THE 24-H VARIATION OF MOOD DIFFERS BETWEEN MORNING-TYPE AND EVENING-TYPE INDIVIDUALS

Gerard A. Kerkhof
Departments of Physiology and Psychology,
University of Leiden,
The Netherlands

INTRODUCTION

Evidence is accumulating in favor of a 24-h variation of mood, driven by an endogenous circadian pacemaker, presumably located in the suprachiasmatic nucleus of the hypothalamus (Moore-Ede, Sulzman, & Fuller, 1982). Subjective mood, as assessed by means of a rating scale, appears to follow a 24-h pattern which closely parallels that of core body temperature. Thus, subjective ratings of mood reach their lowest values near the minimum of the temperature rhythm, and their highest values near the crest of the temperature rhythm (Boivin, et al., 1997; Monk, et al., 1992). Since the phase of the endogenous temperature rhythm of morning-type (M-type) individuals as compared with evening-type (E-type) individuals appears to be advanced (Kerkhof & Van Dongen, 1996), a similar interindividual phase difference may be expected for the 24-h rhythm of mood. A recent publication by Chebat and coworkers (1997) presents some support for this contention. However, additional evidence is needed before firm conclusions can be drawn (see Discussion). To this end, the present study was undertaken.

METHODS

According to a previously described procedure (Kerkhof & Van Dongen, 1996) 16 M-type (9 females; M ± SD age: 27.7 ± 3.1 years) and 13 E-type (6 females; M ± SD age: 24.1 ± 2.9 years) healthy subjects were selected. In short, the subject was selected if the fitted maximum of her/his oral temperature curve fell earlier than 17:30 h (for M-types) or later than 19:30 h (for E-types). Subsequently, the subjects were instructed how to use a sleep-wake logbooklet, in which they kept daily records of ratings (on 5-point rating scales) of their subjective mood and subjective alertness for a period of two consecutive weeks. In this way a mean number of 69 measurements (SD=13) per subject was obtained. For the M-types the overall mean ± SD rating for subjective mood was 3.47 ± 0.21 and for the E-types this was 3.68 ± 0.17, which amounted to a statistically significant difference (t27 = -2.92, p <.01). For subjective alertness the overall mean ± SD rating was 2.71 ± 0.31 for the M-types, and 2.55 ± 0.27 for the E-types (t27 = 1.42, p >.15). For the subsequent analyses the ratings of each subject were transformed into z-scores. The z-scores were folded into one 24-h period, collected in bins of one hour, and averaged per bin.
RESULTS

SUBJECTIVE MOOD

Z-SCORES

TIME OF DAY (h)

E-types

M-types

SUBJECTIVE ALERTNESS

Z-SCORES

TIME OF DAY (h)

E-types

M-types

Fig. 1A and 1B. Mean standardized values of mood (1A) and alertness (1B) averaged across morning-type and evening-type subjects as a function of the time of day.
Figures 1A and 1B give the across-subjects mean values for mood and alertness, respectively. Whereas the M-types reported their best mood in the period from 9 a.m. until 4 p.m., and showed a subsequent minor decrease, the E-types reported a substantial improvement in the course of the day. With respect to alertness, the two groups followed clearly opposite diurnal trends: the M-types showed a gradual decrease from a maximum around 11 a.m. until a minimum shortly after midnight, while the E-types showed a gradual increase from 8 a.m. until about 10 p.m. Repeated-measures analysis-of-variance with M/E-type as between-subjects factor and time of day as within-subjects factor (because of the small number of measurements, the bins for the night period were not included, i.e. from midnight until 8 a.m.), revealed a significant interaction for mood ($F_{1,405} = 6.98$, $p < 0.001$, $e = 0.95$) as well as for alertness ($F_{1,405} = 13.11$, $p < 0.001$, $e = 0.86$).

With respect to mood, these results differ from those of Chebat et al. (1997), who report a diurnal decrease for their M-types and no diurnal change for their E-types. A number of methodological differences between the two studies may account for this: as opposed to the Chebat et al. study, the present study employed repeated measurements on the same subjects, collected many more measurements, and used a simple rating scale (vs. a 12 item questionnaire). In addition, and maybe of the most importance, the measurement conditions differed substantially. Whereas the present study obtained ‘spontaneous’ mood ratings (i.e. initiated by the subject), Chebat and coworkers instructed groups of 20 to 30 subjects to complete a questionnaire in a classroom. It is conceivable that in a classroom, subjective mood scores reflect the impact of the situation upon the subject, rather than her/his endogenously modulated mood. In other words, Chebat and coworkers may have measured the mood response rather than the mood state of the subject.

In agreement with previous indications (Boivin et al., 1997), the present data do not simply suggest a covariation of subjective mood with subjective alertness. In particular for the M-types, the range of variation of mood was considerably smaller than that of alertness. Except for the data for 4 and 5 a.m., only a minor variation could be observed for mood, while for alertness a pronounced 24-h pattern was obtained. For the E-types a distinct diurnal increase of mood as well as alertness appeared. This confirms that the phenomenon of the diurnal variation of mood is not specific for endogenous depression, but may also be observed in healthy individuals, in particular E-type individuals.
REFERENCES


