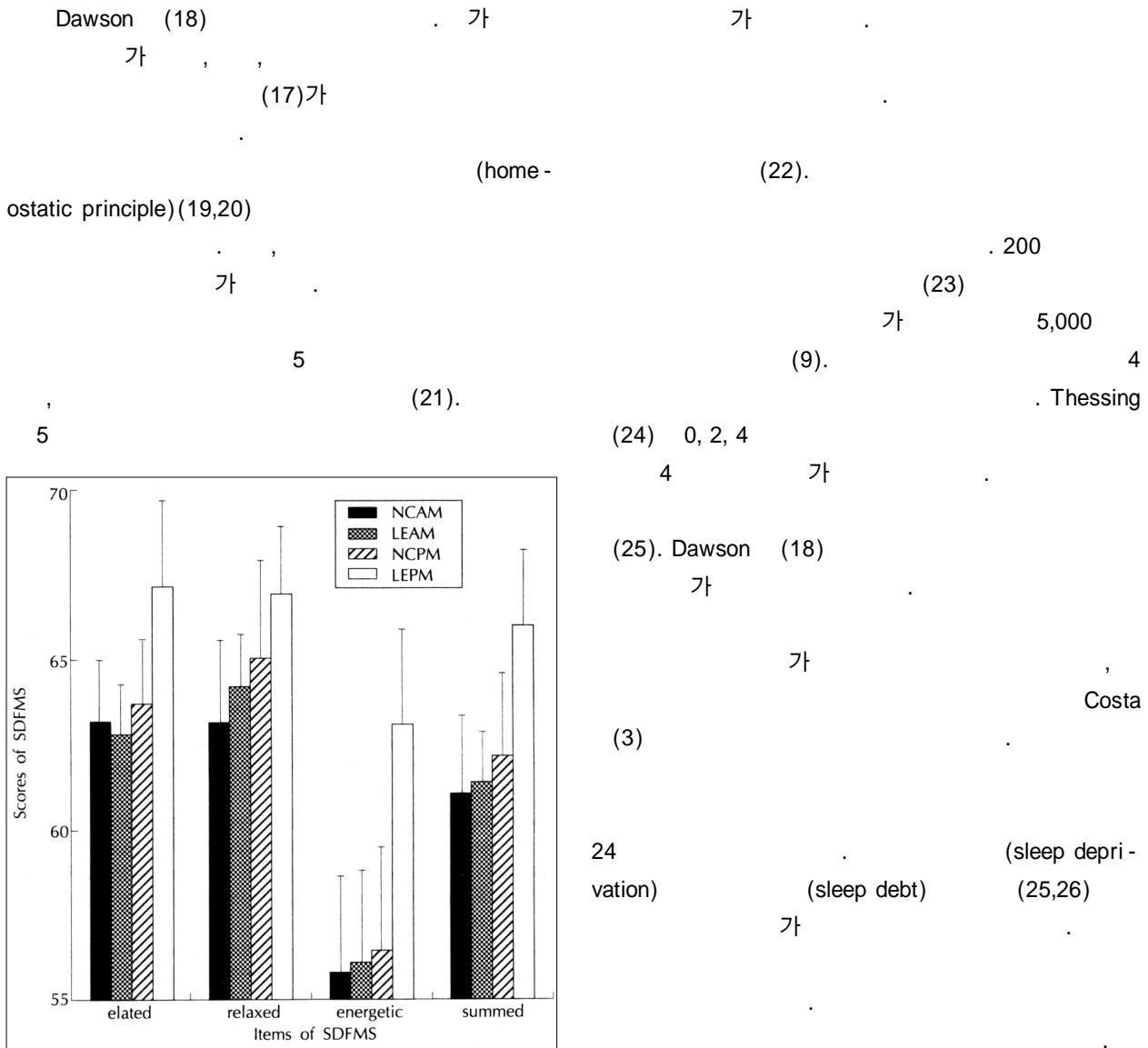


Fig. 4. Mood changes during light exposure treatment. Mood states were scored by the use of SDFMS at 8PM and 8AM. SDFMS: semantic differential feeling and mood scales, NC: night-shift control study, LE: light exposure study, AM: 8AM, PM: 8PM.

Table 3. Frequency and severity changes of light exposure side effects

| | Severe | | Tolerable or minimal | | None | |
|----------------|--------|-------|----------------------|-------|-------|-------|
| | Day 1 | Day 3 | Day 1 | Day 3 | Day 1 | Day 3 |
| Eye irritation | 1 | 0 | 9 | 9 | 2 | 3 |
| Headache | 1 | 0 | 6 | 5 | 5 | 7 |
| Nausea | 1 | 0 | 4 | 4 | 7 | 8 |
| Fatigue | 1 | 0 | 9 | 8 | 2 | 4 |
| Irritability | 0 | 0 | 6 | 5 | 6 | 7 |
| Dizziness | 1 | 0 | 6 | 2 | 5 | 10 |
| Mood elevation | 0 | 0 | 1 | 0 | 11 | 12 |
| Tension | 0 | 0 | 0 | 2 | 12 | 10 |

Numbers denote numbers of subjects who complained of side effects

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