SCHWARTZ, DAVID GLENN

REFLECTIVE SELF REPRESENTATION, SLEEP AND DREAMS

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REFLECTIVE SELF REPRESENTATION, SLEEP AND DREAMS

by

DAVID SCHWARTZ

A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, the City University of New York.

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8/2/79 Stewart J. Ellman
date Chairman of Examining Committee

8/8/79 Martin L. Hoffman
date Executive Officer

Arthur Arkin, M.D.

Samuel Messick, Ph.D.
Supervisory Committee

The City University of New York

Abstract

REFLECTIVE SELF REPRESENTATION, SLEEP AND DREAMS

by

David Schwartz

Advisor: Professor Steven Ellman

This study was an effort to test a psychological interpretation of a phasic/tonic model of sleep and dreaming. Seven hundred fifteen dream reports from 20 male subjects were rated on indicators of suspension of reflective self representation--i.e., the experiencing of the dream as real or objective. Dreams were collected during either phasic (bursts of rapid eye movements--REM's) or tonic (no REM's) intervals of REM and NREM sleep. In addition, social desirability response bias and daydreaming patterns of subjects were assessed via the MMPI and Imaginal Processes Inventory respectively plus two new IPI scales designed to assess suspension of reflective self representation in daydreaming for this study. Results were that suspension of reflective self representation (SRSR) in nocturnal dreaming was significantly associated with REM as opposed to NREM sleep and, within REM sleep, was significantly associated with phasic as opposed to tonic intervals. However, this latter effect was not significant for some indicators of SRSR for subjects who were high on social desirability response bias. High SD bias was associated with inhibition of phasic REM reports and facilitation of tonic REM reports. SS who were adaptively absorbed with positively toned daydreaming during the day, and who were accepting of daydreaming, showed significantly less SRSR in REM sleep and significantly more SRSR in NREM sleep. These same subjects showed significantly less qualitative differentiation between REM and NREM dream reports. It was concluded that a phasic/tonic, energic model of sleep and dreaming, employing the concept of suspension of reflective self representation as the primary psychological correlate of phasic REM activity, was supported.

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CHAPTER I

Introduction

The correlation of physiological events with a class of psychological events or behaviors imposes a basic problem of the human sciences on psychology. This is the problem of how to conceptualize and depict internal structures and processes and their relationship to reported experience and behavior in such a way which explains the observed correlation and predicts other, as yet unobserved, correlations.

The dramatic discovery of a correlation between REM sleep and the reporting of dreams (Aserinsky & Kleitman, 1953) presented exactly this problem and has stimulated the production of hypotheses and implicit models of psychophysiological parallelism in the past 25 years. Such models vary with respect to the breadth of their implications for human functioning and with respect to the strength of their assertions.

The strongest model of psychophysiological parallelism depicts a perfect isomorphism between physiological and psychological events, so that for each psychological change there is an analogous physiological event of a particular type. Roffwarg, Dement, Muzio, and Fisher (1962) developed this view of REM sleep, asserting that each REM represented the dreamer scanning visual imagery in the direction of that eye movement. If further developed, such a model would predict that for every sensory event in the dream, there is the occurrence of a physiological event in the appropriate physical structure (auditory imagery in the middle ear, for example) both qualitatively and quantitatively correlated with it. Loud sounds heard on the right should be accompanied by relatively high amplitude middle ear muscle activity (MEMA) in the right ear.

While this sort of model makes very strong statements, its implications may not be very broad. On one level, it explains the mechanism of dream experience with microcosmic precision, but implies little about the relation to dreaming to personality, for example.

Instead of proposing a perfect one-to-one relation between physiological and psychological events, we might postulate a relationship such that psychological events are qualitatively analogous to physiological events and positively correlated with them, but imperfectly so. In this case, the latent model is not that the physiological event directly causes the psychological one, but, rather, that physiological processes produce psychological effects indirectly, through some indetermediate structure. For REM sleep this would mean that dream imagery of a particular sensory modality would be more evident when the corresponding physiological system is operating. More MEMA's would mean more auditory imagery, although not a sound for every MEMA in the corresponding ear. The more dreamlike experience associated with REM sleep could be explained as the consequence of the relative predominance of the firing of sensory pathways, as opposed to cognitive centers. In other words, the weaker hypotheses imply a model which says a bit more about REM sleep, namely that it is functionally tied up with the operation of sensory systems. If such a model were made more explicit, other predictions could be made. For example, one might predict the lowering of some type of sensory threshold following REM deprivation or changes in REM sleep following the manipulation of sensory systems.

This example also illustrates the increased testability of weaker, broader hypotheses.

Both of the preceding models portray the relationship of behavior to physiology as fairly direct; i.e., little is said concerning intermediate influences on the production of a dream report, such as cognitive style, defense, and developmental history. Psychological theory is largely missing from these models. Both of these models (in their simplest forms) regard intermediate, or psychological variables as the producers of error variance. The true dream is seen as the unencumbered product of physiology, which is interfered with by variations in current conditions and subject differences, which themselves are relatively independent of sleep or dream processes. Research methodology which follows logically from such a point of view would be (and has been) to use apparently homogeneous subject groups and expect relatively high, consistent psychophysiological correlations.

An alternative model would emphasize the indirectness and the psychological nature of the production of a dream report and therefore treat subject variability in a different way.

The physiological properties of a given moment during sleep can be viewed as the instigators of a complex process which eventuates in a dream report. The psychological process set in motion by, for example, a burst of REM's, would be affected by the REM's so long as they are happening and then begin a life of their own, in accordance, perhaps, with personality dynamics of the subject. These psychological processes can be viewed as dynamically and developmentally related to the instigating physiological processes. In other words, individual differences in reporting style (i.e., dream revision) would be expected to systematically interact with physiological process as well as be one indicator of the quality of that physiological process for the history of the subject. According to this model, reporting style, rather than being a source of error, if deciphered, can be a source of information regarding how the subject has experienced a recent physiological event as well as how he or she has experienced that type of event over his or her history.

This more indirect, psychological and dynamically oriented model would therefore not predict that any particular mental content (e.g., dreams with more activity, bizareness) would be the unique correlate of REM physiological process. Rather, a particular mental state or the operation of a particular ego function would be expected as the immediate consequence of REM's, for example. From whatever we conceptualize that state to be, we can infer various further consequences for the quality of dream reports and other aspects of sleep behavior and experience.

This kind of model of psychophysiological parallelism would have very different research strategies and expectations from the two simpler models described above. More heterogeneous subject groups might be desirable with multidimensional personality assessment. In addition, simple correlations between qualitative aspects of dream reports and physiological variables would be expected to be low, but stable, and with widespread individual differences. Furthermore, REM's might be seen as neither the cause nor the effect of dreaming, but, rather, REM's and dreaming could be seen as the respective physiological and psychological representatives of the operation of a particular ego function.

The literature review which follows is intended to show that the construction of such an indirect, psychological and dynamically oriented model of dreaming and REM sleep is warranted by past findings.

CHAPTER II

Literature Review

Psychophysiological Parallelism in Dreaming

As noted above, Roffwarg et al (1962) proposed the strongest hypothesis to explain the correlation between REM sleep and dreaming. This hypothesis was that the occurrence and direction of REM's paralleled the gaze of the dreamer as he scanned visual imagery. In attempting to validate this hypothesis, the researchers were very thorough in eliciting the necessary data from the subjects in order to determine in what direction they should have been looking, given the dreams they described. Unfortunately, this care was not extended to the use of traditional blind procedures in correlating EOG records with the dream reports. Thus, their study did not shed much light on the question under investigation.

Moskowitz and Berger (1969) attempted to reinvestigate the issue and made an opposite mistake. Dreams were sorted with the judges blind to experimental conditions; however, the careful interviewing necessary to determine in what direction the subject was looking was not carried out. No one has yet investigated Roffwarg et al's (1962) hypothesis with the methodology necessary to form a conclusion.

During the 1960's, many other studies were reported which were intended to show more or less direct correlations between physiological variables and aspects of dream content. Their findings were generally inconsistent. The main autonomic functions assessed were respiration, heart beat, penile erection, and electrodermal activity.

In general, tonic heart rate was not found to relate to sleep mentation (Fahrion, Davison, and Berger, 1967; Hauri and Van de Castle, 1970; Shapiro, Goodenough, Biederman, and Sleser, 1964). Hauri and Van de Castle (1973) did find some significant relationships with heart rate. On the other hand, increased variability in heart rate preceding dream collection was found to be associated with increased emotionality in dream reports (Fahrion et al, 1967; Hauri and Van de Castle, 1970).

Rechtschaffen's (1973) review of this research describes the data on respiration as showing mixed results. Some studies found no significant relationship (Knopf, 1962), while others (Hauri and Van de Castle, 1970) found significant correlations between emotionality and tonic respiratory rate for the last minute of REM sleep prior to awakening but not for other less proximal intervals. Hauri and Van de Castle (1970) also found a significant negative correlation between respiratory variability and subject "involvement" in the dream. Hobson, Goldfrank, and Snyder (1965) reported significant correlations between aspects of respiration and mentation variables within both REM and NREM sleep.

Rechtschaffen (1973) summarizes the correlations of elctrodermal response and aspects of sleep mentation as providing little evidence for a close association between these two variables. However, Hauri and Van de Castle (1973) did find some significant relationships between skin potential fluctuations and aspects of dream reports, in particular skin potential fluctuation variability with emotionality.

The data correlating aspects of penile erection in REM sleep with manifest dream content are in certain ways consistent with the foregoing inconsistencies: the high rate of erection in REM sleep is not matched by an expected high rate of manifest sexual content in REM dreams (Snyder, 1970; Fisher, Gross, and Zuch, 1965; Fisher, 1966). However, Fisher did obtain a strong correlation between sudden sharp increases in penile tumescence and erotic content. Also, Karacan, Goodenough, Shapiro, and

Starker (1966) reported that sustained erections were associated with greater amounts of REM activity, which itself has psychological correlates (see below).

As will be more clear from a more detailed analysis of some more recent studies of psychophysiological parallelism which follows shortly, the majority of the studies referred to above are beset with serious shortcomings in experimental design, assessment procedures, and statistical analysis, rendering suspect positive and negative findings alike. However, as Pivik (1978) points out in an otherwise highly skeptical accounting, one generalization does emerge: correlating periods of rapid physiological change--e.g., sudden penile tumescence, variability measures--with mental activity has produced more consistently positive findings than correlating tonic levels of the same variables. This is entirely consistent with the findings that bursts of REM's were associated with increased vividness and emotionality (Hobson et al, 1965; Verdone, 1963) and activity (Berger and Oswald, 1962; Dement and Wolpert, 1958; Pivik and Foulkes, 1968) in the dream.

During the 1960's, it was generally accepted that although the specific association of REM's with the directionality of dream imagery as hypothesized by Roffwarg et al (1962) was very much in doubt, a non-specific, but direct, association of REM's with other aspects of dream reports--"activity," vividness, emotionality--was a fact. Increased sophistication concerning the possibility of confounding the effects of REM's with that of time of night and/or other physiological variables which are highly correlated with bursts of REM's led some of the original investigators of this question (Firth and Oswald, 1975) to doubt the validity of the nonspecific association of REM's with dream activity and others (Pivik, 1978, Hauri and Van de Castle, 1973) to be skeptical of the possibility of disentangling the "effect" of REM's or any physiological variable from any other variables.

The question of the validity and meaning of an association between REM's and mentation variables is very important because of its obvious connection to whether or not rapid physiological changes during sleep--i.e., phasic events--are correlated with any psychological dimension. Furthermore, in attempting to refute this claim, Firth and Oswald (1975), Hauri and Van de Castle (1973), and Keenan and Krippner (1970) illustrated most of the methodological problems briefly alluded to above. Therefore, these studies will be reviewed in some detail below, both to examine their evidence and to make certain methodological and conceptual points clearer.

Some attention to a report by Keenan and Krippner (1970) is worthwhile since it is cited by Firth and Oswald (1975) in support of their claim of refuting Berger and Oswald (1962). Keenan and Krippner (1970) collected 97 dream reports from a single S during 20 nights of sleep recording and, using the Hall-Van de Castle "activities" content category, divided reports into those with four or fewer categories and those with five or more. REMP's were divided into 20-second intervals, and each interval was rated for the presence or absence of REM's. REMP's with 80% or more of "REM units" were designated high REM density, and those below this criterion were labelled low REM density. A chi square analysis showed a significant relationship between high REM density REMP's and high activity dream reports. After noting that the night's first report was usually a low activity, low REM density dream, all 20 first-of-the-night reports were discarded and the resulting data were reanalyzed, yielding non-significant results.

Briefly, the inadequacies of this report (in fact, an abstract) are:

(a) only one S was used, (b) no scale of mentation was done, and, accordingly, (c) a relatively weak statistical test was performed.

Hauri and Van de Castle (1973) conducted a much more extensive study of nocturnal psychophysiological parallelism and argued that Berger and Oswald's (1962) finding was an artifactual result of their failure to control for time of night. Hauri and Van de Castle collected data from 15 male SS who slept in a laboratory for 1 adaptation night and 3 non-consecutive experimental nights. In order to control for the effects of time of night, all mentation was collected after at least 3½ hours of undisturbed sleep. During the second half of the night, two awakenings were made during REMP's and two during NREM sleep. REMP awakenings were usually made 15 minutes into the third or fourth REMP. In addition to REM's, the following physiological variables were recorded: heart rate, phasic vasoconstrictions (both recorded from SS' big toe via a strain gauge), respiratory rate, and skin potential fluctuations. REM's were evaluated by dividing REMP's into 2½-second epochs and rating each of these for the presence or absence of eye movements.

During REMP's, physiological variables were scored during 1-minute episodes for the entire REMP preceding awakening, for the 6 minutes immediately preceding the awakening, and for the last 1 minute preceding the awakening. In addition, variability was computed for each physiological parameter during the above intervals.

Mentation was rated as follows: each report was rated blind by a single judge (Van de C.) on each of three 7-point "global" scales. The first of these assessed "total emotionality displayed by the S in his dream, giving particular emphasis to sexual and aggressive impulses . . . being acted out." The second scale rated physical activity of the dreamer--i.e., judging the total output of pure physical energy that would be involved if the sleeper were engaged in these activities during wakefulness. The third scale was designed to measure the dreamer's involvement as an actor in the events of his dream--i.e., rating how much he tried to influence the dream events rather than being a non-participant observer. The scales correlated significantly with each other (.59 - .73).

Mentation and physiological variables were dichotomized around each S's median value and placed in 2 x 2 tables which were then combined across SS using Cochran's method.

Dream reports with higher total emotionality were significantly associated with higher heart-rate variability during the last 6 minutes ($p <$ .005) and the last 1 minute ($p < .05$) prior to awakening, with the number of skin potential fluctuations ($p < .005$) and its variability ($p <$ .05) during the last 1 minute, with respiratory rate during the last 1 minute ($p < .05$), and with vasoconstriction variability during the last 6 minutes ($p < .05$). As the authors note, emotionality was not related to any aspect of the total REMP prior to awakening.

Dream reports with greater physical activity of the dreamer were significantly associated with higher heart-rate variability during the last 6 minutes ($p < .01$) and with higher skin potential fluctuation variability during the last 1 minute ($p < .05$).

The active involvement of the dreamer with dream events was significnatly associated with heart-rate during the total REMP ($p < .005$) and during the last 6 minutes ($p < .01$), with heart-rate variability during the last 6 minutes ($p < .05$) and with the mean number of phasic vasoconstrictions during the last 6 minutes ($p < .01$).

Citing Foulkes (1966) and Hauri, Sawyer, and Rechtschaffen (1967), the authors assert that general "dream intensity" is an important "distinguishing factor" between different dreams and that emotionality, physical activity, and dreamer involvement are all correlated with it. On this basis, they summed their three global ratings for each dream to produce general "intensity" scores. These scores were significantly associated with heart-rate variability during the last 6 minutes ($p < .005$) and 1 minute ($p < .05$), with skin potential fluctuation variability during the last 1 minute ($p < .05$), with the mean number of skin potential fluctuations during the entire REMP ($p < .05$), and with mean respiratory rate during the last 6 minutes ($p < .05$).

Hauri and Van de Castle (1973) began the discussion of their data by noting that some of the weaker but statistically significant relationships may be spurious since so many individual statistics were computed (120). Therefore, their discussion was restricted to the findings which were at least at the .01 level of significance. This left eight significant psychophysiological relationships of the 120 assessed. The authors regarded four of these as highly significant ($p < .005$). They concluded that dream content "can be related to physiological variables" during REM sleep, which they did not find surprising considering the dense interconnections of the human brain.

In addition to this rather weak conclusion, the authors added that dream emotionality is at times related to physiological variables while physical activity in the dream is not. If such a differential analysis of their data were pursued, it could also be concluded that eye movements during the last one minute are correlated with the involvement of the dreamer with his dream and not with emotionality or physical activity (although this is a weak relationship--$p < .05$). Although it might be tempting to draw conclusions, several aspects of Hauri and Van de Castle's methods complicate the picture considerably.

The first serious difficulty in making a differential psychological interpretation of their data is that mentation reports were judged by only one rater with unestablished reliability for these scales. Interestingly, the scales correlated with one another to a moderately high degree. If the intercorrelation of the scales exceeds the reliability of the judge--a logical possibility from the data presented--, the ratings might reflect as much or more about the measurement process--i.e., the rater--as about the subjective experience of the dreamer, which is at issue. It is also worth noting that the titles of the three scales do not fully correspond to their content; for example, the "emotionality" scale gave "particular emphasis" to sexual and aggressive impulses being acted out. No specification of how this was carried out is presented; neither is there a theoretical rationale for this approach.

The statistical analysis chosen by the authors is seriously flawed in several ways. Although they chose to scale the mentation data, a very good procedure for evaluating presumably normally distributed variables, they analyzed these scores using a version of the chi square technique. Aside from being an inappropriate statistic for score data, χ^2 is a relatively weak test, making it likely in an area where the data are so distant from the phenomenology (ratings $\leftarrow$ rater $\leftarrow$ scale $\leftarrow$ report $\leftarrow$ dream) that significant relationships would be overlooked. The likelihood of this last point is increased by the fact that there were substantial individual differences in the data. For their strongest correlation, that between "emotionality" of the dream and heart-rate variability ($p < .005$), only nine SS showed a clear positive association, five SS showed no association, and one showed a reverse trend.

A final difficulty in their statistical analysis is worth noting. As the authors themselves point out, the multiple use of a single statistic, in this case a type of chi square, raises the overall alpha level. (One hundred twenty statistics were computed.)

The authors chose to combine the three types of mentation ratings on the basis that they formed a conceptual unity--"dream intensity." Although there is some evidence that various parameters of mentation reports intercorrelate (Foulkes, 1966), the concept of "dream intensity" does not correspond to any as yet suggested unitary psychological function.

The intended thrust of the above criticisms is that it is likely that Hauri and Van de Castle overlooked some significant relationships and made no psychological conceptualization of what they found. Therefore, it may be useful to resummarize their findings with some attention to the question of what can be retained and what should be discarded in an effort to provide a basis for a psychological reconceptualization of this and other studies of psychophysiological parallelism in dreaming. This follows: the largest number of significant correlations with physiological variables was produced by the scale which attempted to assess the involvement of the dreamer with his dream. The emotionality scale produced five such significant correlations and the physical activity scale, only two. It seems safe to say that "physical activity" as a mentation variable adds little new information but that subject involvement and emotionality may be retained for future reconsideration.

The authors reported that even for their strongest correlations individual differences were widespread. This may suggest at least two things: (a) we need not be disheartened by low correlations since there may be significant interference from S variability and (b) personality variables combined with physiological variables may significantly improve prediction of qualitative aspects of mentation reports.

Firth and Oswald (1975) took Hauri and Van de Castle's (1973) findings as refuting Berger and Oswald's (1962) early claim and as indicating that "eye movement during REM sleep is scarcely related to dream content." They attempted to replicate this "negative finding" (a questionable scientific procedure) as follows. Twenty SS (sex not indicated) were awakened on either 4 or 8 experimental nights, each awakening being after $7\frac{1}{2}$ minutes of both their second and fourth REMP's. (Twelve of these SS were involved in a drug paradigm as well, receiving either 200 - 400 mg anylobarbitone or 10 - 20 mg nitrazepam.) Mentation reports were rated by one judge (Oswald), who rated them as "visually 'active' or 'passive' following the principles used by Berger and Oswald (1962)." This means that dreams were classified as "active or passive according to the nature of the events described and especially if such events . . . would have been accompanied by many shifts of gaze had they occurred in real life." Eye movement profusion was assessed by counting the number of 2-second epochs in the last 5 minutes and the last 1 minute prior to awakening. "A point-biserial correlation was calculated," which was evaluated using a Wilcoxon matched-pairs signed ranks test. This analysis was carried out for all data as well as for second REMP's alone, fourth REMP's alone, 5-minute intervals, 1-minute intervals, and non-drug nights alone. The analysis for both REMP's combined yielded low but significant correlations for both the 5-minute and 1-minute intervals. Analysis of the second REMP alone yielded a slightly higher significant correlation, while the fourth REMP alone produced a lower and non-significant correlation.

The authors interpreted these data as indicating that there is not a justification for assuming a relationship between dreams with "active" content and eye movement. They based this on their finding that the correlations "where REMP was controlled for [were] not consistently significant"--i.e., the fourth REMP alone did not yield a significant correlation, nor did non-drug nights alone (although in magnitude these two latter non-significant correlations were not much smaller than the significant correlation: .15 vs. .19).

Before commenting on these findings and conclusions, it is important to make note of the methodological shortcomings of this study, which are generally similar to those of Hauri and Van de Castle (1973). The first and perhaps most serious difficulty is that reports were rated by only one judge, for whom reliability was not established in any way, thus leaving open the possibility that ratings did not accurately reflect a characteristic of the dream reports. Second, all mentation ratings were dichotomized, so that only very gross variability between reports would be reflected in scores. Third, the principle used for rating the dreams was inexplicit to the extent that at least two factors which might go in opposite directions for a given dream were implied by the instructions. That is: "Dreams were classified as passive or active according to the nature of the events described <u>and</u> especially if such events . . . would have been accompanied by many shifts of gaze had they occurred in real life." The subject might dream himself or herself vigorously eating a meal or addressing an audience. Both of these seem quite active in a psychological sense of the term but might not be accompanied by shifts of gaze, nor are they necessarily visually active at all. How did the rater rate such dreams? The authors provided no examples of active or passive dreams, and the instructions they refer to from an earlier study quoted above (Berger and Oswald, 1962) are quite ambiguous.

The above discussed methodological difficulties would tend to bias the results in the direction of "no difference." This suggests that Firth and Oswald's (1975) measurement process was probably insensitive to a great deal of true variance in the mentation reports. By contrast, the authors felt that they had sampled a wide range of eye movement profusion. Thus, we would expect the obtained correlation between these two variables to be quite diminished.

In spite of all of the above mitigating circumstances, a significant correlation between eye movement activity and "active" dream reports was still obtained. Firth and Oswald (1975) were unimpressed by this because: (a) the magnitude of the correlation was low and (b) it was non-significant when various subgroupings of the data were analyzed separately. As was discussed above, this seems to be a questionable interpretation of their data.

Furthermore, it is possible that what Firth and Oswald as well as Hauri and Van de Castle (1973) regarded as a virtue in their study--"controlling for time of night"-- in fact contributed to a deceptively diminished correlation. Controlling for time of night by simply eliminating mentation reports from the first half of the night only makes sense if we understand the correlations between REM's and dream quality and between time of night and dream quality according to a very simple and direct model of psychophysiological parallelism. This is a model wherein REM's and time of night each independently and directly produce qualitative differences in dream reports. An alternative model as described earlier might view the REM as one imperfect indicator of an underlying neuropsychological process which itself gives rise to dreams. If other phasic events which are imperfectly correlated with REM's (sudden increases in heart rate, respiratory rate and penile tumescence, MEMA's) are also indicators of an underlying process which is the true mediator of an important aspect of dream process and all of these phenomena increase across the night, then we would expect that any one of them--e.g., REM's--, would show the strongest relationship to aspects of dream reports early in the night, when it is most likely that the REM's would be well correlated with the underlying neural event--i.e., when no REM's is most likely to mean no phasic activity of any sort. Later in the night, the absence of REM's is less likely to rule out the presence of various other phasic events not being recorded since so much more of the REMP would be populated with them. Of course, this does not mean that there should be no correlation between aspects of dream reports and REM's late in the night, only that such a correlation would be diminished for neither early nor late in the night would a high correlation between a single physiological indicator and dream quality be expected.

Antrobus, Fein, Jordan, Ellman, and Arkin (1978) have given very strong empirical and theoretical support to the above analysis (completely unknown to me at the time of writing) by showing that "optimum statistical power . . ." is to be had by collecting data from the first half of the first night of any experimental paradigm.

Given the very insensitive measurement techniques employed by Firth and Oswald, it can be said that this is precisely what they found. A significant correlation was obtained for the second REMP alone, but not for the fourth, which, of course, occurs later in the night. Similarly, Hauri and Van de Castle (1973) collected all of their data after at least 3½ hours of sleep had elapsed, which, taken together with the possibly unreliable measurement techniques they used, may account for the weak relationships they obtained.

The failure of various subgroupings of the data to produce significant correlations may be explained (as the authors themselves point out) as the result of restricting the range of the eye movement variable. "Active drug and withdrawal nights [each] included a greater proportion of REMP's with either very high or very low eye movement profusion." According to Ley (1972), restriction in the range of one variable will generally reduce the value of a correlation. Interestingly, the magnitudes of the correlations for subgroupings of the data were in some cases slightly larger than for the pooled data; however, they fell short of statistical significance, presumably due to the decreased *n*.

The most recent report of an association between REM's and dream quality is a very well-controlled study by Ellman, Antrobus, Arkin, Luck, Bodnar, Sanders, and Nelson (1974). They showed that within REMP's, dream reports associated with bursts of REM's are significantly more "dreamlike" (Foulkes' Df scale) than reports from quiescent REMP intervals.

Taking all of the above considerations into account, it is possible to view the studies of the relationship of REM's to aspects of dream experience as at least not adequately investigated and at best as quite encouraging and providing some important guides as to how we might optimally test a specific hypothesis of psychophysiological parallelism.

With the possible exceptions of Ellman et al. (1974) and Fisher et al. (1965, 1966), none of the studies considered thus far made a serious attempt to integrate their data with any physiological or psychological theory or model. In 1963, a new model of the physiology of sleep was proposed by Moruzzi. Its essential point was that REM sleep should be viewed as the occurrence of an ensemble of discrete, phasic, neural discharges, originating in the hind brain and operating predominantly, but not exclusively, against a background of tonic EEG activity and suppressed muscle tonus. This was in opposition to the view that REM sleep could be viewed as a more or less homogeneous entity.

The major implication which flows from Moruzzi's conceptualization is that the phasic events within REM sleep constitute activity which is qualitatively different from the surrounding REMP.[1] The major importance of Moruzzi's contribution from the point of view of dream research is that various physiological phenomena--REM's, sudden changes in penile tumescence, etc.--were being conceptualized in a unified way, assigning great significance to sudden changes in neurophysiological activity, and the reported differences between REM and NREM mentation being explained as primarily the product of the presence of differential quantities of phasic activity, not necessarily of REM sleep, meaning tonic REM sleep.

Numerous studies employing lesioning techniques (Jouvet and Delorme, 1965; Morrison and Pompeiano, 1970), pharmacological techniques (Dement, Zarcone, Ferguson, Cohen, Pivik, and Barchas, 1969) and REM deprivation procedures (Ferguson and Dement, 1968) have demonstrated the physiological independence of phasic and tonic aspects of REM sleep. States in which phasic events were dissociated from REM sleep, or vice versa, were induced, in partial confirmation of Moruzzi's (1963) model.

The psychological implication of the phasic-tonic model--that phasic events should have a psychological correlate which eventuates in a particular

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[1]Pivik (1978) understands Moruzzi's emphasis somewhat differently: he says that Moruzzi is asserting that "along tonic dimensions, REM-NREM differences [are] largely ones of degree and not of kind." Although possible, this does not seem to be a necessary implication. It is possible for tonic REM to be qualitatively different from tonic NREM while still preserving the uniqueness of phasic REM.

type of mentation report--is itself much less explicit and perhaps, in part consequently, has much less clear scientific status. Looking back at the studies reviewed thus far, it can be said that although none of these studies directly addressed themselves to the phasic-tonic model, their data are generally quite consistent with it in the following ways: (a) rapid changes in physiological variables were the most reliable correlates of qualitative aspects of dream reports (Pivik, 1978); (b) in most studies, bursts of REM's were correlated with increased dreamlikeness in some aspect of mentation reports; and (c) phasic activity increases both across the night and within REMP's (Brooks, 1968), and, analogously, mentation reports have been found to be more dreamlike in the second half of the night and later in REMP's.

Pivik (1978), focussing on one very popular and important phasic event, the PGO spike, sees a much less consistent picture in these data, making the following four negative points: (a) If PGO spikes are recorded at the level of the lateral geniculate nucleus, rather than at the pontine level, they decrease in quantity with elapsed time into the REMP. (b) PGO spiking is most intense during the 30 - 60 seconds prior to a REMP. Larson and Foulkes (1969) report this period in humans to be associated with less recall and less dreamlikeness than other NREM intervals. (c) REM deprivation increases PGO spiking in NREM sleep during deprivation and during REMP's following deprivation. Attempts to enhance NREM mentation thrugh REM deprivation (Arkin, Ellman, Antrobus, and Farber, 1978) have produced negative results, while the effects of REM deprivation on REMP mentation have been mixed. (d) The sleep onset period is apparently devoid of phasic activity. Nevertheless, several studies (Foulkes and Vogel, 1965; Vogel, Foulkes, and Trosman, 1966) report that mentation associated with this period is very "dreamlike."

Pivik (1978) acknowledges the inadequacy of evaluating the phasic-tonic model and a "spike-content relationship" using the above type of comparisons. However, he also describes these comparisons as "disappointingly unimpressive." Indeed, from the point of view of a direct model of psychophysiological parallelism, one might hope for more consistently analogous findings. But if the phasic-tonic model is understood more psychologically--i.e., with attention to intermediate processes and structures--, then the negative analogies listed by Pivik may not seem so disappointing. First, PGO spikes have never been recorded in human subjects because they require subcortical electrodes. Therefore, while they are a desirable indicator in terms of the wealth of physiological data available with respect to them, it may be a mistake to make them a focus of human theorizing.

Second, it may be the case that the psychological state induced by phasic activity is responded to differently in NREM than REM sleep (perhaps with more defense) so that the finding of low recall at the end of NREM periods immediately prior to REMP's (an interval found to be rich in phasic activity in cats) may be the result of the interaction of the psychology of NREM sleep with the psychology of high intensity phasic activity rather than the direct product of an average level of phasic activity.

Similarly, with respect to the effects of REM deprivation on dream reports, it is possible that the effects of enhanced phasic activity on mentation reporting may not be the same in an organism which has undergone REM deprivation as compared to naturally occurring phasic activity. It may be the case that the relationship of phasic activity to mentation reporting is curvilinear in some subjects--i.e., a very high phasic activity produces no report.[2] If REM deprivation produces too much or too intense phasic activity for some intervals, the enhancing effect of increased phasic activity may be sufficiently mitigated to produce no effect overall. Furthermore, the increased state of arousal produced by REM deprivation may have differential effects on the reporting styles of different subjects.

The expectation that the sleep onset period, by virtue of being presumably phasic activity-free, should produce mentation reports with little or no dreamlike quality may also overly simplify the process of dream report production. The physiological properties of the sleep onset period may produce some dreamlike effects, but not the ones associated with phasic activity. In other words, "dreamlikeness" is not a unitary psychological concept, and only some or one of its components is likely to be the true correlate of phasic activity. Interestingly, in examining the ego functions evident in dream reports from different phases of the sleep onset period, Vogel et al. (1966) did report that when reports were more dreamlike in one way--regressive and bizarre content--, another ego function showed the least dreamlike inhibition--i.e., subjects retained reality contact to the extent that they did not believe their experiences to be real. One additional point concerning the sleep onset period is worth noting: it does contain phasic activity in the form of bursts of theta waves, which Pope (1973) has correlated with qualitative aspects of mentation reports.

As Moruzzi's phasic-tonic model captured the interest of researchers, dream report studies appeared which attempted to directly address the implications of his hypotheses for theories of dream production. A short review of these studies follows. Studies of phasic activity correlates in

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[2]Hauri (1975) has noted that periods of very high arousal have been associated with either the most dreamlike reports, or no recall.

REM sleep will be reviewed separately from studies of NREM sleep. This is for theoretical as well as practical reasons. As noted above, it is possible that phasic activity will have a different impact on the subject during REM as opposed to NREM sleep so that REM/NREM differences would be the product of the interaction of the effects of tonic REM sleep with phasic activity rather than the effects of phasic activity alone. In that case, it would be a mistake to expect a consistent psychological correlate of phasic activity across sleep stages. Each tonic stage background may contribute unique positive or negative amplification of the effects of phasic activity.

No study of the psychological correlates of phasic activity within REM sleep has failed to report a significant difference between dream reports associated with phasic activity and those from relatively tonic REMP intervals. Phasic activity in the form of REM's and periorbital integrated potentials (PIP's) (Watson, 1972) have been associated with significantly more movement (Bosinelli, Molinari, Bagnaresi, and Salzarulo, 1974), self-participation (Bosinelli et al., 1974), hostility (Pivik, 1971), primary visual experience as opposed to secondary cognitive elaboration (Foulkes and Pope, 1973; Molinari and Foulkes, 1969), bizarreness (Watson, 1972), discontinuity (Watson, 1972), and dreamlikeness (Ellman et al., 1974) in elicited mentation reports. Phasic activity associated reports were less often conceptual and thoughtlike (Bosinelli et al., 1974; Foulkes and Pope, 1973; Molinari and Foulkes, 1969).

Although all studies showed significant differences, no consistent pattern of a repeated finding of psychological meaning emerged. There are at least two possible reasons for this: very rarely did any researchers attempt to replicate or extend what any other researcher had done on a conceptual level, and the quality of methodology varied from study to study. For example, as Pivik (1978) points out, Watson (1972), using an n of four, had higher interrater reliability for his bizarreness scale than did Foulkes and Pope (1973) but conducted clarification and extension of spontaneous content reports by an interviewer not blind to awakening conditions. Ellman et al. (1974) scored mentation reports by placing them in a forced normal distribution on the dimension of dreamlikeness, which contains at least six different psychological components. Molinari and Foulkes may have confounded elapsed time into the REMP with the presence of REM's. With the exception of Ellman et al. (1974), number of subjects tended to be low, with the mean n being nine.

It can be concluded that studies of the mentation correlates of phasic activity in REM sleep strongly confirm Moruzzi's assertion of the uniqueness of phasic activity. However, these studies do little to extend or clarify the psychological meaning of that assertion.

Because REM's are both very rare and difficult to record in NREM sleep, studies of phasic activity in NREM have been confined to other phasic activity indicators: K complexes, PIP's, phasic EMG suppressions, and phasic inhibition of the H reflex. Since K complexes, by definition, do not occur in REM sleep[3] (Rechtschaffen and Kales, 1968), it is questionable as to whether they are an appropriate phasic event indicator to be used in the evaluation of Moruzzi's phasic-tonic model. However, as Pivik (1978) points out, their increased presence just prior to REMP's and reactions to experimental manipulations perhaps analogous to PGO spikes have encouraged some

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[3]Some investigators (Barros-Ferreira, Goldsteinas, and Lairy, 1973; Cartwright, Monroe, and Palmer, 1967) have reported the systematic recurrence of K complexes in conjunction with REM sleep phenomena such as low voltage-mixed EEG, EMG suppression, between bursts of REM's and have attempted to demonstrate the association of such "ambiguous time" or "intermediate stage sleep" with particular subject groups and conditions.

investigators to focus on them.

Pivik, Halper, and Dement (1969) reported that high K complex frequencies were associated with either the absence of recall or mentation reports of the most dreamlike quality, whereas the lowest rates of K complexes were associated with conceptual mentation, both mundane and bizarre, and perceptual mentation of a non-hallucinatory quality. Were these data replicated, they would be consistent with the suggestion made earlier (see p. 22) that the relation of phasic activity to dream reports may be curvilinear--i.e., that very high levels of phasic activity produce reduced recall. Rados and Cartwright (1976) assessed the relationship of the bizarreness of mentation reports to the density of K complexes, sleep spindles, and REM's, discarding all no-content reports from their analysis: only density of K complexes was significantly related to bizarreness. Interestingly, the same investigators (Rados and Cartwright, 1976), in a report of preliminary data ($n = 3$), describe what they call a reciprocal relationship between K complexes and REM's under conditions of partial sleep deprivation.

Other investigations of the mentation correlates of K complexes are not strictly comparable to the studies described above since they (Weisz, 1972; Ellman et al., 1974) did not discriminate different frequencies of K complexes but, rather, in the case of Weisz, made "phasic awakenings following a single K complex or sleep spindle or, in the case of Ellman et al., following either phasic EMG suppression in combination with K complexes or without K complexes or K complexes without EMG suppression, and grouped all three conditions as "NREM phasic awakenings." Neither of these two studies found any significant differences between the two types of awakenings they examined.

One can summarize these four studies as suggesting that the main effect of the K complex with respect to dream reports is most discernible in its midrange values.

Rechtschaffen, Watson, Wincor, and Molinari (1972) report the only mentation study of NREM periorbital activity. They assessed mentation under four conditions: (a) control--i.e., no phasic PIP's and no tonic periorbital activity, (b) PIP's and tonic periorbital activity, (c) bursts of tonic activity without PIP's and (d) PIP's alone. For both PIP's alone and PIP's mixed with tonic activity mentation reports were longer and more highly distorted.

Pivik (1971) made use of the transient inhibition of the spinal monosynaptic H reflex, which is coincident with phasic EMG suppression, as an NREM phasic activity indicator. He found that of a variety of mentation report variables "only two--auditory imagery and hostility--were significantly higher under phasic conditions." However, Pivik also very carefully assessed NREM mentation from delta sleep (stages 3 and 4 were examined individually) separately from stage 2 sleep and uncovered a paradoxical, although in some ways internally consistent, clustering of effects: phasic delta awakenings produced significantly more recall than tonic delta awakenings. On the recall dimension, the phasic-tonic distinction made no difference for REM or stage 2 sleep. As a group, tonic delta and phasic REM and stage 2 produced the most thoughtlike dream reports. No attempt will be made to interpret these unusual data. However, they have one sure implication if replicated: correlates of phasic activity are at least in part determined by aspects of the surrounding sleep stage, be these aspects psychological, physiological or both.

Overall, it can be said that studies of phasic activity correlates in

NREM sleep encourage the belief that phasic events are significant correlates, if not determinants, of the differential quality of dream reports under different electrographic conditions. They also suggest that the effect of phasic activity is likely to be weak to moderate at most and that it interacts with other variables in complex ways.

Furthermore, it can be said that virtually none of the data reviewed thus far are inconsistent with Moruzzi's phasic-tonic model. On the other hand, it cannot be said that these data constitute confirmatory evidence of the model's validity. This is because studies of the mentation correlates of phasic events only evaluate the simplest and least developed aspect of the phasic-tonic model: i.e., that phasic events are qualitatively different from tonic activity and may be responsible for observed differences between REM and NREM sleep. That statement could be true and yet the broader implications of the phasic-tonic model still be false: i.e., that the occurrence of phasic activity corresponds to a more or less unified psychological process which is logically connected to the functional significance of REM sleep and dreaming. In order to provide confirmatory evidence of a statement such as this, it is necessary to (a) interpret it--i.e., name and describe the construct or processes implied by the model, (b) deduce specific hypotheses which would be implied by that interpretation (combined with certain assumptions), and (c) test these hypotheses. Such a validation is most impressive if the deduced hypotheses are relatively non-obvious. If the hypotheses are confirmed, support is lent to the model and validity to the construct. Most studies have proceeded only through the first step of the above process.

An interpretation or construct can be arrived at utilizing three lines of evidence. These are: (a) examining the available experimental data for any apparent common elements, (b) considering clinical data to uncover fruitful overlaps between the functions observed in these two broad domains, and (c) conceptualizing on an a priori basis by building upon the logical implications of the relevant concept--in this case, dreaming. The behavioral and experiential phenomena experimentally observed to correlate with the presence of phasic activity in REM sleep are: increased feelings of self-involvement (Hauri and Van de Castle, 1973), feeling of self-participation (Bosinelli et al., 1974), primary visual experience (Molinari and Foulkes, 1969; Foulkes and Pope, 1973), activity (Berger and Oswald, 1962; Firth and Oswald, 1975), emotionality (Hauri and Van de Castle, 1973), movement (Bosinelli et al., 1974), bizarreness (Watson, 1972), discontinuity (Watson, 1972), dreamlikeness (Ellman et al., 1974), and decreased thought-like qualities (Molinari and Foulkes, 1969; Foulkes and Pope, 1973; Bosinelli et al., 1974). Not all of these findings should be given equal weight, since some have been successfully, or partially, replicated, while others are in conflict with other studies. So, for example, it is possible to view Bosinelli et al.'s findings concerning the "feeling of self-partici-pation" as a partial replication of Hauri and Van de Castle's findings with respect to "feelings of self-involvement." Foulkes and Pope (1973) success-fully replicated Molinari and Foulkes (1969) with respect to "primary vis-ual experience." Firth and Oswald (1975) replicated Berger and Oswald (1962) with regard to "activity" of dream content. Ellman et al.'s findings re-garding "dreamlikeness" are in effect a replication of the preceding stud-ies since the Foulkes Df scale includes, in composite form, virtually all the variables examined in the other studies. Three different studies have found less thought-like or conceptual dream reports to be associated with phasic activity during REM sleep.

Findings concerning emotionality, bizarreness, movement and discontinuity have been either unitary or equivocal. Therefore, for the first step in developing a psychological construct to be used in a test of the phasic-tonic model of sleep and dreaming, the following characteristics of dream reports need to be conceptualized: feelings of self-involvement or self-participation, primary visual experience, activity, dreamlikeness, and an absence of conceptual or thoughtlike process. An internal mental event which is experienced with self-involvement, directly "seen," contains relatively more activity and is unaccompanied by reflective cognition sounds like a loss of a particular kind of objectivity, namely that which informs the subject that he or she is having a mental experience--i.e., without external referents. In short, the dream is experienced as real and external, compelling attention and furnishing stimulation.

Schafer (1968), working from clinical data, has described an ego function which seems to be logically connected to the above conceptualization of a particular loss of objectivity in dream reports. In an effort to explain how daydreams and other mental representations associated with preconscious activity, such as introjects, provide the person with experiences of wish-fulfilling gratification and/or anxiety-laden torment, he developed the concept of the <u>reflective self representation</u>, which he defines as the subject's awareness, or mental representation of himself as a thinker, daydreamer, or dreamer. Schafer argues that only when this self-representation is actively repressed via an anti-cathexis--i.e., when the person actively bars from awareness the fact that he is thinking or daydreaming--is the daydream experienced as a real, external event, thus capable of providing a more gratifying or hurtful mental experience than an imagining, for which clear-cut self/object differentiation is maintained. Joining these clinical and experimental conceptualizations together, it can be hypothesized that when phasic events are occurring, that reflective self representation is transitorily suspended, and, hence, the dreamer experiences the dream as real and external rather than as a product of the self.

On an a priori basis, it can be seen that regarding the mental experience as having external or objective reality is part of the definition in ordinary language of dreaming. When someone says, regarding a sleep experience, "It was an extraordinary dream, but I knew I was dreaming," this is recognized as an effort to lesson or minimize the extent to which dreaming took place. Similarly, psychotic mental experience has been likened to a "waking dream" in that the individual gives no evidence that he or she is aware of the subjective origin or idiosyncratic meaning of his or her experience.

Personality and Dreaming

The interpretation being applied to the phasic-tonic model, using the above three sources of conceptualization, therefore, is that the occurrence of phasic activity is the physiological mediator of the suspension of reflective self representation. The deduction of subsidiary hypotheses from this broad statement can go in various directions, depending upon the assumptions made and the areas of human functioning in which one is interested. Personality is a good candidate for hypothesis deduction and testing because there are several studies of the personality correlates of qualitative aspects of sleep mentation, and it qualifies as a relatively non-obvious area in that its assessment is at least temporally removed from the assessment of dream quality. The assumptions to be made in deducing hypotheses concerning personality and dreams are as follows: (a) The persistent recurrence of a particular psychophysiological state--in this case, suspension of reflective self representation in conjunction with phasic activity--will lead to the development of particular psychological structures in the form of traits. This means that differential levels and spatio-temporal distributions of phasic activity would be correlated with particular personality traits. (b) A trait which develops in this way will have its effect in all states of consciousness, interacting with particular states in predictable ways. This might be called an assumption of structural continuity.

Some hypotheses which are deducible from these assumptions and the basic hypotheses stated above are: (a) Subjects who experience relatively more suspension of reflective self representation in waking functioning will tend to report dream experiences with relatively more suspension of reflective self representation. (b) Differences between REM and NREM mentation will be significantly less evident for subjects relatively high in the tendency to suspend reflective self representation in waking functioning. This would be due to the effect of a psychological structure in mitigating or overriding the effects of different physiological states. (c) The correlation between suspension of reflective self representation in dream reports and the tendency to suspend reflective self representation in waking functioning will be significantly higher in NREM sleep than for other sleep stages. This is because the relative absence of the strong physiological effector (phasic activity) would allow the personality factor to control more variance.

The available literature on patterns of personality and dream reporting is consistent with the above expectations, while not directly addressing them. A review of that literature follows. It is intended to illustrate that consistency, but more importantly it is intended to develop a psychological interpretation of the trait in question.

Foulkes and Rechtschaffen (1964) collected REM and NREM mentation reports from 24 male and female SS for 2 consecutive nights. SS rated their own dream reports for the amount of various "dreamlike features" (e.g., "violence, remoteness, dramatic quality") on the morning following report elicitation.

Personality variables included all MMPI standard clinical scales as well as a dozen supplemental MMPI scales plus several TAT cards picked to emphasize sexual and aggressive themes which were rated for the same variables as the mentation reports on 7-point scales.

Since the above procedure produced no less than 704 correlation coefficients, any differentiated interpretation of individual correlations would be difficult to support. Therefore, a few general findings will be focussed on. The authors report that of 28 significant correlations between standard MMPI clinical scales and SS' ratings of various dreamlike features of their own dreams, 27 were positive. An independent rater also rated SS' dream reports. His median ratings correlated .32 and .35 with SS' self-ratings of REM and NREM mentation respectively (significant, but low). When the rater's ratings of dream questionnaire dimensions were correlated with MMPI clinical scales, 18 significant correlations were obtained, 17 of which were positive. Fifteen of these were for NREM ratings. (The authors add that this apparent trend in favor of the NREM mentation is vitiated by the fact that of the 90 correlations between aspects of REM mentation with MMPI scales, 77, or 86%, were positive, although apparently not significant.)

The authors interpreted these data as consistent with Freud's "belief that dream experiences serve the function of affect expression and primary process discharge and that these functions are particularly prominent with an increasing degree of functional pathology" (p. 1000). In other words, their model of dreaming asserts that quantitative and qualitative aspects of dreaming are a more or less direct functional indicator of psychopathology. The two main challenges to such an interpretation are that (a) the MMPI scores they collected are not indicators of pathology in a normal sample such as their own, and (b) that dream reporting influenced their correlations more than dream experience.

To the first objection, Foulkes and Rechtschaffen (1964) reply that while "MMPI scales in [their] sample could reflect personality dimensions [such] as introspectiveness, sensitization to pathology, or lack of defensiveness, rather than psychopathology," their "personal impressions" of SS did indicate that high scorers were pathological. The second objection was handled somewhat more rigorously: Foulkes and Rechtschaffen reasoned that "if the sleep experiences of high scoring MMPI SS are actually more dreamlike than those of low-scoring MMPI SS, it might be expected that eye movement activity would be positively associated with MMPI . . . scales since it is fairly well established that more active dreams have a greater amount of eye movements." Therefore, they scored all experimentally terminated REMP's for the percentage of 2-second intervals containing REM's and correlated this value with MMPI scales; only three of these correlations were significant, and negatively so, thus "failing to confirm the interpretation of MMPI - dream questionnaire correlations which holds that it is the dream experiences, rather than reports or ratings thereof, that are related to pathology" (p. 1001). Foulkes and Rechtschaffen (1964) therefore concluded that the MMPI-dream questionnaire correlations could be "most conservatively viewed as indicating an association of pathology with dream reporting, since available evidence fails to confirm that either rating set or dream experience (as defined by the non-verbal criterion of eye movements) is a crucial factor entering into these correlations" (p. 1002). (Rating set was ruled non-crucial because the independent rater also produced a pattern of positive correlations with MMPI scales, albeit a very different one.)

With regard to this conclusion, it does not seem that Foulkes and Rechtschaffen adequately respond to the criticism that the scientific evidence for pathology in their subject sample is slim.[4] Furthermore, one must concur with the authors that the method of mentation assessment in this study does not permit a discrimination between reporting style and dream experience.

Pivik and Foulkes (1966) collected data from 20 male SS which are somewhat more psychologically interpretable due to the personality assessment technique used than are those of Foulkes and Rechtschaffen (1964). SS were selected for having very high or low scores on a measure of defensive style, the Byrne Repression-Sensitization scale of the MMPI. (Full scale MMPI profiles were collected as well but are not reported on in any detail.) Briefly, repressers are persons who "react to threatening stimuli with avoidance defenses such as denial, while sensitizers are persons who react to threatening stimuli with approach defenses such as intellectualization. All SS slept for two consecutive nights. For the first of the nights, half of the SS were in an experimental condition: this meant that the first four REMP's were interrupted at the first sign of REM sleep and that at the fifth REMP, 5 minutes of uninterrupted REM sleep was permitted, at which point the S was awakened for the retrieval of dream content. The other half

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[4]Even were this the case, "pathology" is a very multidimensional psychological function.

of the SS were in a control condition for night #1. For the control condition, four awakenings were made during NREM sleep. Retrieval of dream content was made after 5 minutes of REM sleep during the third REMP of control nights.

Dream reports were assessed by two independent raters using the Foulkes Dreamlike Fantasy scale. Interrater reliabilities were .88 and .95 for experiemental and control nights respectively. The main focus for Pivik and Foulkes was the effect of REM deprivation on dream content; however, for the purposes of this research proposal, the most interesting differences observed were between the two subject groups. For the control condition, mentation content retrieved from sensitizers was rated significantly ($p < .06$) more dreamlike on the Df scale. Following REM deprivation, the repressers showed a significant ($p < .01$) increase in the dreamlikeness of their mentation reports, while sensitizers' increase was not significant. (It is unlikely that the failure of the sensitizers to show a significant increase in dreamlikeness following REM deprivation was a "ceiling" effect since they did increase dreamlikeness following REM deprivation, just not as much as sensitizers, nor with as little variance.) "Examination of the EOG patterns during REMP's preceding content retrieval awakenings . . . revealed that repressers significantly increased the percentage of 2½ second intervals containing at least one REM following REM deprivation, while sensitizers showed a non-significant increase" (p. 1284). Furthermore, there was an apparently significant difference in eye movement frequency between sensitizers and repressers for the control condition preceding awakenings. (Sensitizers were higher.)

The authors regarded the "close correspondence between differences in pre-awakening eye movement frequency and differences in the intensity of subsequently reported dreams" as paralleling earlier findings that active dreams are preceded by more eye movements than are passive ones.

Pivik and Foulkes (1966) also note that their sensitizers "scored high on MMPI pathology scales (e.g., an average score of three SD's above the mean on the schizophrenia scale) while repressers had essentially normal profiles" and that this confirmed Foulkes and Rechtschaffen's (1964) observation that high MMPI scoring SS have more intense dreams than normals.

In addition to confirming Foulkes and Rechtschaffen's (1964) findings, Pivik and Foulkes' (1966) data also throw some light on the meaning of that finding: they suggest an association between qualitative and quantitative aspects of sleep mentation and an individual's predominant defensive style. More specifically, their data suggest that SS who tend to focus on anxiety-provoking stimuli in awareness are likely to report dreams from REM sleep which are more perceptual, bizarre, hallucinatory and dramatic than SS who respond to such stimuli by trying to push them out of awareness. This provides a somewhat more circumscribed lead for future personality dream research than did Foulkes and Rechtschaffen (1964). However, these data, if replicated, would still leave the question of the nature of the psychological structure, function or process, which overlaps dream reporting, the R-S scale and REM frequency, and which prompted Foulkes and Rechtschaffen and Pivik and Foulkes to judge their SS to be "pathological," very much in the dark. What might help is more construct-oriented personality assessment of SS and more psychologically defined and less global assessment of dream reports (cf. Campbell and Fiske, 1959). The Foulkes Df scale is influenced by at least six possible psychological processes and, yet, produces a unitary score.

In a later study, Pivik and Foulkes (1968) collected NREM mentation only from 20 male SS to whom were also administered the R-S scale, the California Personality Inventory, and the TAT. MMPI scores were estimated from CPI scores. Dreams were rated independently using the Df scale. Once again, a differentiated psychological interpretation of the findings would be unsupportable due to the profusion of individual correlation coefficients. In general, the findings of the two earlier studies are supported, with some exceptions. In addition, the authors report that the association between the Df ratings of NREM mentation and personality scales is generally higher than that between the Df ratings of REMP mentation and the same scales. They regarded the data from this study as providing further support for their notion that "personality disturbance" is associated with more dreamlike sleep mentation.

The possibility that mentation from different sleep stages is differentially correlated with personality measures is given further support by data collected by Foulkes, Spear, and Symonds (1966). They collected three REMP and four sleep onset (SO--descending alpha and stage 1 NREM) reports during one night of recording from 16 young adult females and 16 young adult males. Mentation reports were rated using the Df scale. Personality assessment consisted of the CPI and the administration of two TAT cards. The following data were obtained: Df ratings of sleep onset mentation correlated positively with CPI Social Presence ($\underline{r} = .35$, $\underline{p} < .05$), CPI Self-acceptance ($\underline{r} = .37$, $\underline{p} < .05$), and negatively with CPI Socialization ($\underline{r} = -.57$, $\underline{p} < .001$).

The authors interpreted these data as indicating that SS who report more dreamlike sleep-onset mentation seemed to have greater social poise, to be more self-accepting, and to be less rigidly conforming to social standards than "hypnogogic non-dreamers."

The dreamlikeness of REMP mentation was negatively correlated with the CPI Psychological Mindedness Scale ($r = -.40$, $p < .05$) and positively associated with TAT Aggression and TAT Hedonic tone ($r = .45, .42$; $p < .01, .05$, respectively). The dreamlikeness of sleep-onset mentation correlated significantly with the word count of REMP mentation ($r = .47$, $p < .01$), but its correlation with the dreamlikeness of REMP mentation was non-significant ($r = .20$).

Foulkes et al. (1966) suggested that "one might conclude that hypnogogic fantasying is under the same kinds of ego-controls as predominate in the TAT, but that neither share as much in common with [REMP dreaming] as they do with one another." In other words, the authors tend to see sleep-onset mentation as an ego-function, becoming more dreamlike with increasing ego-strength and expansiveness, while REMP dreaming (and NREM dreaming, by the same reasoning) is seen as a defensive response to tensions outside the ego (cf. Vogel et al., 1966), becoming more dreamlike with less adequate ego-functioning.

While the personality data from this study are not sufficient to compel acceptance of the above conceptualization, they are highly suggestive from the point of view of the psychophysiological model being presented here. If REMP reports in fact reflect more of a S's defensive structure, while SO reports are more the product of "constructive" cognitive structures, then we might infer that the physiological state variables present in REM sleep, but presumably largely absent from the SO period, (i.e., phasic activity) are of such a psychological nature that they tend to trigger a defensive response. Of course, this is only one of several possible ways to understand Foulkes et al.'s data.

For example, it may prove to be more accurate to say that what causes the differentiation of sleep-onset reports is the presence of some as yet undetected physiological phenomenon in the sleep-onset period, rather than the absence of REMP-type phasic activity or a more complex interaction of psychological and physiological phenomena. For the purposes of the present research, it is important that the current literature does suggest systematic differences between the personality correlates of mentation reports from different sleep stages.

Foulkes et al. (1966) attempted to expand the psychological interpretation of their data by examining more carefully the CPI items which were most successful in discriminating SS rated high in hypnogogic Df from SS rated low for the same variable and in discriminating SS high in REMP Df from SS low in REMP Df. There was little overlap among these four subject groups. Foulkes et al. noted that the CPI items which were most successful in discriminating high and low SO dreamers seemed to be related to characteristics of the "authoritarian personality" syndrome (rigidity, intolerance), with SO non-dreamers closely approximating the syndrome. The authors felt that the CPI items which discriminated high from low REMP dreamers were less apparently homogeneous (e.g., "I am fascinated by fire," "I have strange and peculiar thoughts," "Police cars should be especially marked so that you can always see them coming," "A person should adapt his ideas and his behavior to the group that happens to be with him at the time"). However, they noted that all these items were keyed false on several CPI scales of social adjustment. They also noted that seven of the eight items which discriminate high from low SO dreamers were keyed so that endorsement of the item was typical of low SO dreamers. The authors interpreted this item analysis as indicating that "while the low hypnogogic fantasizer exerts rigidly successful control over . . . impulse life, the high [REMP] fantasizer shows fascination with impulse life (as symbolized, for example, by fire) in conjunction with weakened ego-control mechanisms (as indicated by the presence of strange and peculiar thoughts and by the concern with evading detection evident in the police car response and in the strategy of adopting the protective coloring of conformity to the environment in which one finds oneself)" (p. 285).

One may confirm or disconfirm psychological analyses such as the above (with its implications for psychophysiological parallelism) by assessing personality and mentation with construct oriented measuring instruments.

Starker (1974) presents data which support the idea that a construct oriented assessment would enhance our psychological understanding of the determinants of qualitative aspects of sleep mentation. He chose to focus on a very circumscribed aspect of personality which is conceptually closely linked to nocturnal dreaming: daydreaming habits and styles. Starker administered the Imaginal Processes Inventory (IPI--an inventory of 344 Likert-type items designed to assess daydreaming habits--e.g., "I often daydream of becoming very rich") to 55 normal males and then selected SS who scored high on the three factors which factor analyses have indicated influence scores on IPI subscales (Singer and Antrobus, 1963). These factors are Positive Daydreaming, Negative Daydreaming (i.e., guilt-ridden, conflictual, frightening) and Anxious Distractible Daydreaming. The latter defines SS for whom daydreaming is an intrusive distraction from ongoing mentation, often emotional and negatively toned. Starker selected three high-scoring SS for each of these factors and obtained their nocturnal mentation by having them fill out a morning dream log for 14 consecutive nights. Two independent judges rated these reports for number of idea units, emotionality, bizarreness, and affective polarity (i.e., positive vs. negative affect). The results generally indicated that anxious distractible daydreamers reported night dreams which were significantly more bizarre, emotional, and rich in idea units than positive and negative daydreamers, as well as containing significantly more affectively negative content than positive daydreamers. Furthermore, of eight reported instances of SS being awakened by nightmares, six were reported by anxious distractible daydreamers, while two were from negative daydreamers, and none from positive daydreamers (chi square = 30.3, $p < .001$).

One might argue that it is certainly not surprising that a correlation between aspects of daydreaming habits and a mentation report recorded in the daytime by the unsupervised subject proved significant. In other words, it might be the case that the lack of EEG dream retrieval techniques in this study biased the data in the direction of a positive correlation by actually bringing the dream report process temporally closer to the daydreaming process. However, the likelihood of this (which could be shown through an EEG replication of the study with a higher n) is diminished by the fact that only one of the three factors assessed by the IPI showed a strong relationship to nocturnal dream reports, and this factor (anxious distractible daydreaming) was related to a very definitely nocturnal process--nightmare awakenings.

It is interesting to note that the quantity of daydreaming, whether it was positive or negative, was not significantly related to the bizarreness, emotionality, and conceptual richness of night dreams; but, rather, the quality of daydreaming--i.e., "the intrusiveness of the process into ongoing mental life"--was. The only nocturnal dream variable for which anxious distractible daydreamers were not the highest was positive (happy) content. The author suggests that this may indicate that the anxious distractible daydreaming factor "reflects a more poorly integrated ego-structure."

Although this is not an EEG study, and its n is low, it provides the strongest support yet cited for the hypothesis that SS who tend more to suspend reflective self representation (i.e., experience relatively more intrusive distraction from their waking stream of thought as a result of fantasy processes), also experience an enhancement of dream experience. In Starker's (1974) study, the nature of this latter enhancement is left relatively vague. It is one purpose of the present study to make it more specific.

For the most part, the studies of the intercorrelations between personality traits and aspects of sleep mentation are marked by problems in the statistical treatment of data and in the assessment of sleep mentation. With some exceptions, the assessment of personality did not utilize instruments with established construct validity (e.g., MMPI, CPI), nor did they attempt to follow the principles of convergent and discriminant validation (Campbell and Fiske, 1959) at all and, accordingly, produced uninterpretable or equivocal conclusions. However, in some ways, the numerous positive findings have some conceptual unity and, in particular ways, are consistent with the phasic-tonic model as described above. For example, both Foulkes and Rechtschaffen (1964) and Pivik and Foulkes (1968) found that correlations between NREM mentation and personality variables were higher than for REMP mentation, a datum which would follow from the phasic-tonic model.

Therefore, it can be helpful, in conceptualizing the personality trait alluded to above as part of an interpretation of the phasic-tonic model, to re-examine the conceptual consistencies evident in these data. Foulkes and Rechtschaffen (1964) and Pivik and Foulkes (1966, 1968) all report that the increased "dreamlikeness" of mentation reports is associated with SS who score high on clinical scales of the MMPI. These authors took this to indicate that the trait which differentiated these SS from the others was pathology, or maladjustment. This interpretation has been criticized both on the grounds that there are no data which show that in normal samples MMPI scores predict pathology and on the grounds that the concept of pathology does not qualify as a unifying psychological concept. Reanalyses of MMPI standardization data conducted by Messick (1971) and Jackson and Messick (1967) suggest what high MMPI scores might mean in terms of a more circumscribed psychological process. Using factor analytic techniques (the intercorrelations among MMPI scales are quite high), they concluded that the most powerful determinant of high scores on MMPI scales is the tendency to endorse relatively infrequent, bizarre, or socially disapproved self-descriptions. This is, in other words, the negative interaction of the two response sets commonly known as social desirability and acquiescence. That is, the subject who is relatively unmotivated by tendencies to conform to social norms in self-description and/or is quite willing to agree to descriptions of himself considered peculiar by the majority of the population will score high on MMPI scales even if he is not schizophrenic, depressed, psychopathic, or otherwise classifiable as pathological. And, such SS tend to report more "dreamlike" dreams. Therefore, it seems most reasonable to conclude from the general pattern of positive correlations between MMPI clinical scales and qualitative aspects of dream reports obtained by Pivik, Foulkes, and Rechtschaffen (1964, 1966, 1968) that some trait predisposes SS to be relatively more willing to endorse socially disapproved or peculiar self-descriptions and report dreams which are more vivid, perceptual, bizarre, dramatic, and hallucinatory.

Before proceeding to conceptualize this trait any further, two points are worth making: (a) One assumption of the present model is that this trait would be developed in any individual as the result of the chronic occurrence of differential leels and patterning of phasic events. Therefore, this trait must be logically connected to the psychological state which is hypothesized to be a correlate of phasic events. This state has been characterized above as one in which the dreamer reacts to his or her subjective dream experience as if it were an external or objective event. (b) The trait which we are trying to conceptualize must also be linked to the other personality measures which have been associated with qualitative aspects of the dream report, to which we now turn.

Pivik and Foulkes (1966) found that SS who scored toward the sensitization end of the Byrne R-S scale rported more "dreamlike" dreams from REM sleep. As was described above, this means that the more dreamlike dreamer is a person who tends, in waking life, to focus anxiety-provoking stimuli in awareness, in various ways, rather than to push them out of awareness. The question now becomes: wnat trait might predispose SS to be relatively more likely to endorse socially-disapproved self-descriptions, focus anxiety-provoking stimuli in awareness, and report dreams which are rated as more dreamlike? Before beginning an answer to this question, let us add Foulkes, Spear, and Symond's (1966) interesting data.

In their analysis of CPI items which discriminated high from low sleep onset dreamers and high from low REMP dreamers, they noted that all of the items which when endorsed discriminated high from low REMP dreamers were keyed false on scales of social adjustment, which they interpreted as was described above. However, examination of these items reveals that they are all relatively socially disapproved self-descriptions: "I am fascinated by fire," "I have strange and peculiar thoughts." Furthermore, seven of the eight items which discriminated high from low sleep onset dreamers were keyed positively, suggesting that an acquiescent response set might be the personality variable which influences the production of more dreamlike mentation reports from the sleep onset period. The point here is that the data collected by Foulkes et al. (1966) are very consistent with the conceptualization of the MMPI data described above--that a tendency to agree to socially disapproved self-descriptions is the factor operating in high-scoring SS. In the case of the high REMP dreamers, the emphasis would seem to be on the fact that the self-description was socially disapproved, and/or clearly linked to relatively uncensored impulse life, while for the high sleep onset dreamers, acquiescence seems to outway the content of the item.

The last study whose data need to be added to the conceptualization of a personality trait which is correlated with qualitative aspects of sleep mentation is that of Starker (1974). His study suggested that one factor which discriminated SS who reported more dreamlike (emotional, bizarre, etc.) dreams from others was their tendency to have daydreams which were experienced as distractive intrusions into ongoing mental life. This fits nicely with the interpretation of the studies of Foulkes and Rechtschaffen (1964), Pivik and Foulkes (1966, 1968), and Foulkes, Spear, and Symonds (1966) offered above. It would be expected that an individual who experienced his or her waking fantasy processes as distracting intrusions into ongoing mental life would be more likely to endorse socially disapproved self-descriptions since the frequently disapproved or peculiar content of daydreams would have a more compelling, real quality from which the person might not so easily distance himself or herself. In developing a defensive style, such an individual might be expected to incline toward cognitive manipulations which fit harmoniously with an increased tendency toward vivid experience of internal events--i.e., "sensitizer" type defenses such as intellectualization and isolation.

This conceptualization--the tendency to experience fantasy as real and external--derived from experimental data is strikingly similar to Schafer's (1968) formulation derived from clinical data. In expanding his explanation of the dynamics of daydreams and introjects (discussed above) into the realm of individual differences, he speculates that the constancy of reflective self representations may vary between subjects as well as between conditions. Furthermore, Schafer suggests that generalized tendencies to repress, or regressively suspend, reflective self representations may vary in quality as well as in degree between individuals. In this context, he describes "individual differences in the stability of the reflective self representations, or the readiness to repress them or regressively lose them." Schafer describes three personality types, varying along a continuum with respect to stability or readiness to suspend reflective self representation: (a) "Rigid" individuals, who are highly self-conscious, feeling they must emphasize their reflective self representations; and, accordingly, their play and daydreams are hampered by an acute self-awareness. (b) "Flexible" individuals, who "have their reflective self representations steadily available, and at the same time, can suspend them easily." They are "better able to use regression for adaptive and creative purposes." (c) "Fluid individuals, who "maintain reflective self representations only erratically and with difficulty." Narcissistic and schizoid character pathology are included in this group. Their "differentiations of self and object representations are not sharp and consistent enough and . . . their reflective self representations are . . . diffuse, weakly invested . . . easily lost or drastically minimized" (pp. 108-109).

It will be interesting to see if Schafer's trichotomous ordering of modes of reflective self representation, based on clinical data, is also evident in patterns of dream reporting, as well as in patterns of daydreaming, and also to determine how these two functions are related to one another.

Examining that relationship is intended to give construct validity to Schafer's formulation and support to a psychological interpretation of the phasic-tonic model.

Hypotheses and Predictions

1. The suspension of reflective self representation is a correlate of REM phasic activity.

Predictions: 1A. REM mentation reports will be scored higher on Absorption in Dreaming (AID) scales than NREM reports.

1B. Phasic REM reports will be scored higher on AID scales than tonic REM reports.

2A. There will be a continuity of psychological structure between modes of waking fantasy experience and sleeping fantasy experience.

Prediction: 2A. Subjects' mean AID scale scores will correlate positively with measures of suspension of reflective self representation in waking consciousness.

2B. The continuity in psychological structure will be strongest when the least phasic activity is present.

Prediction: 2B. Mean AID scale scores' correlations with waking measures of suspension of reflective self representation will be significantly higher in tonic REM sleep than in phasic REM sleep.

2C. The tendency toward differentiation, or containment, of nocturnal fantasy in REM sleep will be paralleled in waking functioning.

Prediction: 2C. Differences between subjects' mean REM and NREM AID scale scores (NREM subtracted from REM) will correlate negatively with waking measures of supension of reflective self representation.

CHAPTER III

Methods

The general procedures which were used in the collection of the raw data are contained in the appendix. What follows is a description of the assessment procedures and statistical treatment of the data.

Mentation Report Selection and Assessment

Mentation reports from 2 consecutive baseline nights and 2 consecutive midbaseline nights were used. The second pair of baseline nights followed the first pair by 7 to 12 days, during which time a 4-night sleep deprivation and recovery period plus 3 - 5 nights of home sleep had taken place.

Each of the 20 male subjects contributed approximately nine mentation reports per night, making a total of 715 reports. Each of these reports was rated on the seven Absorption in Dreaming subscales by two independent judges, blind to sleep conditions and subject characteristics. Mentation reports were rated for one subject at a time. Within that subject, reports were shuffled into an approximation of a random order.

Reports for which the subject produced not a single idea unit (besides the fact that he could not remember what was going through his mind) were designated "no report" and discarded from the data analysis. Disagreements between the raters were resolved by consensus. Interrater reliability for each AID scale was assessed via product-moment correlations for the continuous scales (Reality and Affect) and via tetrachoric correlations for the dichotomous scales. This was done for two randomly selected subjects. In addition, two other randomly selected subjects were rerated following the completion of all scoring (approximately 3 months later) in order to assess unreliability due to temporal drift. These reliability data are all contained in Table 2.

A description of the seven AID scales follows. The exact procedure for using the AID scales is contained in the appendix.

1. Reality: This 7-point scale was designed to rate the subject's evaluation of the extent to which his mentation experience seemed real, or objective. It is based only on the subject's response to the last question asked during the mentation interview ("How real did it seem?") and, presumably, is predominantly indicative of the subject's waking consciousness, or ego-functioning.

2. Affect: This 7-point scale was designed to rate the subject's evaluation of the intensity of his emotional experience during the preceding mentation experience. It is based on the subject's response to the fourth, or next to last, question of the mentation interview ("What feelings or emotions did you have?) and, hence, is like the Reality scale in the sense that the subject was probably relatively more awake and ego-oriented. However, scoring was not solely based on the subject's self-evaluation.

3. Denial: This dichotomous rating was designed to assess the presence of defensiveness in the subject's report. It is based on the third and fourth questions of the mentation interview. It is independent of any judgement on the part of the subject, since it is not directly inquired into, and is based wholly on the rater's application of the instructions.

4. Global: This dichotomous scale was designed to assess the subject's actual loss of reflective self representation and consequent immersion in a primarily sensory experience during the preceding mentation. Unlike either Reality or Affect, it is relatively independent of the subject's judgement. Global is based on the first three questions of the mentation interview: "What was just going through your mind?", "Any more to it?", and "How clear

and vivid was it?".

5. <u>Responsivity</u>: This 7-point scale was designed to assess to what extent the subject failed to respond to the experimental situation in a way which indicated his objective awareness. It utilizes all five questions of the mentation interview.

6. <u>Self-representation</u>: This dichotomous rating was designed to assess whether or not the subject experienced himself as reflective with respect to his mentation experience--i.e., experienced himself as the thinker or dreamer of his experience--, as evidenced in the grammatical form of his replies to the first two questions of the mentation interview. It is independent of the subject's own judgement.

7. <u>Temporal</u>: This dichotomous scale was designed to assess whether or not any inappropriate fluctuation in the subject's employment of verbal tense was evident from his responses to questions 1 and 2 of the mentation interview. It is independent of any evaluation on the part of the subject.

Scores from the seven AID scales were intercorrelated with one another within various sleep conditions: NREM, REM, phasic REM, early in the night, late in the night, early REM, etc., thus producing approximately 15 7 x 7 correlation matrices showing the intercorrelatedness of the seven AID scales. This was also done within each subject and between subject mean values for particular conditions in order to ensure that within subject variability was not obscuring any existing correlations. As described in the results section below, this analysis led to the decision to leave the seven AID scales as independent entities.

Analysis of the Relationship Between Sleep Conditions and Mentation Report Quality

A 2 x 2 x 2 analysis of variance was conducted with respect to each

AID scale mean score as the dependent variable. The three independent variables for all seven ANOVA's were: (a) REM condition--i.e., REM or NREM, (b) phasic condition--i.e., phasic or tonic, and (c) time of night--i.e., before or after 50% of the subject's total sleep time for that night had elapsed.

Planned comparisons between phasic and tonic REM means for the Reality, Affect, Global, and Self-representation scales were conducted.

Personality Assessment

Each subject was administered the basic clinical and validity scales (L, F, and K) of the Minnesota Multiphasic Personality Inventory, the Imaginal Processes Inventory, and the Maudsley Personality Inventory in the course of the collection of the sleep and dream data.

Factor scales for the Imaginal Processes Inventory (IPI) were obtained by conducting a principle components factor analysis of the following IPI scales: Daydreaming Frequency, Absorption in Daydreaming, Acceptance of Daydreaming, Positive Reactions in Daydreaming, Frightened Reactions to Daydreams, Visual Imagery in Daydreams, Auditory Images in Daydreams, Bizarre Improbable Daydreams, Mindwandering, Achievement-oriented Daydreams, Hallucinatory-Vividness of Daydreams, Fear of Failure in Daydreams, Hostile Daydreams, Sexual Daydreams, Heroic Daydreams, Guilt Daydreams, Boredom, and Distractibility. The Neuroticism scale of the Maudsley Personality Inventory was included in the factor analysis as per the instructions of the designers of the IPI (Singer and Antrobus, 1972).

The first three factors were rotated to maximize loadings of zero and one. Scores from scales which loaded with other scales as in the original Singer and Antrobus factor analyses, and/or loaded a given factor above .50 and did not load any other factor higher, were combined to produce factor scores.

Two additional daydreaming/personality test scores were obtained by selecting items from the IPI on a rational, a priori basis with the intention of creating scales to assess two personality constructs described by Schafer (1968): flexibility and fluidity.

Excluding the MMPI, then, each subject had ten personality scores consisting of the three factor scales, five independent IPI scales, and the two newly constructed scales. These ten scores were intercorrelated with one another as well as with three validity scales of the MMPI: F, K, and L.

Correlation of Personality Scores with Mentation Scores

For each subject, a mean rating for each of the AID scales was computed for each of four sleep conditions: NREM, REM, phasic REM, and tonic REM. In addition, for each AID scale, each subject's mean NREM score was subtracted from his mean REM score to produce a REM-NREM difference score. Therefore, for each AID scale, a given subject had five mentation scores plus a mean rating across sleep conditions (all reports). Each of these scores was correlated with the personality/daydreaming scales and the clinical and validity scales of the MMPI.

Differences between correlation coefficients in different sleep conditions (in particular, between REM and NREM and between phasic and tonic REM) were assessed using t-tests for the significance of a difference between correlated correlations.

CHAPTER IV

Results

A total of 715 mentation reports were rated. Each of 20 subjects provided approximately nine reports for each of 4 baseline nights. Of these, 66 reports were rated as having no content and were discarded from the data analysis. Of the remaining reports, an additional 79 were from the sleep onset period and also were excluded from the data analysis, leaving a total of 570 scored dream reports. These consisted of 419 NREM reports (137 tonic and 282 phasic) and 151 REM reports (69 tonic and 82 phasic). Each report was designated as early or late, depending upon whether it was recorded before or after 50% of the subject's total sleep time for the night had elapsed. One hundred seventy-three reports were thus designated early and 397, late. One hundred three REM reports were late and 48, early; 125 NREM reports were early and 294, late. Table 1 presents these data as well as the breakdown of phasic and tonic categories into early and late. It can be seen that approximately 70% of the scored reports were classified as late and that this proportion was equally divided between REM and NREM reports.

Each mentation report was scored by two independent judges on each of the seven subscales of the Absorption in Dreaming (AID) scale. The exact procedure for each subscale is contained in the appendix.

Establishment of Mentation Report Assessment

The first phase of the data analysis was carried out in order to determine how to best combine subscales of the AID scale, since each subscale was originally construed as a component of the relatively unitary process of suspension of reflective self representation. Each subscale was correlated with every other subscale within particular sleep conditions, such as REM sleep, NREM sleep, or late REM sleep. Fifteen 7 x 7 correlation matrices were produced in this way. Virtually all correlations were positive. While many significant correlations appeared, they were generally of a very low order (i.e., about .30). Correlations within individual subjects and between subject means did not reveal any trends that were not observable in the across subjects matrices. The most consistently strong relationship was between the Reality subscale and the Global subscale.

Therefore, it was concluded that each subscale should be treated as a separate dependent variable representing relatively independent aspects of the suspension of reflective self representation. The Denial and Responsivity subscales both produced very skewed distributions (they were both scored very infrequently) and, although included in the data analyses, were not regarded as directly related to reflective self representation. This is based on the fact that neither of these subscales evidenced a consistent positive relationship to the other subscales and on the basis of their content.

Relationship Between Sleep Conditions and Mentation Report Qualities

The second phase of the data analysis was an examination of the relationship between sleep conditions--REM vs. NREM, phasic vs. tonic, and early vs. late--and the mentation variables. A 3-way analysis of variance was conducted with respect to each AID subscale as the dependent variable. (See tables 3 - 13 and figures 1 - 7.) The three independent variables were the three dichotomous sleep conditions described above--REM condition, phasic condition, and time of night. In addition to the ANOVA's, planned comparisons between phasic REM and tonic REM conditions were carried out with respect to the five AID subscales which were designated as good indicators of suspension of reflective self representation: i.e., Reality, Global, Self representation, Temporal, and Affect. The results of these analyses follows. (AID subscales will be referred to as scales hereafter.)

For the Reality scale, REM condition produced a strong main effect (F = 12.41, $p < .0001$), with REM reports higher on this variable. Neither phasic condition nor time of night produced a significant main effect. The interaction between REM and time of night was significant (F = 4.06, $p <$ .044), and the interaction between REM and phasic conditions approached significance (F = 3.32, $p < .067$). The high cells were late REM and phasic REM. The result of the planned comparison between phasic REM and tonic REM did not reach statistical significance (t = 1.115, $p < .133$).

For the Affect scale, REM condition produced a strong main effect (F = 17.1, $p < .0001$), with REM reports scoring higher. There were no other main effects or interactions for this variable. However, it may be worth noting that the difference between REM and NREM mentation was greatest late in the night, as was the case to a much greater extent with the Reality scale. The planned comparison revealed no difference between phasic and tonic REM conditions on the Affect scale (t = .254, $p < .40$, one tail). Phasic REM was somewhat higher than tonic REM.

For the Denial scale, no significant effects resulted. However, the interaction between REM and time of night approached significance (F = 3.04, $p < .08$). Denial was scored most frequently in late phasic REM.

For the Global scale, REM condition showed a very powerful main effect (F = 28.45, $p < .0001$), with REM reports scoring higher on this dimension. Time of night also showed a significant main effect (F = 4.10, $p < .043$), with late reports scored higher. The interaction between phasic and REM conditions approached significance (F = 3.30, $p < .07$). Late phasic REM produced the highest rating for this variable. The planned comparison between phasic and tonic REM was significant in the expected direction: i.e., phasic scored higher ($t = 1.657$, $p < .049$, one tail).

For the Responsivity scale, no significant effects obtained. Time of night came close to a significant main effect ($F = 3.61$, $p < .058$), late reports scoring higher, and the interaction between time of night and REM conditions approached significance ($F = 3.37$, $p < .067$).

For the Self-representation scale, there were no significant main effects. However, this variable was scored higher both for REM and late in the night. Furthermore, the interaction between REM and phasic conditions was significant ($F = 4.1$, $p < .043$). Phasic REM produced the highest score for this variable. The planned comparison between phasic and tonic REM for this variable came very close to significance in the predicted direction. ($t = 1.509$, $p < .066$).

For the Temporal scale, REM conditions showed a significant main effect ($F = 4.91$, $p < .027$), with REM once again scored higher.

Establishment of Personality Assessment

The purpose of the third phase of the data analysis was to examine correlations between daydreaming styles (as putative indicators of the state of waking reflective self representation) and dream report patterns associated with different sleep stages and conditions. The psychometric instrument for assessing daydreaming habits was the Imaginal Processes Inventory (IPI). Data from MMPI clinical and validity scales were also examined in order to assess the influence of response sets and to compare the present data with previous studies of the same issues which used the MMPI as the principal psychometric instrument (Foulkes and Rechtschaffen, 1964; Pivik and Foulkes, 1968).

According to the designers of the IPI (Singer and Antrobus, 1963, 1972), in general, subscales should be combined into the factors their factor analyses supported. Since it was not possible to know if the present subject sample had an equivalent factor structure to those of Singer and Antrobus, a principle components factor analysis was conducted. The first three factors were rotated to maximize loadings of zero and one. Scales which loaded with other scales as in the original Singer and Antrobus factor analyses and/or loaded a given factor above .50 and did not load another factor higher, were grouped together to form factor scales. The factors thus formed were very close to Singer and Antrobus' (1972) results for the first two factors but produced a different clustering for the third factor. The first factor, here labelled Neurotic daydreaming, consisted of the following scales: Neuroticism score of the Maudsley Personality Inventory, Mindwandering, Distractibility, Boredom, Hostile daydreams, and Frightened Reactions to daydreams. Singer and Antrobus labelled this factor "Anxious Absorption in daydreaming." High scorers on this factor endorse statements which depict themselves as in poor control of their ongoing stream of thought and frequently troubled by it.

The second factor, here labelled Frequent Vivid daydreaming, corresponds to "Positive Vivid Daydreaming" in the Singer and Antrobus factor analyses. It consists of the following scales: Hallucinatory-vividness of daydreams, Absorption in daydreaming, Sexual daydreams, and Frequency of daydreaming. Subjects high on this factor seem to experience frequent daydreaming, which is vivid, real-seeming, and in which they are relatively absorbed.

The third factor does not correspond to anything which materialized in the Singer and Antrobus factor analyses. It is here labelled Articulate daydreaming and consists of the following scales: Achievement-oriented daydreaming, Visual imagery in daydreams, Auditory imagery in daydreams, and Heroic daydreams. It seems that subjects scoring high on this cluster of scales report articulated daydreams with well-delineated, positively toned ideation.

The reliability of the three factor scores is attested to by the fact that Singer and Antrobus (1972) established acceptable reliabilities for each subscale, and the combination of these subscales into a much longer total scale must lead to still higher reliability.

The three factor scores were intercorrelated across the 20 subjects; and of the three correlation coefficients thus produced, one was significant: i.e., Frequent Vivid daydreaming correlated .53 ($p < .02$) with Neurotic daydreaming. Correlations with two validity scales of the MMPI which are closely associated with social desirability response sets (F and K) (Jackson and Messick, 1969) were significant for both the Neurotic daydreaming factor and the Frequent Vivid daydreaming factor. Neurotic daydreaming correlated .71 with the F scale and -.75 with the K scale. Both of these correlations indicate that socially desirable responding is associated with lower scores on the Neurotic daydreaming factor scale. The F and K scales correlated .42 and -.51 respectively with the Frequent Vivid daydreaming factor scale. Only the latter correlation coefficient is significant ($p < .02$), making it reasonable to say that the influence of a social desirability response set on Frequent Vivid daydreaming is less pronounced than in the case of Neurotic daydreaming.

In order to assess suspension of reflective self representation (as conceptualized by Schafer, 1968) more purely and less mixed with social desirability, two new scales were constructed from IPI items selected on an a priori, rational basis to correspond to two of Schafer's conceptualizations They are conceptually similar to the Neurotic and Frequent Vivid daydreaming factors. The first of these, labelled Flexibility, was designed to assess rigidity vs. flexibility in the suspension of reflective self representation: i.e., as described by Schafer (1968), the tendency of the subject to "use [fantasy] regression for adaptive . . . purposes" (pp. 108-109). High scores were intended to indicate an increased tendency to experience daydreams as real-seeming, making frequent use of them for adaptive purposes. The reliability of this scale was established, using the Spearman-Brown odd-even split half technique, at .86. The correlations of the Flexibility scale with the MMPI F and K scales were .21 and -.42. Neither of these is significant, and both are lower than the corresponding correlations with the Frequent Vivid daydreaming scale, the former being significantly lower ($t = 2.06$, $p < .03$, one tail).

To assess "fluidity" (ie., Schafer's concept of the tendency to have poor control over reflective self representation and, hence, experience relatively more discomfort and distress in connection with ongoing stream of thought and daydreaming), another scale was constructed from IPI items selected on an a priori, rational basis and entitled Fluidity. Its reliability (.78) was established in the same manner as the Flexibility scale. (Both complete scales are contained in the appendix.)

The IPI scales which remained after the creation of the three factor scales were: Acceptance of daydreaming, Positive Reactions in daydreaming, Guilt daydreams, Fear of Failure daydreams, and Bizarre Improbable daydreams. These were included in the data analysis as independent measures. Table 14 shows the intercorrelation of the ten daydreaming scales with each other and with the MMPI F, K, and L scales.

The Flexibility and Fluidity scales share some items with Frequent Vivid and Neurotic daydreaming as well as with Acceptance of daydreaming and

Positive reactions in daydreaming. Correlations due to item overlap alone are presented in table 14.

It can be seen that scales conceptually related to Schafer's notion of flexibility--Flexibility, Frequent Vivid daydreaming, Acceptance of daydreaming, and Positive Reactions in daydreaming--correlate positively with one another and, when correlations due to item overlap are considered, to a lesser degree with the scales connected with Schafer's fluidity concept. These two latter scales--Fluidity and Neurotic daydreaming--are both strongly correlated with the MMPI indicators of socially desirable responding, so that high scores on both scales are associated with a diminished concern with social desirability.

Correlation of Personality Scores with Mentation Scores

In order to correlate patterns of night dreaming with measures of daytime mentation, each subject's mean rating for each of the seven AID scales was correlated with scores on the daydreaming scales and MMPI scales. This was done for all mentation reports (i.e., across sleep conditions), for all NREM reports alone, for REM reports alone, for phasic REM reports, for tonic REM reports, and for the difference score between REM and NREM mentation means (i.e., NREM always subtracted from REM.) The reliability of mentation mean scores was assessed by the Spearman-Brown odd-even split-half technique. The reliability of the difference between REM and NREM means was computed via McNemar's (1969) formula for the reliability of a difference score.[5] These data are presented in table 2. They do not, however, represent true estimates of the reliability of these scores for any

[5]The comparability of REM and NREM reliability was assessed by computing the projected reliability of REM scores were it to have the same number of items (24) as the NREM scores. The results showed similar *r*'s.

population. This is because the n's in each split half were too low to permit this. This was particularly the case for REM and subcategories of REM, where split-half n's were always below five, and in the cases of phasic and tonic REM, where they were never more than two. For NREM mentation, each split-half contained 12 or fewer reports. Therefore, the reliabilities are intended to be used only to determine whether or not the absence of a significant correlation in a particular condition can be attributed to the relative unreliability of the measure in that condition.

Correlations between daydreaming scales and MMPI scales, and mentation mean scores for the different sleep conditions, are presented separately for each mentation scoring category--i.e., each AID scale. Correlations with MMPI clinical and validity scales are presented chiefly for the purpose of evaluating the role of response set and, in general, will not be discussed individually. (See tables 16 - 22.)

Thus, there are 420 correlation coefficients of interest--i.e., between 10 daydreaming scales and seven AID scales for each of six sleep conditions. Of these, 48, or 11½%, reached a statistically significant value of .44 ($p < .05$, two-tailed test) or higher, more than twice the number than would be expected by chance alone.

The Affect scale produced 13 significant correlations, the highest number of the seven AID scales. All of these correlations were positive and were evenly distributed among sleep conditions. The four daydreaming scales which we have designated as indicators of Schafer's concept of flexible suspension of reflective self representation--Flexibility, Frequent Vivid daydreaming, Acceptance of daydreaming, Positive Reactions in daydreaming (hereafter referred to collectively as Flexible Frequent daydreaming)--produced six significant correlations. A strikingly high correlation (.71) appeared between the REM-NREM difference score and Guilt daydreams. There was no observable difference between the pattern of REM and NREM correlations.

The next highest producer of significant correlations was the Global scale, with 11 significant rho's. Ten of these were negative and were concentrated in REM correlations with Flexible Frequent daydreaming, no significant correlations at all appearing with other daydreaming scales. All four Flexible Frequent daydreaming scales correlated significantly negatively (-.53 to -.66) with the REM-NREM difference score. Phasic REM and all REM also produced significant negative correlations. But, interestingly, tonic REM produced none (although all were negative), while the one significant correlation with NREM mentation was a positive correlation with Acceptance of daydreaming. In fact, disregarding significance levels, it can be seen that all NREM correlations with Flexible Frequent daydreaming scales were positive, while all REM and REM-NREM difference correlations were negative.

The Temporal scale produced eight significant correlations, five of which were in REM conditions, all of which were negative. Only one of these appeared in a NREM correlation--i.e., with Fear of Failure daydreams. For the Flexible Frequent daydreaming scales, correlations with NREM mentation were on the order of zero. An interesting datum for the Temporal scale is that it is the only AID scale for which two significant negative correlations were obtained for the <u>all</u> dream reports category, cutting across sleep stages. These were for Bizarre improbable daydreams (-.64) and Fear of failure daydreams (-.45).

The Reality scale produced five significant ($p < .05$, two tail) correlations, three positive and two negative. The positive correlations were between NREM mentation and Acceptance of daydreaming (.48), between phasic REM mentation and Guilt daydreams (.66), and between REM-NREM difference scores and Guilt daydreams (.52). Significant negative correlations were between REM-NREM difference scores and Acceptance of daydreaming (-.53) and between tonic REM mentation and Neurotic daydreaming (-.51). Again, it can be readily seen that REM and REM-NREM difference correlations with Flexible Frequent daydreaming are all negative (or zero), while virtually the opposite is true for NREM mentation.

The Self-representation scale produced four significant correlations, three positive and one negative. Two of the positive correlations are from NREM sleep, while the third is from the all reports category. The one significant negative correlation was between REM-NREM difference and Acceptance of daydreaming (-.44). The relationship of NREM to REM measures with respect to correlations with Flexible Frequent daydreaming scales is similar to that found in the Global, Reality, and Temporal scales: taking the sign of the correlation into account, NREM correlations were always higher--i.e., presented a more positive correlation. Furthermore, the correlations with REM-NREM difference scores were uniformly negative as was the case with the Global, Reality, and Temporal scales.

The Denial scale had four significant correlations, all with the Guilt daydreams scale. Virtually all of this scale's correlations with Flexible Frequent daydreaming scales were negative, regardless of sleep condition.

The Responsivity scale produced three significant correlations, all negative and all for a REM sleep condition. Two of these were with Flexible Frequent daydreaming scales. The third was between phasic REM and Fear of Failure daydreams.

The correlations between Flexible Frequent daydreaming scales and mentation ratings show an interesting consistency: if we focus on the Reality, Global, Self-representation, and Temporal scales--remembering that these were designated as better indicators of suspension of reflective self representation in dreams--, virtually all correlations between Flexible Frequent daydreaming scales in NREM sleep are positive and almost all (14 of 16) REM correlations are negative. Five of the NREM correlations are significant, as well as five of the REM correlations. All of the correlations between REM-NREM difference scores and Flexible Frequent daydreaming scales for Reality, Global, Self-representation, and Temporal are negative, seven of the 16 significantly so. The only exceptions to the above pattern are two zero order correlations (-.08, -.05) between Flexibility and Frequent Vivid daydreaming and Temporal in NREM sleep. This pattern of negative correlations in REM sleep, positive correlations in NREM sleep, and negative correlations for REM-NREM difference scores (all for Flexible Frequent daydreaming scales) is most visible and well-represented by significant correlations, on the Global scale. The Affect scale is not completely an exception to this pattern: its four correlations with Flexible Frequent daydreaming scales in NREM sleep are all positive, one of them significantly so ($\underline{p} < .05$, two-tailed test), while the other three are not too far off (.41, .39, and .33).

Another way to conceptualize the consistent differentiation between REM and NREM correlations with Flexible Frequent daydreaming scales is as a difference between REM and NREM correlation coefficients. According to the above described pattern, this would be positive if REM were subtracted from NREM. If we focus again only on the Reality, Global, Self-representation, and Temporal scales, 16 such comparisons are possible. In every case, the difference is positive; and for eight of these, the difference is significant ($p < .05$, one-tailed test). (See table 23.)

The Guilt daydreams scale--conceptually very different from Flexible Frequent daydreaming scales--also produced a consistent pattern of differentiation of REM and NREM correlations, in the opposite direction, however. In the case of this scale (Guilt daydreams), a consistent pattern was evident across all but the Denial and Responsivity scales. This pattern was as follows: all correlations in REM were positive (one significant) and all in NREM were negative (one of these barely missed significance). Therefore, of course, the difference between NREM and REM correlations (REM subtracted from NREM) was negative for each of the five comparisons. Two of these differences were significant (Reality: $\Delta r = -.62$, $t = 2.64$, $p < .02$; Affect: $\Delta r = -.79$, $t = 3.96$, $p < .001$) and two others approached significance (Temporal: $\Delta r = -.56$, $t = 1.93$, $p < .08$; Self-representation: $\Delta r = -.47$, $t = 1.82$, $p < .10$). Correlations between REM-NREM difference scores and Guilt daydreams (for the five AID scales under consideration) were all positive, two of the five significantly ($p < .05$, two-tailed) (i.e., Reality and Affect, .52 and .71 respectively) and one just shy of significance (Self-representation .42), thus continuing an almost exact reversal of the Flexible Frequent daydreaming correlations. The pattern of REM and NREM correlations being described here is strongest for the Reality and Affect scales. (See table 23.)

To some extent, the differentiation between REM and NREM correlations with the Guilt daydreams scale is paralleled in the differentiation between phasic and tonic REM correlations. For the Reality and Affect scales, there was a substantial difference between phasic and tonic REM correlations which was in the same direction as the difference between REM and NREM correlations: i.e., phasic subtracted from tonic REM yielded a negative remainder, as did REM subtracted from NREM. This difference was highly significant for the Reality scale (Δ $\underline{r}$ = -.107, $\underline{t}$ = 4.69, $\underline{p} <$ .0001), but not significant for the Affect scale.

Another interesting differentiation between phasic and tonic REM correlations is evident with respect to the correlations with the MMPI F and K scales, both of which are indicators of socially desirable responding. Since high scores on the K scale and low scores on the F scale are indicators of increased tendency toward socially desirable responding, these scales' correlations will go in opposite directions, as will their phasic-tonic differences when they are, in fact, reflecting the same data pattern. The pattern that they revealed is that correlations with social desirability were always more positive in tonic REM, as compared to phasic REM. This manifested itself most consistently in the following way: for the K scale, for which high scores indicate increased concern with socially desirable responding, the subtraction of phasic REM correlations from tonic REM correlations always (for the five AID scales focussed on previously) led to a positive remainder. Two of these comparisons for the K scale led to statistically significant differences--i.e., for Global (Δ $\underline{r}$ = +.57, $\underline{t}$ = 2.11, $\underline{p} <$ .05, two-tailed test) and for Temporal (Δ $\underline{r}$ = +.55, $\underline{t}$ = 2.41, $\underline{p} <$ .05). The other differences were: Reality, +.48; Affect, +.19; and Self-representation, +.37. (See table 23.)

Contrariwise, but with the same meaning for the F scale, for which low scores indicate an increased tendency toward socially desirable responding, the subtraction of phasic REM correlations from tonic REM correlations always led to a negative remainder--i.e., correlations with the F scale were always more negative in tonic REM as compared with phasic REM. This difference was significant for one of the five comparisons--

i.e., for Reality ($\Delta r = -.99$, $t = 3.98$, $p < .001$). The other differences were: -.20, -.21, -.21, and -.32.

Before turning to the MMPI clinical scales, it is worth noting where they stand in relation to socially desirable responding. Jackson and Messick's (1967) factor analysis of MMPI scales broken up into true and false keyed components showed that every clinical scale is correlated with a social desirability factor to a greater or lesser degree. For some scales, the true and false keyed halves correlate in opposite directions with social desirability and, hence, the total scale score is not a good social desirability indicator. In general, high scores on a given clinical scale indicate a diminished concern with socially desirable responding. The scales which were the best indicators of social desirability in Jackson and Messick's factor analysis were: Schizophrenia, Psychasthenia, Depression, and Social Introversion. The weakest are Paranoia and Hypomania. In the present data, K corrections were carried out for Schizophrenia, Hypochondriasis, Psychopathic Deviate, Hypomania, and Psychasthenia. This leaves Social Introversion and Depression as probably the purest social desirability indicators in the present data.

The correlations with the MMPI clinical scales present the most consistent pattern when examined with respect to REM-NREM and phasic-tonic REM differentiation. However, let us first examine their overall pattern for each AID scale and the five sleep conditions: REM, NREM, tonic REM, phasic REM, and REM-NREM difference score. (Tables 16 - 22.)

Of the 50 correlations with the Reality scale, 30 were negative (four significantly, $p < .05$) and 20 were positive (one significant). Negative correlations were concentrated in NREM (nine of 10 were negative, one significantly) and tonic REM (all were negative, three significantly). REM sleep had mainly zero order and low negative correlations, while phasic REM had virtually all positive correlations (one significant). REM-NREM difference correlations were either zero order or low positive. The outstanding correlations were produced by the Schizophrenia scale in NREM sleep (*r* = -.56) and tonic REM (*r* = -.59), the Depression scale in tonic REM (*r* = -.47) and phasic REM (*r* = .45), and the Social Introversion scale in tonic REM (*r* = -.57).

The Affect scale produced eight negative (all zero order or low) and 42 positive correlations (seven significant). The significant and higher correlations were concentrated in REM and phasic REM. Notably high correlations were produced by Masculine-Feminine in REM (*r* = .56) and phasic REM (*r* = .61), Psychopathic Deviate in REM (*r* = .47) and phasic REM (*r* = .56), Depression in the same conditions (*r* = .52 and .45 respectively) and Paranoia in the same conditions (*r* = .41 and .48 respectively).

The Denial scale produced twelve negative (generally low) and 32 positive (six significant) correlations. The significant correlations were relatively evenly divided among the five sleep conditions, with the exception that tonic REM produced no significant correlations. Notably high correlations appeared for Psychopathic Deviate in REM (*r* = .47) and phasic REM (*r* = .62), for Hysteria in the same conditions (*r* = .48 and .45 respectively), for Paranoia and the REM-NREM difference score (*r* = .49), and for Schizophrenia in NREM (*r* = .45).

For the Global scale, there were 19 negative and 31 positive correlations; however, 35 of these were of zero order--i.e., .15 or lower. Negative correlations were concentrated in NREM sleep (nine of 10). High correlations were for Hypochondriasis in NREM (*r* = -.44) and tonic REM (*r* = .46). However, of the 50 correlations, only two were significant, below the number to be expected by chance alone.

For the Responsivity scale, 10 negative and 40 positive correlations appeared. Only one of these was significant. No pattern in the distribution of the correlation coefficients among sleep conditions was evident.

The Self-representation scale produced 50 correlations which were evenly divided between negative and positive correlations. Each sleep condition had close to equal numbers of positive and negative correlations. Two correlations were significant: Hysteria ($r = -.44$) and Social Introversion ($r = .55$), both for phasic REM.

The Temporal scale also divided its 50 correlations evenly between positive and negative and between sleep conditions. No significant correlations appeared.

We turn back now to the question of differences between REM and NREM correlations on the one hand and between phasic and tonic REM correlations on the other.

For the Reality scale, eight of the 10 comparisons between NREM and REM correlations (REM always subtracted from NREM) showed REM scores to have a more positive correlation with the MMPI scales--i.e., the remainder was negative for the eight and positive for two. The two scales which were exceptions were Paranoia ($\Delta r = +.03$) and Hypomania ($\Delta r = +.05$). (As will become clear, Hypomania, which was described as a relatively weak social desirability indicator above, is an exception to the pattern of REM-NREM differences for six AID scales.) Most of these differences are fairly small, the highest being Δr -.33, n.s., attained for the Psychopathic Deviate, Psychasthenia, and Schizophrenia scales.

The comparisons between phasic and tonic REM correlations (phasic always being subtracted from tonic) showed a parallel pattern, but with much larger differences. (See table 24.) All comparisons led to a negative remainder, four of which reached statistical significance: Depression ($\Delta r = -.92$, $t = 3.39$, $p < .01$), Schizophrenia ($\Delta r = -.88$, $t = 3.28$, $p < .01$), Social Introversion ($\Delta r = -.76$, $t = 2.68$, $p < .02$), and Psychopathic Deviate ($\Delta r = -.66$, $t = 2.11$, $p < .05$).

For the Affect scale, eight of the 10 REM-NREM comparisons led to negative remainders (i.e., again, REM correlations were more positive). However, also paralleling the Reality scale, the differences were generally small, none reaching statistical significance. The three highest differences ($\Delta r = -.41$) were for Psychopathic Deviate, Paranoia, and Social Introversion. The exceptions to the direction of the difference were Hypomania ($\Delta r = +.10$) and Hypochondriasis ($\Delta r = +.04$).

The phasic-tonic comparisons presented a similar pattern: eight of the 10 comparisons showed phasic REM correlations to be more positive. One of these (Psychopathic Deviate) came close to significance ($\Delta r = -.47$, $t = 2.05$, $p < .06$). The other larger differences were Hysteria, Paranoia, and Schizophrenia ($\Delta r = -.40$, $-.40$, and $-.42$ respectively).

For the Global scale, once again, eight of 10 comparisons showed REM correlations to be more positive. These were generally low, with the exception that Hypochondriasis was high and significant ($\Delta r = -.71$, $t = 2.11$, $p < .05$). The highest of the other differences were Schizophrenia ($\Delta r = -.32$). The phasic-tonic comparisons on the Global scale do not represent the pattern being described here with any strength--seven of 10 comparisons show REM correlations to be more positive, the highest of these being Schizophrenia ($\Delta r = -.30$). One of the three comparisons which go in the opposite direction approached statistical significance: Hypochondriasis ($\Delta r = +.51$, $t = 1.81$, $p < .10$).

For the Denial scale, seven of 10 REM-NREM comparisons show REM correlations to be more positive. The highest of these, for Hypomania, was significant ($\Delta r = -.49$, $t = 2.69$, $p < .02$). The next highest, Paranoia, approached significance ($\Delta r = -.39$, $t = 2.05$, $p < .06$).

The phasic-tonic comparisons for the Denial scale presented a somewhat more consistent pattern of differences. All yielded negative remainders, showing phasic correlations to be more positive. The difference for the Psychopathic Deviate scale was significant ($\Delta r = -.47$, $t = 2.26$, $p < .05$).

The Self-representation scale presents the least consistent pattern of both REM-NREM and phasic-tonic differences. For REM-NREM comparisons, there are approximately equal numbers of positive and negative remainders (four and five respectively) ranging from $\Delta r = -.51$ (for Hysteria, $t = 2.02$, $p < .06$) to +.48 for Masculine-Feminine ($t = 1.9$, $p < .10$). For phasic-tonic differences on this scale, the data are also mixed--six of 10 differences show phasic REM to be more positively correlated, and one of them is significant (Social Introversion: $\Delta r = -.53$, $t = 2.16$, $p < .05$). The four differences which go in the opposite direction are Paranoia ($\Delta r = +.45$), Hypochondriasis ($\Delta r = +.25$), Psychopathic Deviate ($\Delta r = +.21$), and Masculine-Feminine ($\Delta r = +.16$).

The Temporal scale produced a more consistent pattern of REM-NREM comparisons. Nine of the 10 show REM correlations to be more positive. One of these, Psychopathic Deviate, is close to significance ($\Delta r = -.54$, $t = 1.83$, $p < .10$). However, the other differences are quite low, the highest being $\Delta r = -.20$ for Depression. The difference in the opposite direction is for Hypomania.

The phasic-tonic differences for the Temporal scale show little, if any, internal consistency--four had negative remainders, four had positive, and two were zero. The negative remainder for Social Introversion barely missed significance ($\Delta \underline{r} = -.50$, $\underline{t} = 2.085$, $\underline{p} < .06$).

CHAPTER V

Discussion

Confirmation of Hypothesis 1

Before directly addressing the question of whether or not the data warrant acceptance of the hypothesis of a correlation between the occurrence of phasic REM activity and suspension of reflective self representation, it may be worthwhile to state the logical relationship between predictions 1A and B, and hypothesis 1.

In general, in order for there to be a correlation between phasic REM and suspension of reflective self representation, we would expect that REM mentation would be higher on indicators of this variable than NREM mentation. However, it is possible that tonic REM mentation would be so low on suspension of reflective self representation that the overall REM mean could be pulled down, washing out any REM-NREM difference. In that case, an association between phasic REM and suspension of reflective self representation would be demonstrated (for a given indicator) if: (a) phasic REM is significantly higher than tonic REM, and (b) if phasic REM is higher than NREM. In any case, it is necessary (in order to show an association of a given suspension of reflective self representation indicator with phasic REM) to show that phasic REM is significantly higher than tonic REM.

Hypothesis 1 is confirmed for the Global scale, without qualification: REM was significantly higher than NREM and phasic REM was significantly higher than tonic REM.

For the Self-representation scale, the data are somewhat more equivocal. There was no significant REM-NREM difference, although it was in the predicted direction. However, phasic REM was significantly higher than all

NREM ($\underline{t} = 1.904$, $\underline{p} < .028$). The comparison between phasic REM and tonic REM just missed significance ($\underline{p} < .067$). Furthermore, the interaction between REM condition and phasic condition was significant. Given these data, one is reluctant to say that we have failed to reject the null hypothesis. On the other hand, clear confirmation was certainly not demonstrated. This will be given further discussion later.

The Reality scale satisfied the condition of having a higher REM than NREM rating; however, the difference between phasic and tonic REM, although in the expected direction, was non-significant, thus apparently failing to confirm the hypothesis. Similar results were obtained for the Affect scale --i.e., there was a strong REM-NREM difference, but a non-significant phasic-tonic REM difference. Essentially the same finding was obtained for the Temporal scale, with the exception that the REM-NREM difference was not as strong ($\underline{p} < .02$).

The Denial and Responsivity scales were most clearly disconfirmed as phasic REM correlates; there were neither significant REM-NREM nor phasic-tonic differences. However, in general, differences were in the expected direction.

Before discussing the psychological meaning of this distribution of firm and equivocal findings, one additional methodological point is worth noting: in spite of the fact that the number of REM and NREM reports was well balanced with respect to time of night, the number of phasic and tonic REM reports was not. Thus, as can be seen from table 1, a disproportionately high number of tonic REM reports were collected late in the night. This does not represent a confounding of any positive findings since it militates against the confirmation of hypothesis 1 (in that late night reports have been reported to be more dreamlike [Verdone, 1965]), but it does mean that the phasic-tonic REM comparison is relatively stringent. In fact, late tonic REM reports were higher than early tonic REM reports for the Reality, Affect, and Denial scales, possibly making it less likely to obtain significance for those variables.

In trying to understand these findings, it will be helpful to conceptualize how the AID scales are differentiated from one another. For some scales (Reality and Affect), the subject is clearly asked to exercise some self-judgement--i.e., "How real did it feel?" and "What emotions did you experience?"--, which is considered in scoring the item. For other scales (Global, Temporal, Denial, Responsivity), the subject's self-evaluation has little direct impact on the score. This differential demand characteristic (i.e., soliciting self-evaluation) is partly present for the Self-representation scale in that the subject is asked "What was just going through your mind" and then rated for whether or not he uses a grammatical form equivalent to "going through your mind" (i.e., he can choose whether or not to imitate the experimenter). Nonetheless, the subject has no direct awareness of the influence of this aspect of his report.

Another dimension along which the AID scales are differentiated from each other is the quantitative portion of the report on which they depend. For example, Global utilizes the first three questions of the mentation interview; Self-representation uses only the first two; Reality, only the fifth; Affect, only the fourth; and Temporal, the first two. It might be argued that one reason why Global and Self-representation were better confirmed as phasic REM correlates is that both depend upon material furnished in the beginning of the interview, assuming that particular psychological properties adhere to such material. Foulkes and Pope (1972) asserted that the differentiation between phasic and tonic REM which they observed was present only when the first two questions of their mentation interview was used. However, Bosinelli et al. (1974) rated on the basis of an extensive 10 question interview and obtained a significant difference between phasic and tonic REM reports on a psychological dimension very similar to the one under discussion here--i.e., the "feeling of self-participation in the dream." None of their ratings, however, depended on self-evaluation from the subject but, rather, inquired into concrete facts of the preceding mentation experience (e.g., "Could you see anything?"). The possibility that the elicitation of a self-evaluating judgement from the subject (present for particular AID scales) interfered with the psychological impact of phasic activity is theoretically consistent with the idea that the phasic activity is a physiological aspect of the suspension of an ego function--i.e., the reflective self representation. In other words, if the demand characteristics of the experimental situation elicit an ego function, then this will interfere with the measurement of the organismic loss of that ego function presumably taking place at the same time. Therefore, it can be seen that suspension of reflective self representation would be best assessed with instruments which minimally elicit ego-oriented self-representation processes.

Furthermore, it could be predicted that subjects who are most responsive, or susceptible to the external elicitation of self-evaluation processes, would be least likely to show a differentiation between actually different levels of reflective self representation when such external elicitation is present in the mentation measurement process. Conversely, subjects who are least influenced by external demand, and therefore give a more accurately modulated account of internal experience, will tend to show a differentiation between phasic and tonic REM reports insofar as phasic and tonic REM actually have different experiential correlates. The mixing together of two such subject groups could lead to the non-significant findings in the right direction, such as are reported here.

Fortunately, it is possible to identify the two groups of subjects by looking at scores on measures of social desirability response bias which, in fact, rate the subject's tendency to tailor his responses to fit what he believes would put him in a favorable light--i.e., to produce a self-evaluation more geared to what he believes is normal or expected than to what is being experienced at the moment.

At least two measures of the tendency to respond in a socially desirable manner are available in the present data: the Guilt daydreams scale of the IPI and the Social Introversion scale of the MMPI. That the Guilt daydreams scale is a social desirability indicator is evident in several ways. Its 5-point Likert items entail admitting to habitual thoughts which are clearly socially disapproved: e.g., "I often feel tortured by images of the sins I have committed," "In my fantasies, a friend discovers that I have lied." Low scorers on the scale tended to deny these items outright by giving a rating of 1 to almost all of the 11 items. High scorers rarely endorsed the items with ratings above 3 but, rather, got their high scores by admitting that these statements were slightly true for them --i.e., ratings of 2 and 3. Therefore, it can be seen that high scorers on this scale are unlikely to be any more guilt-ridden than low scores; they are just less prone to dismiss undesirable self-descriptions which, although perhaps infrequently true, are not necessarily bizarre or rare. Also in favor of viewing the Guilt daydreams scale as a social desirability indicator is the fact that it correlates significantly with the MMPI F scale and other MMPI scales which have been established as social desirability measures (e.g., Depression, Schizophrenia, Social Introversion).

The Social Introversion scale of the MMPI was shown to be a relatively strong social desirability indicator in the factor analyses of Jackson and Messick (1967). (The Psychasthenia and Schizophrenia scales loaded social desirability higher in those factor analyses but, since they were K corrected for the present data, Social Introversion remains the best social desirability indicator for the present purposes.) Furthermore, on an a priori basis, Social Introversion may represent the aspect of social desirability which is most important here--i.e., sensitivity to an implicit external social (from the experimenter) demand.

In addition, the correlations of the Guilt daydreams scale and Social Introversion scale with subjects' phasic and tonic REM mentation scores strongly suggested that segregating subjects with respect to these scales would have an interesting impact on phasic-tonic differences: in general, both scales correlated very differently with phasic REM scores as opposed to tonic REM scores. For example, for the Reality scale, phasic REM correlations were significantly more positive than tonic REM correlations; for the Self-representation scale, the same relationship obtained, but significantly only for the Social Introversion scale. Therefore, phasic-tonic comparisons were carried out again, this time only for the eight subjects who scored above the mean and median of the Guilt daydreams scale, and also for the 10 subjects who scored above the mean and median of the Social Introversion scale. (There was considerable overlap between these two groups. The Guilt daydreams scale correlated .44 with the Social Introversion scale across all 20 subjects.) The results of this analysis follow below.

High Guilt subjects showed a phasic-tonic difference on the Global scale which was very similar to that for all subjects--i.e., $p < .049$--although the phasic REM mean was higher ($\bar{X} = .94$, max. = 1.0). However, for the Reality scale, the effect of segregating high Guilt subjects was quite startling: there was a large highly significant difference between phasic and tonic REM ($t = 3.53$, $p < .0005$) with phasic reports rated much higher. The phasic-tonic difference for the Affect scale after segregation of high Guilt subjects was larger than for all subjects but did not reach significance ($t = 1.34$, $p < .09$). All of the other phasic-tonic differences for high Guilt subjects (with the exception of the Responsivity scale) were in the expected direction and were somewhat enlarged for Self-representation and Denial but did not reach significance.

For the high Social Introversion subjects, phasic and tonic REM means for the Global scale were about the same as for all subjects, but the difference between them was not significant ($t = 1.34$, $p < .09$). For the Reality scale, the difference was much larger than for all subjects and was significant ($t = 3.25$, $p < .001$). The phasic-tonic difference for the Self-representation scale was also much larger than for all subjects and was significant ($t = 2.23$, $p < .015$). All other phasic-tonic differences were in the expected direction (with the exception of Responsivity) and enlarged but non-significant.

What this sub-analysis seems to clearly indicate is that phasic REM activity is associated with two additional aspects of the suspension of reflective self representation besides the appearance to the rater that the subject was involved with and immersed in his dream. These are the feeling of realness of the dream and the loss of the subject's grammatical representation of himself as dreamer or thinker, the former variable showing a very strong relationship. The observation of these associations is interfered with by the operation of a social desirability response bias when assessment is carried out via a self-evaluation question.

The intensity of Affect in the dream report does not seem to be a correlate phasic activity to a sufficiently reliable extent to be observed through the present instruments. This is consistent with the hypothesis of a primary correlation between suspension of reflective self representation and phasic activity. While it seems likely that when the average subject represses a reflective aspect of ego-functioning and allows a mental experience to feel real that there would be an upsurge of affective experience, it is also likely that different defensive structures interacting with different characteristics of the fantasy of the moment might mitigate this effect for particular subjects and for particular fantasies in ways that may be quite difficult to control experimentally. The present data clearly indicate that something going on in REM sleep is associated with increased affective experience. This could be simply the effect of the heightened autonomic arousal, present throughout the REM period.

A similar argument could be made to explain the failure of defensiveness in the dream report (as assessed by the Denial scale) to be correlated with phasic REM activity or REM sleep. However, a more serious methodological problem cannot be ruled out as the possible cause of a negative finding for the Denial scale. The highly skewed distribution of this scale --very few reports were rated positively for it--suggests that this measure was not sufficiently sensitive to defensiveness--i.e., it tended to miss many actual instances of defense by applying too narrow and strict a criterion.

The occurrence of a dream report in which an external observer independently judges the subject to have been unreflectively immersed (the Global scale) is also clearly associated with phasic REM activity. Interestingly, this relationship was more reliable across subjects, in that it was statistically significant for the 20 unselected subjects, but was weaker, both in terms of the significance of its phasic-tonic difference (as compared with the Reality scale for low social desirability subjects) and in terms of its failure to reach significance at all for the phasic-tonic comparison for the high Social Introversion subjects. This suggests that the psychological correlate of phasic REM activity has some specificity, which itself may have broad enough sequelae to be measured in more than one way. According to the present data, the inital, or primary, psychological correlate of REM's is the experiencing of the dream as real-seeming, and one consequence of this is for the dreamer to give the impression of being relatively more involved in his dream. It might be argued that the more reliable difference for the Reality scale is the result of the greater sensitivity of that scale, since it is a 7-point scale, while the Global scale is dichotomous. While possible, this seems unlikely when it is considered that the Global scale produced a much larger difference for the REM-NREM comparison. This is consistent with interpreting the Global scale as reflecting a relatively more non-specific result of the loss of reflective self representation.

The failure of the Responsivity scale to differentiate either phasic from tonic REM reports or REM from NREM reports can be understood similarly to the same results for the Denial scale. Very few mentation reports scored above zero on this 7-point scale, suggesting that it was too insensitive to many instances wherein the subject was relatively more involved with his dream, and, hence, unresponsive to the environment, but perhaps still managed to respond appropriately to the experimenter.

As in the case of the Reality scale, high scores on the Self-representation scale--i.e., the tendency to report the dream as if describing an external event (as evidenced by the absence of a grammatical reflective self representation)--were significantly associated with phasic REM activity, and this association was obscured (to a lesser extent than for the Reality scale) in subjects high on social desirability response bias, in particular in subjects scoring low on the Social Introversion scale. What seems to have happened here is that for subjects who are more sensitive to social cues--in this case, the experimenter saying, "What was just going through your mind?"--, endogenous stimulation had less effect on choice of grammatical form--i.e., the subject spoke as the question seemed to suggest he should, regardless of internal state. Subjects less oriented towards behaving in a socially desirable way behaved in accordance with internal cues: when there was phasic activity, and presumably the dream felt like an external event, the manner of describing it betrayed this aspect of experience. As in the case of the Reality scale, the experimental situation elicited an aspect of ego-functioning which for some subjects was strong enough to interfere with or mask an underlying transitory suspension of an aspect of ego-functioning, the reflective self representation.

Inappropriate fluctuation in the verbal tense of mentation reports was reliably associated with REM as opposed to NREM sleep but did not differentiate between phasic and tonic REM reports. As in the case of the Affect scale, this can be seen as consistent with the hypothesis of a primary association between suspension of reflective self representation and phasic activity. What this negative finding suggests is that alteration in the employment of verbal tense is not a reliable consequence of the suspension of reflective self representation.

That there was more fluctuation in verbal tense in REM sleep as compared with NREM sleep may mean that this is a part of a general pattern of psychophysiological arousal associated with REM sleep, which could be responsible for both the increased intensity of affect and some cognitive disorganization leading to inappropriate fluctuations in verbal tense. This does not mean that phasic activity has no impact on these two variables (Affect and Temporal). Rather, in the case of Temporal, the fact that subjects' mean scores correlated with personality variables differentially for phasic and tonic REM suggests that phasic activity may have a systematic effect on it; but this effect is very indirect, interacting with personality, so that it is even possible that for some subjects phasic activity may be systematically associated with less fluctuation in verbal tense. For example, a subject who has an ambivalent attitude toward fantasy processes may show his wavering style in fluctuating verbal tense most readily when aroused via REM sleep but not if his internal attention pattern is altered by phasic activity. A relatively complex prediction such as this could be evaluated with more diversified personality assessment, not available in the present data.

Overall, these data represent a strong confirmation of a hypothesis of psychophysiological parallelism specific to a particular psychological function, reflective self representation, in that three relatively independent indicators, each logically connected to suspension of reflective self representation, significantly differentiated between phasic and tonic REM reports when relevant systematic sources of error were removed. The general finding of a psychological differentiation between phasic and tonic REM reports is consistent with several other studies: Berger and Oswald (1962), Ellman et al. (1974), Firth and Oswald (1975), Hauri and Van de Castle (1973), Bosinelli et al. (1974), Molinari and Foulkes (1969), Pivik (1971), and others (see literature review).

The particular psychological function to which the present data point --the suspension of reflective self representation--is also very consistent with most of these earlier studies: Berger and Oswald (1962) and Oswald and Firth (1975) both focussed on "activity" in the dream, defined very vaguely. It seems likely that dreams in which the dreamer was deeply involved may have been rated as more active. Molinari and Foulkes (1969) and Foulkes and Pope (1973) both reported that phasic reports were more frequently associated with "primary visual experience" as opposed to "secondary cognitive elaboration." Clearly, the notion of a mental experience which the subject "sees" and about which he does not think implies relative unreflectivity regarding the experience. Furthermore, Foulkes and Pope (1973) reported that their effect was only reliable when the first two questions of the mentation interview were assessed. The present data indicate that that finding is an artifact of a social desirability response bias effective for the last three questions of the interview, which call for self-judgement.

Hauri and Van de Castle (1973) reported the highest number of psychophysiological relationships between rapid changes (phasic) in physiological variables and the dreamer's involvement with his dream. Their finding was suspect due to unestablished reliability, poor statistics, and weak effects; but it is clearly confirmed in the present data.

Bosinelli et al. (1974) reported that the feeling of self-participation was a correlate of phasic REM activity, a psychological concept obviously related to the loss of reflective self representation.

The only inconsistency between the present data and previous findings is that Bosinelli et al. (1974) did find emotion significantly more often in phasic REM reports than in tonic REM reports. This may be explained by the fact that their mentation interview was lengthier and possibly allowed for more emotive expression. In addition, Bosinelli et al. simply rated dreams for the presence or absence of emotion, in contrast to the attempt to scale emotional intensity in the present research.

The present confirmation of an hypothesized correlation between suspension of reflective self representation and phasic REM activity is not itself sufficient to establish suspension of reflective self representation as the primary psychological correlate of phasic REM activity. However, the present data do provide some evidence for such an assertion: the personality factor which clearly interfered with high scores on those mentation scales which were correlates of phasic activity was a factor which, on logical and theoretical grounds, would be expected to interfere with observation of suspension of reflective self representation but not, for example, with primary visual experience. The personality factor being referred to here is social desirability response bias which, as evidenced by MMPI scale scores and the Guilt daydreams score, differentiated significantly between phasic and tonic REM in its correlations with subjects' mean scores for the Reality and Self-representation scales. I. e., subjects high on social desirability were apparently inhibited from producing the distinctive kind of mentation report given by other subjects when phasic activity was present. This makes sense if the psychological meaning of such activity is perceived as anxiety-provoking or undesirable, which a suspension of reflective self representation might be. If the essence of such an experience were that it was primarily visual and without cognitive elaboration, it is difficult to see why a social desirability bias would interfere with its being reported. One might expect that reporting a primary visual experience might be inhibited in subjects low in visual imagery in daydreaming styles if the phasic REM report is essentially a primary visual experience. In fact, the nine subjects who scored below the mean and median of the Visual Imagery in daydreaming scale had phasic REM Reality scores which were substantially above tonic REM scores--i.e., a difference which was not much lower than that for the high social desirability subjects.

The fact that a high social desirability response bias lowers AID scale scores in phasic REM but has the opposite effect in tonic REM, coupled with the fact that this 2-way effect is most pronounced for the Reality scale, which requires the subject to carry out a self-evaluation, strongly suggests that there is an antithesis between well-modulated self-judgement and the presence of phasic REM activity. It seems that when phasic activity is present, the same high social desirability subject who might normally (i.e., for tonic REM) please the experimenter with a high self-rating for Reality now denies the real-seeming quality of his dream. Contrariwise, the low social desirability subject who has little enthusiasm for his tonic REM report is quite excited about his phasic REM report. The high social desirability subject holds back and apes the experimenter (for the Self-representation scale) when phasic activity is there, while the low social desirability subject rates his mentation to be much more real-seeming and also speaks as if it were. Clearly, phasic activity has a high potential to be perceived as undesirable, thus triggering defense or, if not, then giving the mental experience a feeling of objectivity.

Another way to approach the question of what kind of psychological experience is associated with the occurrence of phasic activity is to examine the personality correlates of differential patterns of spatio-temporal distribution of phasic activity. (Several studies have reported the occurrence of phasic activity normally associated with REM periods in NREM sleep [c.f. Pivik, 1978].) The logic of such an approach is based on the assumption that traits which develop in conjunction with a differential pattern of phasic activity distribution reflect the psychological meaning of the phasic activity.

While the present data do not offer a direct observation of this phenomenon, it is possible to infer an indirect measure of phasic activity distribution. For AID scales which have been shown to be correlated with REM phasic activity, the difference score between REM and NREM may be an indicator of the extent to which phasic activity is confined to REM sleep or, contrariwise, if it intrudes into NREM sleep. It should be noted that this approach is highly speculative although it may make logical sense. While there are reports to indicate that phasic activity in NREM sleep is associated with an enriching of the dream experience (Rechtschaffen, 1973; Watson, 1972), these data are by no means consistent (cf. Pivik, 1978). It is possible that the REM-NREM difference score is not actually related to the distribution of phasic activity. However, as will be seen, interpreting it as if it is so related proves to be consistent with the hypothesized correlation between phasic activity and suspension of reflective self representation.

The AID scales for which a low REM-NREM difference score may most likely indicate a relatively greater spill-over of phasic activity into NREM sleep (i.e., its failure to be contained exclusively in REM periods) are Reality, Global, and Self-representation. All three of these scales' REM-NREM difference scores had significant negative correlations with one or more of the four daydreaming scales which were designated Flexible Frequent daydreaming scales. For all 12 such correlations, the coefficient was negative. The REM-NREM difference for the Reality scale correlated -.53 with Acceptance of daydreaming. For the Global scale, difference scores correlated -.53 to -.66 for the four Flexible Frequent daydreaming scales. For the Self-representation scale, the REM-NREM difference score correlated -.44 with Positive Reactions in daydreaming ($p < .05$, two-tailed test).

Following the interpretation offered above, it seems that subjects who do not confine phasic activity to REM sleep verbalize greater acceptance of the role of daydreaming in their daily lives, tend to make more positive use of daydreaming, and experience their daydreams as more vivid and real-seeming. Focussing solely on what this implies concerning the experiential correlate of phasic activity, the following interpretation is possible: the occurrence of transitory losses of reflective self representation over a broader range of states of consciousness--NREM sleep and perhaps waking states--may facilitate the development of a cognitive and defensive structure which more effectively utilizes for adaptive purposes the suspension of reflective self representation in the form of daydreaming. That is, the developing person accommodated to the pattern of phasic activity distribution which was present. Basically the same process could be occurring in a somewhat different way: in attempting to use internal mental activity for defensive or adaptive purposes (perhaps encouraged by environmental stress), the individual's development included the active recruitment of phasic REM activity--as an inducer of a gratifying reality feeling--into NREM sleep and different levels of waking consciousness.

In either case, the personality style to be associated with broader distribution of phasic activity is consistent with the hypothesized correlation between suspension of reflective self representation and such activity--increased usage and acceptance of vivid and real-seeming daydreaming.

Confirmation of Hypotheses 2A, B and C

2A. There will be a continuity of psychological structure between modes of waking fantasy experience and sleeping fantasy experience

The prediction to test this hypothesis was that subjects' mean AID scale scores (across sleep conditions) would correlate positively with measures of suspension of reflective self representation in waking consciousness --i.e., the four Flexible Frequent daydreaming scales.

This prediction was best confirmed for the Affect scale, for which all four correlations were positive, two of them significantly so.

The Self-representation scale also had four positive correlations. However, only one of these was significant (Frequent Vivid Daydreaming), while the other three were not far off (.41, .41, and .36).

The other three AID scales being considered here (Global, Reality, and Temporal) (Denial and Responsivity are excluded from discussion for reasons given above [pp. 81-82]) produced much more variable results and, in fact, do not confirm the hypothesis as originally stated and conceptualized (see tables 16 - 22). The problem with this conceptualization was that it predicted a structural continuity to be observable across different sleep conditions, albeit to greater or lesser extents depending on conditions. In fact, there were significant continuities between waking and sleeping cognitive structure, but these were highly specific to sleep conditions. It was predicted that REM sleep and, in particular, phasic REM sleep, would mitigate the influence of structural continuities on the mentation report. As will be discussed in more detail later, the strength and nature of this effect was underestimated and unexpected, so that continuities which existed for NREM sleep were completely obscured when correlations were computed across conditions.

Continuities were evident for NREM mentation in the following ways: subjects who were more accepting of the role of daydreaming and fantasy in their daily lives judged their NREM dreams to feel more real and appeared to be more immersed and involved in them experientially; subjects who experienced their daydreaming as more real-seeming and vivid, and who daydreamed more frequently, reported NREM dreams with more intense affect; subjects who reported relatively more positive reactions in daydreaming tended to report their NREM dreams with more of a sense that they were involved with them as quasi-real events--i.e., they employed no grammatical reflective self representation.

The above summary only takes into account the significant ($p < .05$, two-tailed test) correlations between daydreaming scales and NREM mentation scores. Eighteen of the 20 correlations for the Reality, Affect, Global, and Self-representation scales with Flexible Frequent daydreaming scales were positive, and 15 were above .30, giving added support to the hypothesis of a structural continuity between waking styles of fantasy process and NREM mentation. The NREM report does reflect the individual's attitude and mode of operation with respect to waking fantasy life.

2B. <u>The continuity in psychological structure will be strongest when the least phasic activity is present</u>

The prediction to test this hypothesis was that mean AID scale scores' correlations with waking measures of suspension of reflective self representation would be significantly higher in NREM than in REM sleep and significantly higher in tonic REM than in phasic REM sleep.

For the Global and Temporal scales, with respect to the difference between REM and NREM correlations, the data actually went beyond confirming the hypothesis in the following sense: there was not simply a weaker continuity between REM sleep and waking fantasy processes as compared with NREM sleep; but, rather, the continuity evident between NREM mentation and daydreaming styles was in general absent in REM sleep and replaced by a significant complementary, or reciprocal, relationship between REM dream activity and daydreaming. In fact, for the Global and Temporal scales, it would be accurate to say that the complementarity or reciprocal relationship between the quality of REM sleep mentation and daydreaming was more reliable than the continuity between NREM mentation and daydreaming patterns. For example, for the Global scale, all four correlations between Flexible Frequent daydreaming scales and REM mentation scores were negative and significant ($p < .01$) while of the four corresponding correlations for NREM mentation only was significant (although all were positive). For the Temporal scale, the pattern was similar: all four correlations between Flexible Frequent daydreaming scales and REM mentation were negative, one significantly (Acceptance of daydreaming, $r = -.59$, $p < .01$) and the other three not far off (-.36, -.35, -.40). On the other hand, all four corresponding correlations with NREM mentation were of zero order (.11 and below).

For the Reality and Self-representation scales, the results more precisely confirmed the original prediction: continuity between NREM mentation and daydreaming was evident, and wherever this was the case the corresponding REM correlation failed to show any significant relationship between daydreaming and night dreaming. Even in the cases where the difference between the two correlation coefficients is clearly non-significant, the difference is always in the expected direction--i.e., the REM correlation is always more negative.

For the Reality scale, there is only suggestive evidence of a reciprocal relationship between REM dreaming and daydreaming in that all four correlations are negative and only one of these is clearly zero order. The other three were non-significant. For the Self-representation scale, there was no sign of a reciprocal relationship between REM dreaming and daydreaming.

The second part of hypothesis 2B--that structural continuity would be more evident in tonic REM mentation than in phasic REM mentation--failed to be more confirmed for the intended personality measures--i.e., the four Flexible Frequent daydreaming scales. However, a consistent pattern including many significant differences between phasic and tonic REM correlations did emerge, almost all of which were powerfully evident for the correlations between Reality scale scores and the several measures of social desirability response bias: Guilt daydreams, five MMPI clinical scales, the MMPI F scale, and the Neurotic daydreaming scale. The Global and Self-representation scales each had one significant difference between phasic and tonic REM correlations with social desirability measures consistent with the Reality scale's pattern--i.e., high social desirability response bias was associated with lower AID scores in phasic REM and higher scores in tonic REM. An explanation for these somewhat unexpected findings follows.

The original basis for expecting less structural continuity in REM sleep was that the presence of phasic activity as a powerful, state-variable would mitigate the influence of any trait variable--in particular, proneness to waking suspension of reflective self representation. In fact, although structural continuities between waking and sleeping suspension of reflective self representation were missing from REM sleep and present in NREM sleep as predicted, the hypothesized mechanism of this effect--non-specific interference by a relatively stronger state variable--was clearly not confirmed. REM sleep, generally, seemed to have its major mitigating effect on personality with respect to Flexible Frequent daydreaming traits, while phasic REM in particular showed its strong impact exclusively on socially desirable responding. This latter effect was well demonstrated by the fact that for the Reality scale (the scores of which were clearly influenced by social desirability response bias) positive correlations between tonic REM scores and social desirability (i.e., negative correlations with MMPI or Guilt daydreams scale) were reversed for phasic REM mentation so that low social desirability subjects scored higher on the Reality scale. The Self-representation scale also showed this effect, but less extensively.

This suggests that the mechanism for the effect of sleep condition on personality trait expression in the dream is much more specific than was originally conceptualized in the present model. Phasic activity does not disrupt just any personality trait from operating. The trait must have some dynamic relationship to the experience associated with phasic activity. So, for example, subjects who prefer to appear conventional and appropriate tend to rate their dreams as more real than the average subject when no phasic activity is present; but if some phasic activity is present, they clam up. On the other hand, REM sleep (as a whole) seemed to interfere with the facilitating effect of both social desirability and Flexible Frequent daydreaming. However, the fact that this was more than a disruption and was a full reversal of a continuous relationship suggests that the mechanism is not simply the effect of a strong state variable, as originally hypothesized. Rather, the REM score should be understood as the expression of some quantity of mental content which, in fact, varies as a function of daydreaming activity. The REM dream does not so much reflect specific style as the dynamic consequence of a waking style. Because there is more adaptive daydreaming, there is less immersion in REM dreaming or underutilization of the REM period for involving dreams leads to greater exploitation of the waking stream of consciousness.

It is interesting that the reciprocal relationship between REM scores and Flexible Frequent daydreaming scales was most pronounced for the Global and Temporal scales, which were least influenced by response set. The ratings for these scales were the least dependent on conscious cooperation from the subject and were the closest to projective assessments of the subject's dream experience.

Comparison of Personality/Dream Correlations with Previous Findings

A comparison of the present data with previous findings is of dubious value for several reasons. First, the two principal EEG studies which correlated dream scores with personality measures (Foulkes and Rechtschaffen, 1964; Pivik and Foulkes, 1968) actually produced very little in the way of a reliable finding, in spite of the authors' psychological interpretation of their data, as discussed above in the literature review section. The number of significant correlations which emerged in their massive matrix was barely above the chance level. Although the authors claimed that the overall pattern revealed a positive association between MMPI scales and dream-like qualities of mentation reports, based on the fact that of the significant correlations, almost all were positive, perusal of the data indicated many negative correlations existed which, although non-significant, were not of obvious zero order (i.e., below -.20).

Secondly, no differentiation between phasic and tonic REM awakenings was done as was done in the present study and as was shown to be of great significance with respect to MMPI correlations. Furthermore, virtually all dream scores were arrived at by having the subject assign a numerical rating to his report, thus maximizing the potential influence of social desirability response bias and minimizing the independent judgement of the experimenter. Again, this deviates sharply from the present methodology.

The major consistency between the aspects of the present data which are comparable to Foulkes and Rechtschaffen (1964) and Pivik and Foulkes (1968)--NREM and overall REM correlations for five AID scales with 10 MMPI clinical scales--was that there was no significant finding: of 100 correlations, exactly five were significant ($p < .05$), the number to be expected by chance alone. Interestingly, these five did cluster in the scales which elicited self-judgement from the subject. However, no predominance of positive relationships was evident for these five correlations.

It weems likely that any pattern of positive correlations obtained by Foulkes and Rechtschaffen and Pivik and Foulkes was the result of their heightened tapping of social desirability response bias (in their method of dream scoring), which is a primary factor influencing MMPI scores. This interpretation is supported by the fact that for their scale, which did employ an external rater (Imagination), far fewer significant correlations emerged (i.e., one of 13).

One other study should be reconsidered in the light of the present findings, that of Starker (1974), because it is the only other dream study to employ the Imaginal Processes Inventory and correlate it with patterns of dreaming. Unfortunately, dreams were recorded by subjects keeping home dream logs, without any electrographic recording. This left the question of sleep-stage specific personality correlations--a principal finding of the present data--completely in the dark. What Starker did find was a positive correlation between the "Anxious Absorption in Daydreaming" factor and various dreamlike qualities of reported sleep mentation, which he interpreted as indicating the continuity between waking and sleeping cognitive structures. The "Anxious Absorption in Daydreaming" factor corresponds to the Neurotic daydreaming factor scale in the present data. The correlation of this variable with clinical and validity scales of the MMPI strongly suggested that it is primarily influenced by social desirability response bias. In accord with this interpretation of it was the further finding that its only significant correlation was negative with tonic REM Reality scores, along with a host of social desirability indicators (MMPI Schizophrenia, Depression, Social Introversion, L). What seems to have happened in Starker's study is similar to what happened for Foulkes and Rechtschaffen (1964)--i.e., dream scores were a reflection of subjects' response style rather than of subjects' experience, owing either to the method of obtaining the raw data (in the case of Starker) or the ratings (for Foulkes and Rechtschaffen).

In the present data, the Reality scale was clearly susceptible to the influence of response bias, and it is only to this scale that Neurotic daydreaming was significantly related. Surprisingly, the obtained relationship was the reverse of Starker's finding. This might be because social desirability response bias exerts an influence in the laboratory opposite to that which it exerts at home. In the laboratory, intensified concern with social desirability motivates the subject to say his dream is more real-seeming to please the experimenter, with whom he is in immediate contact. At home, the same conforming subject will be guided by his internalization of societal norms and, thus, constrict the ideational richness of his personally recorded dream, as Starker found.

What the present data indicate is that one must be very cautious in inferring experiential meaning to a subject's report when it is collected without the convergent validation of some independent indictor, such as the EEG.

2C. <u>The tendency toward differentiation, or containment, of nocturnal fantasy in REM sleep will be associated with diminished suspension of</u>

<u>reflective self representation in waking functioning</u>.

Prediction: Differences between subjects' mean REM and NREM AID scale scores (NREM subtracted from REM) will correlate negatively with waking measures of suspension of reflective self representation (relevant IPI scales--i.e., Flexible Frequent daydreaming scales).

This hypothesis was confirmed for four of five AID scales under consideration. Seventeen of the 20 relevant correlations were negative, three were zero (below .10), and none were positive. Eight correlations were significant: three at $p < .005$, three at $p < .01$, one at $p < .025$, and one at $p < .05$. Only the Affect scale showed no sign of confirming this hypothesis.

The hypothesis was best confirmed for the Global scale for which all four relevant correlations were negative and significant. The four correlations between the Temporal scale's REM-NREM difference scores and the Flexible Frequent daydreaming scales were also all negative; however, two of these missed significance ($r = -.36$ and $-.30$, $p < .06$, one tail).

The data for the Reality and Self-representation scales also clearly confirmed the hypothesis, but not as strikingly. The Reality scale produced four negative correlations, but only one was significant ($p < .01$). The other three were in the -.20's. The Self-representation scale had four negative correlations, two of which were significant, the other two being -.17 and -.13.

The Affect scale failed to confirm this hypothesis by producing three clearly zero correlations ($r = .01, .03, .08$) and one low negative correlation (-.17).

The intention of hypothesis 2C was to illuminate the nature of the relationship between modes and styles of waking fantasy experience and modes and styles of sleeping fantasy experience. In particular, it was intended to show that increased loss of reflective self representation during waking would be associated with a more even distribution of suspension of reflective self representation experiences between REM and NREM sleep. This expectation was based on a phasic-tonic model of the process of dream experience. If the occurrence of phasic activity represents a particular quality of dream experience, and this experience can be had in NREM as well as REM sleep (but is much more frequent in REM sleep), then, in individuals for whom this experience is relatively more evenly distributed over REM and NREM sleep, one should be able to predict some other facts about the person which would be logical outgrowths of this relatively atypical spatio-temporal patterning of this psychophysiological phenomenon.

As discussed above, there are at least two possible mechanisms for such a phenomenon: (a) the chronically less differentiated pattern of phasic activity at distribution at night has an effect on waking personality functioning, causing more adaptive use of daydreaming by actually presenting the individual with more ungated endogenous suspension of reflective self representation experiences with which he must deal, <u>or</u> (b) the waking predisposition to tolerate and utilize loss of reflective self representation experiences more frequently continues to operate during sleep and is manifested in an increased permeability of the boundary between REM and NREM sleep or, put less metaphorically, by the equalizing of the threshold to aspects of dreamlike experience in REM and NREM sleep.

The first of these two possibilities clearly implies that a personality trait depends upon a physiological process, phasic activity. The second mechanism is more flexible with respect to the question of causality. It leaves open the possibility that the increased similarity between REM and

NREM experience could be a function of a broad personality trait while not excluding the influence of phasic activity distribution. Furthermore, it opens the possibility that phasic activity distribution itself could be influenced by the personality. This second mechanism eschews either physiological or psychological primacy and asserts that these are different observable aspects of the same thing. Moreover, the data seem to support mechanism (b), as follows.

The only AID scale of the selected five which clearly failed to show a reciprocal relationship between its REM-NREM difference score and Flexible Frequent daydreaming scales was the Affect scale. This would be predictable from mechanism (a), which assigns causal responsibility exclusively to phasic activity: scores on the Affect scale were not reliably related to the presence of phasic activity; hence, the difference between its REM and NREM scores are unlikely to reflect any differential patterning of phasic activity. This consistency with mechanism (a) seems to be further reinforced by the fact that the pattern of reciprocal correlations between REM-NREM difference scores and Flexible Frequent daydreaming scales was clearly strongest for the Global scale, the scores of which were clearly associated with the presence of phasic activity, in contrast to the Reality and Self-representation scales which, while showing more reliable phasic-tonic differences, did so only for subjects with no strong social desirability response bias. Since the correlations under consideration here were for all 20 subjects, it is reasonable to assume that REM-NREM difference scores for the Global scale are more indicative of phasic activity patterns than are the corresponding scores for the Reality and Self-representation scales. Therefore, the Global scale's strong showing (four moderately large significant correlations) of a reciprocal relationship between REM-NREM difference scores and Flexible Frequent daydreaming scales might be taken to imply that that relationship obtains only insofar as the REM-NREM difference score is mediated by phasic activity distribution. There is, however, a fly in this ointment.

The Temporal scale, which showed no difference between phasic and tonic conditions, produced the second best pattern of negative correlations between REM-NREM difference scores and Flexible Frequent daydreaming scales--i.e., two significant correlations (one of which was substantial: $\underline{r} = -.57$, $\underline{p} < .005$) plus one which just missed significance ($\underline{r} = -.36$, $\underline{p} < .06$) and one somewhat smaller ($\underline{r} = -.30$). This strongly suggests that mechanism (b) may be a more accurate portrayal of the relationships among daydreaming, differentiation of night dreaming between REM and NREM sleep, and phasic activity distribution--i.e., a functional relationship between daydreaming and night dreaming is strengthened when differentiation of night dreaming is correlated with differentiation of phasic activity, but that relationship is not dependent on the influence of phasic activity. Put more simply and broadly, the presence of phasic activity can be part of the adaptive utilization of nocturnal mentation through the suspension of reflective self representation, but it is not necessary to it. The person has more than one way to alter internal experience in order to be more gratified by it.

The value of this interpretation is that it views both psychological and physiological phenomena as multiply determined, rather than seeking after the unique physiological correlates of particular psychological phenomena in an attempt to reduce psychology to physiology.

CHAPTER VI

Conclusions and Suggestions for Future Dream Research

One major implication of the present data is that contrary to some more pessimistic appraisals (Pivik, 1978), the phasic-tonic model of sleep and dreaming has not "reached a point of diminishing returns" (p. 271). Pivik (1978) strongly suggests that the imminent demise of this model is to be expected, largely based upon what he describes as the weakness and "meagerness" of the effects obtained to date. He makes it quite clear that he does not regard statistically significant differences between phasic and tonic associated mentation reports to be compelling data but, rather, would require 100% discrimination between conditions in order to regard the phasic-tonic model as worthy of pursuit.

The basic fallacy in such an argument is that it ignores the psychological and/or physiological processes which may come between the electrographic transduction of a neural event and its origins in the person and which must influence any behavior which temporally parallels either the polygraphic data or the brain event.

What the present research shows (besides the fact that phasic-tonic differences in mentation reports are real) is that one such intermediate process is measurably operating to obscure phasic-tonic differences in reported mentation. This is the social desirability bias. Furthermore, the psychological nature of this interfering process may imply something about the psychological nature of the experience associated with phasic activity --i.e., it is experienced as undesirable to report by a group of college-age men. One possible route to a further clarification of the nature of this experience is to see how this works for women, or to see what other personality characteristics have either an interfering or enhancing effect on phasic-tonic differentiation. Some psychoanalytic writers (c.f. Schafer, 1968) regard the suspension of reflective self representation as an aspect of loss of self-object differentiation associated with derivatives of infantile fantasies of feared and wished-for merger with a mothering object. This notion is consistent with the finding that phasic event associated reports are inhibited in social desirability oriented subjects but is by no means demonstrated to be the only or best implication of this datum. However, more intensive and extensive personality assessment might shed more light on just what it is that inhibits some subjects when phasic activity is present and, thus, illuminate the general experiential significance of phasic REM.

Therefore, far from being a discouragement to further research as Pivik (1978) says, the lack of perfect discriminability between phasic and tonic associated dream reports is a basis for actually understanding the differential experiential significance of such reports for individuals.

A second major implication of this study is that Freud's theory of dreaming and the much maligned hydraulic model still offer a superior approach to understanding the dynamic relationship between nocturnal and waking consciousness. The finding of a reciprocal relationship between the suspension of reflective self representation in REM mentation and the adaptive use of waking daydreaming is entirely consistent with Freud's energic model, which basically asserts that that which is not discharged during the day will press for expression in dreams. This consistency is lent still more significance when it is csidered that this reciprocal relationship held only for REM mentation and was absent or reversed for stage 2 mentation since REM is the stage the deprivation of which leads to a dramatic compensatory rebound and to the enhancement of specific drive behaviors in animals and which has been shown to have a reciprocal relationship with certain processes in the old brain of rats during waking (Steiner and Ellman, 1972).[6] Several studies have reported interesting effects of REM deprivation on human waking mentation, particularly with respect to attention to inner experience (as measured by Rorschach M; c f. Ellman, Spielman, Luck, Steiner, and Halperin, 1978 and Hoyt and Singer, 1978 for comprehensive reviews) and generally showing an enhancement of inner mental process following REM deprivation; however, this is the first study to show such a reciprocal relationship between subjects' typical daydreaming habits and baseline REM mentation.

The additional finding that subjects who make more adaptive use of daydreaming also show less differentiation between REM and NREM mentation might also be understood as consistent with an aspect of Freud's energic model in that subjects who accept more intrusion of primary process material during the day also allow the admission of such material into NREM sleep, thus relatively equalizing the REM and NREM dream reports. As discussed above, this is far more speculative since it is far from clear that REM-NREM difference scores are in fact a reliable indicator of phasic event distribution or even if phasic activity in stage 2 sleep has similar psychological correlates to that which it has in REM sleep. Therefore, an important follow-up to this study would be a correlation of both qualitative and quantitative aspects of the electrographic sleep records of subjects with waking daydreaming habits and styles as well as with patterns of dream scores.

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[6]It is interesting to note in this context that Pivik (1971) reports that for stage 4 sleep, which also rebounds following deprivation, phasic activity was associated with enhanced dream recall, which was the opposite of the case for stage 2 sleep, which is not associated with any rebound phenomena.

More broadly, if a psychoanalytic interpretation of these data is to be pursued seriously, it would also be important to correlate electrographic and mentation variables with dimensions of psychopathology, always very carefully controlling for social desirability response bias.

APPENDIX

Rules for Determining Subscores of the Absorption in Dreaming (AID) Scale

1. Using the following scale, rate how real the S reports his experience to have seemed from his response to question #5 alone: 1--not real at all. 2--not real, but some doubt is expressed. 3--somewhat real. 4--moderately real. 5--pretty real. 6--real. 7--very real.

For this item, a score of 1 is reserved for reports for which the S clearly states with no doubt that he was aware that the mentation was not objectively real. A score of 7 is reserved for occasions when the S is emphatic about the feeling of reality in the mentation experience.

The literal report of the S determines the score. In cases where the literal response is equivocal or non-responsive to the question, the rater is to infer a score considering the whole response. This is applicable to subscale #2 (Affect) as well.

2. Using the following scale, rate how intense the S reports his affect to have been from question #4 alone: 1--no affect. 2--slight affect, a stated presence of some feeling. 3--specific affect with little intensity. 4--mildly intense affect. 5--moderately strong affect. 6--strong affect. 7--very intense affect.

3. Judge whether or not denial is present in the S's responses to questions 3 and 4. Denial is defined as a negative statement about an uninquired aspect of the mentation--e.g., "I wasn't scared." Yes = 1, No = 0.

4. For each question, rate whether or not the S was responsive to the E's question, points to be given for unresponsiveness as follows: Q1--1 point, Q2--1 point, Q3--1 point, Q4--2 points, Q5--2 points.

5. For questions 1 and 2 only, judge whether or not the S employs a grammatical reflective-self representation--i.e., characterizes the content of a mental event of which he was the thinker or dreamer rather than as a physical event in which he may or may not have participated. E.g., "I was dreaming of being at my mother's house" is grammatically self-reflective (= 0), while "I was aware of being at my mother's house" is not (= 1). One employment of a reflective-self representation is sufficient for the report to rate a zero on this subscale.

6. Judge whether or not there are inappropriate fluctuations in the verbal tense of the S's narrative for questions 1 and 2 only. Yes = 1, No = 0.

7. From the S's responses to the first three questions only, judge whether or not you believe a phasic event was temporally proximal to the S being awakened.

Fluidity Scale

1. My imagination often goes around and around in the same circle.

2. Sometimes my imagination keeps coming back to the same things over and over again, no matter how much I try to change the subject.

3. Sometimes a daydream will make me so upset that I feel like crying.

4. Something that has happened during the day often goes over and over in my mind.

5. Some of my daydreams are so powerful that I just can't take my attention away from them.

6. I often have some kind of emotional reaction to my daydreams which lasts for a long time afterwards.

7. I feel guilty about my daydreams.

8. My daydreams often leave me with a warm happy feeling. (Negative)

9. I will not allow myself to think of some things, knowing how upset I can become when I do.

10. Sometimes a passing thought will seem so real that I will shudder and feel uneasy.

11. At times it is hard for me to keep my mind from wandering.

12. It is hard for me to distinguish my daydreams from what is happening in real life.

13. Some of the voices in my thoughts are threatening or frightening.

14. My daydreams are so clear that I often believe the people in them are in the room.

15. In my daydreams, I am always afraid of being caught doing something wrong.

Flexibility Scale

1. As regards daydreaming I would characterize myself as someone (who never -- an habitual daydreamer).

2. I lose myself in active daydreaming (infrequently -- many different times during the day).

3. When a child I would often create a great fantasy world for myself.

4. During a daydream, I sometimes feel a very strong sense of excitement.

5. A daydream can completely change my mood.

6. Daydreams are unreal and seldom come true. (Negative)

7. Daydreams accomplish nothing more than a temporary escape and just avoid things that must be done. (Negative)

8. Daydreaming never solves any problems. (Negative)

9. I can be aroused and excited by a daydream.

10. A "happy" daydream helps me "snap out" of a spell of unhappiness.

11. My daydreams are often stimulating and rewarding.

12. My daydreams often cheer me up when I feel blue.

13. Sometimes a thrill goes up my spine when I reflect on a great moment of triumph and achievement.

14. I often relive happy or exciting experiences in my daydreams.

15. A daydream can bring a smile to my face.

16. A mere daydream cannot frighten or upset me. (Negative)

17. Unpleasant daydreams don't frighten or bother me. (Negative)

18. I never panic as the result of a daydream. (Negative)

19. I sometimes have a very clear, lifelike picture of what I am imagining.

20. The voices and sounds in my daydreams seem real.

21. My thoughts seem as real as actual events in my life.

Table 1

Number of Mentation Reports Scored for Each Condition in 3-Way Analysis of Variance

Early

	Tonic	Phasic	
NREM	42	83	125
REM	18	30	48
	60	113	

Late

	Tonic	Phasic	
NREM	95	199	293
REM	51	52	103
	146	251	

Table 2

Reliabilities

	Reality	Affect	Denial	Global	Responsivity	Self Representation	Temporal
Inter-Rater Reliability	.82	.86	.83	.73	.88	.94	.85
Temporal Reliability	.92	.92	.92	.90	.82	.95	.62
Difference Score Reliability	.15	.49	.08	.31	-.36	.29	.51

	REM	NREM	REM	NREM	REM	NREM	REM	NREM	REM	NREM	REM	NREM	REM	NREM
Split-Half Reliabilities of Mean AID Scores Adjusted to Equal N's (24)	.55	.56	.77	.81	.74	.78	-.03	.56	.88	.56	.58	.72	.73	.65
	P-REM	T-REM	P-REM	T-REM	P-REM	T-REM	P-REM	T-REM	P-REM	T-REM	P-REM	T-REM	P-REM	T-REM
	.78	-.06	.68	-.11	-.01	.61	.64	-.27	.35	-.09	.55	.20	.82	-.06

	Flexibility	Fluidity
Split-Half Reliabilities of Flexibility and Fluidity Scales	.86	.78

Table 3

3-Way Analysis of Variance: Reality Scale

Source of Variation	Sum of Squares	df	Mean Square	F
Main Effects				
REM Type	62.839	1	62.839	12.406***
Phasic-Tonic	.954	1	.954	.188
Time of Night	5.585	1	5.585	1.103
2-Way Interactions				
REM Type X Phasic-Tonic	16.821	1	16.821	3.321
REM Type X Time of Night	20.546	1	20.546	4.057*
Phasic-Tonic X Time of Night	2.747	1	2.747	.542
3-Way Interactions				
REM Type X Phasic-Tonic X Time of Night	1.062	1	1.062	.210
Explained	109.160	7	15.594	3.079**
Residual	2841.489	561	5.065	
Total	2950.648	568	5.195	

*$p < .05$.
**$p < .01$.
***$p < .0001$.

Table 4

3-Way Analysis of Variance: Affect Scale

Source of Variation	Sum of Squares	df	Mean Square	F
Main Effects				
REM Type	63.521	1	63.521	17.095***
Phasic-Tonic	1.549	1	1.549	.417
Time of Night	5.515	1	5.515	1.484
2-Way Interactions				
REM Type X Phasic-Tonic	2.989	1	2.989	.804
REM Type X Time of Night	6.241	1	6.241	1.680
Phasic-Tonic X Time of Night	2.188	1	2.188	.589
3-Way Interactions				
REM Type X Phasic-Tonic X Time of Night	6.441	1	6.441	1.733
Explained	90.131	7	12.876	3.465**
Residual	2088.294	562	3.716	
Total	2178.426	569	3.829	

*$p < .05$.
**$p < .01$.
***$p < .001$.

Table 5

3-Way Analysis of Variance: Denial Scale

Source of Variation	Sum of Squares	df	Mean Square	F
Main Effects				
REM Type	.103	1	.103	.845
Phasic-Tonic	.012	1	.012	.099
Time of Night	.003	1	.003	.027
2-Way Interactions				
REM Type X Phasic-Tonic	.157	1	.157	1.279
REM Type X Time of Night	.372	1	.372	3.040
Phasic-Tonic X Time of Night	.080	1	.080	.653
3-Way Interactions				
REM Type X Phasic-Tonic X Time of Night	.010	1	.010	.086
Explained	.691	7	.099	.806
Residual	68.796	562	.122	
Total	69.486	569	.122	

Table 6

3-Way Analysis of Variance: Global Scale

Source of Variation	Sum of Squares	df	Mean Square	F
Main Effects				
REM Type	6.264	1	6.264	28.446***
Phasic-Tonic	.047	1	.047	.212
Time of Night	.903	1	.903	4.103*
2-Way Interactions				
REM Type X Phasic-Tonic	.727	1	.727	3.302
REM Type X Time of Night	.009	1	.009	.041
Phasic-Tonic X Time of Night	.112	1	.112	.508
3-Way Interactions				
REM Type X Phasic-Tonic X Time of Night	.427	1	.427	1.939
Explained	8.345	7	1.192	5.414***
Residual	123.750	562	.220	
Total	132.094	569	.232	

*$p < .05$.
**$p < .01$.
***$p < .0001$.

Table 7

3-Way Analysis of Variance: Responsivity Scale

Source of Variation	Sum of Squares	df	Mean Square	F
Main Effects				
REM Type	.091	1	.091	.121
Phasic-Tonic	.327	1	.327	.436
Time of Night	2.707	1	2.707	3.614
2-Way Interactions				
REM Type X Phasic-Tonic	.078	1	.078	.104
REM Type X Time of Night	2.526	1	2.526	3.371
Phasic-Tonic X Time of Night	.436	1	.436	.582
3-Way Interactions				
REM Type X Phasic-Tonic X Time of Night	.574	1	.574	.767
Explained	7.030	7	1.004	1.340
Residual	421.061	562	.749	
Total	428.092	569	.752	

Table 8

3-Way Analysis of Variance: Self-Representation Scale

Source of Variation	Sum of Squares	df	Mean Square	F
Main Effects				
REM Type	.339	1	.339	1.481
Phasic-Tonic	.021	1	.021	.091
Time of Night	.492	1	.492	2.149
2-Way Interactions				
REM Type X Phasic-Tonic	.938	1	.938	4.100*
REM Type X Time of Night	.106	1	.106	.463
Phasic-Tonic X Time of Night	.087	1	.087	.381
3-Way Interactions				
REM Type X Phasic-Tonic X Time of Night	.009	1	.009	.039
Explained	2.080	7	.297	1.298
Residual	128.620	562	.229	
Total	130.700	569	.230	

*$p < .05$.

Table 9

3-Way Analysis of Variance: Temporal Scale

Source of Variation	Sum of Squares	df	Mean Square	F
Main Effects				
REM Type	.822	1	.822	4.909*
Phasic-Tonic	.000	1	.000	.003
Time of Night	.189	1	.189	1.131
2-Way Interactions				
REM Type X Phasic-Tonic	.000	1	.000	.001
REM Type X Time of Night	.001	1	.001	.003
Phasic-Tonic X Time of Night	.414	1	.414	2.474
3-Way Interactions				
REM Type X Phasic-Tonic X Time of Night	.355	1	.355	2.123
Explained	1.809	7	.258	1.544
Residual	94.075	562	.167	
Total	95.884	569	.169	

*$p < .05$.

Table 10

Cell Means for 3-Way Analysis of Variance

Reality Scale

Early

	Tonic	Phasic
NREM	4.48	4.05
REM	4.33	4.40

Late

	Tonic	Phasic
NREM	4.34	4.10
REM	4.86	5.56

Early and Late

	Tonic	Phasic	
NREM	4.38	4.09	4.18
REM	4.72	5.13	4.95

Affect Scale

Early

	Tonic	Phasic
NREM	3.64	3.04
REM	3.39	3.87

Late

	Tonic	Phasic
NREM	3.34	3.32
REM	4.25	4.25

Early and Late

	Tonic	Phasic	
NREM	3.43	3.25	3.30
REM	4.03	4.11	4.07

Table 11

Cell Means for 3-Way Analysis of Variance

Denial Scale

Early

	Tonic	Phasic
NREM	.19	.13
REM	.11	.10

Late

	Tonic	Phasic
NREM	.14	.12
REM	.16	.23

Early and Late

	Tonic	Phasic	
NREM	.15	.13	.14
REM	.15	.18	.16

Global Scale

Early

	Tonic	Phasic
NREM	.52	.51
REM	.78	.73

Late

	Tonic	Phasic
NREM	.62	.59
REM	.73	.94

Early and Late

	Tonic	Phasic	
NREM	.59	.57	.57
REM	.74	.87	.80

Table 12

Cell Means for 3-Way Analysis of Variance

Responsivity Scale

Early

	Tonic	Phasic
NREM	.19	.19
REM	.50	.33

Late

	Tonic	Phasic
NREM	.41	.45
REM	.20	.38

Early and Late

	Tonic	Phasic	
NREM	.34	.37	.37
REM	.28	.37	.32

Self-Representation Scale

Early

	Tonic	Phasic
NREM	.36	.24
REM	.33	.43

Late

	Tonic	Phasic
NREM	.40	.35
REM	.33	.46

Early and Late

	Tonic	Phasic	
NREM	.39	.32	.34
REM	.33	.45	.40

Table 13

Cell Means for 3-Way Analysis of Variance

Temporal Scale

Early

	Tonic	Phasic
NREM	.24	.20
REM	.44	.23

Late

	Tonic	Phasic
NREM	.17	.19
REM	.22	.31

Early and Late

	Tonic	Phasic	
NREM	.19	.19	.19
REM	.26	.28	.28

Table 14

Intercorrelation of Daydreaming Scales and MMPI Validity Scales

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Flexibility												
2. Frequent Vivid D.D.	.86****											
3. Acceptance of D.D.	.48**	.40*										
4. Positive Reaction in D.D.	.78****	.52***	.51***									
5. Fluidity	.54***	.69****	.08	.22								
6. Neurotic D.D.	.56****	.53***	.24	.31	.68****							
7. Articulated D.D.	.44**	-.23	-.02	.35	.18	-.01						
8. Guilt D.D.	.04	.11	-.14	-.16	.22	.28	-.05					
9. Fear of Failure D.D.	.26	.43*	.11	.05	.24	.21	-.14	.50**				
10. Bizarre-Improbable	.33	.32	.18	.12	.15	.23	.32	-.03	.24			
11. MMPI L	-.33	-.39*	-.16	-.18	-.62****	-.64****	-.16	-.07	-.03	.34		
12. MMPI F	.20	.41	.07	-.06	.56****	.71****	-.36	.52***	.30	.01	-.46**	
13. MMPI K	-.42*	-.51**	-.25	-.21	-.55***	-.75****	.09	-.02	-.24	-.16	.66****	-.52

Correlations due to Item Overlap

	1.	2.	3.	4.	5.	6.
Flexibility		.21	.21	.46**		.08
Fluidity		.33		.08		.09

*p < .05 (one-tail)
**p < .025 (one-tail)
***p < .01 (one-tail)
****p < .005 (one-tail)

Table 15

Intercorrelations of AID Scale Scores

between Different Sleep Conditions between Subjects

	Reality	Affect	Denial	Global	Responsivity	Self-Representation	Temporal
Correlations of REM with NREM AID Scale Scores between Subjects	.33	.35	.60	-.25	.73	.32	.11
Correlations of Phasic REM with Tonic REM AID Scale Scores between Subjects	-.05	.28	.39	.13	-	.25	.39

Table 16

Correlations between Personality Measures and Subjects' Mean AID Ratings

for Different Sleep Conditions: Reality Scale

Personality Measure	REM	NREM	Tonic REM	Phasic REM	REM-NREM Difference	All Reports
Imaginal Processes Inventory						
Flexibility	-.21	.01	-.13	-.07	-.20	-.04
Frequent Vivid	-.31	-.06	-.22	-.11	-.24	-.16
Acceptance	-.15	.48**	-.01	-.19	-.53***	.33
Positive Reactions	-.05	.26	.02	-.06	-.26	.27
Fluidity	-.21	-.21	-.36	.13	-.02	-.25
Neurotic Daydreaming	-.17	-.19	-.51***	.32	.00	-.21
Articulate	.27	.00	.35	.01	.25	.09
Guilt Daydreams	.19	-.43*	-.41*	.66****	.52***	-.31
Fear of Failure	.08	-.09	-.16	.35	.16	-.15
Bizarre-Improbable	-.33	-.01	-.23	-.21	-.30	-.26
MMPI						
L	.24	.21	.51***	-.17	.06	.33
F	-.23	-.34	-.62****	.37	.06	.38

(Cont'd.)

Table 16 (Cont'd.)

Correlations between Personality Measures and Subjects' Mean AID Ratings

for Different Sleep Conditions: Reality Scale

Personality Measure	REM	NREM	Tonic REM	Phasic REM	REM-NREM Difference	All Reports
K	.35	.23	.48**	.00	-.15	-.34
Hypochondriasis	-.01	-.15	-.22	.21	-.10	-.17
Depression	-.03	-.31	-.47**	.45**	.21	-.31
Hysteria	-.17	-.37*	-.25	-.01	.13	-.39*
Psychopathic Deviate	.07	-.27	-.27	.39*	.29	-.17
Masculine-Feminine	-.24	-.26	-.40*	.03	-.02	-.34
Paranoia	.06	.09	-.26	.26	-.01	.13
Psychasthenia	.06	-.28	-.09	.25	.29	-.15
Schizophrenia	-.23	-.56****	-.59****	.29	.23	-.59****
Hypomania	-.10	-.05	-.08	.01	-.06	-.09
Social Introversion	-.27	-.43	-.57****	.19	.09	-.40*

*$p < .05$ (one-tail)
**$p < .025$ (one-tail)
***$p < .01$ (one-tail)
****$p < .005$ (one-tail)

Table 17

Correlations between Personality Measures and Subjects' Mean AID Ratings

for Different Sleep Conditions: Affect Scale

Personality Measure	REM	NREM	Tonic REM	Phasic REM	REM-NREM Difference	All Reports
Imaginal Processes Inventory						
Flexibility	.49**	.49	.44**	.39	.03	.53***
Frequent Vivid	.31	.33	.35	.22	.01	.30
Acceptance	.17	.39	.43**	-.03	-.17	.35
Positive Reactions	.47**	.41	.41*	.40*	.08	.49**
Fluidity	.32	.32	.21	.28	.02	.36
Neurotic Daydreaming	.33	.25	.22	.30	.09	.29
Articulate	.35	.29	.21	.34	.08	.36
Guilt Daydreams	.45**	-.34	.15	.52***	.71****	-.19
Fear of Failure	.53***	.03	.40*	.48**	.46**	.11
Bizarre-Improbable	.36	.51	.31	.28	-.10	.42*
MMPI						
L	-.40*	-.30	-.19	-.36	-.11	-.32
F	.07	-.12	-.06	.14	.16	-.15

(Cont'd.)

(Table 17 (Cont'd.)

Correlations between Personality Measures and Subjects' Mean AID Ratings for Different Sleep Conditions: Affect Scale

Personality Measure	REM	NREM	Tonic REM	Phasic REM	REM-NREM Difference	All Reports
K	-.11	-.06	.03	-.16	-.05	-.04
Hypochondriasis	.10	.14	.07	.10	-.03	.11
Depression	.52***	.22	.35	.45**	.28	.30
Hysteria	.20	.17	-.08	.32	.04	.17
Psychopathic Deviate	.47**	.06	.09	.56****	.37*	.19
Masculine-Feminine	.56****	.34	.20	.61****	.23	.43*
Paranoia	.41*	.01	.08	.48**	.38*	.14
Psychasthenia	.31	.28	.29	.23	.04	.39*
Schizophrenia	.24	.11	-.06	.36	.13	.15
Hypomania	-.16	-.06	-.08	-.10	-.10	-.08
Social Introversion	.18	-.23	.12	.16	.37*	-.18

*$p < .05$ (one-tail)
**$p < .025$ (one-tail)
***$p < .01$ (one-tail)
****$p < .005$ (one-tail)

Table 18

Correlations between Personality Measures and Subjects' Mean AID Ratings

for Different Sleep Conditions: Denial Scale

Personality Measure	REM	NREM	Tonic REM	Phasic REM	REM-NREM Difference	All Reports
Imaginal Processes Inventory						
Flexibility	-.24	-.11	-.26	-.12	-.18	-.15
Frequent Vivid	-.26	-.10	-.37*	-.05	-.23	-.15
Acceptance	-.22	-.26	-.06	-.34	.00	-.27
Positive Reactions	-.14	-.21	-.07	-.20	.05	-.22
Fluidity	-.30	-.08	-.42*	-.05	-.28	-.13
Neurotic Daydreaming	-.10	.07	-.12	.02	-.19	.04
Articulate	-.17	-.27	-.09	-.23	.07	-.23
Guilt Daydreams	.45**	.44**	.25	.56****	.09	.48**
Fear of Failure	.10	.15	-.06	.27	-.03	.10
Bizarre-Improbable	.30	.01	.43*	.11	.36	.07
MMPI						
L	.00	.11	.03	-.04	-.11	.03
F	.02	.11	-.06	.20	-.09	.10

(cont'd.)

Table 18 (Cont'd.)

Correlations between Personality Measures and Subjects' Mean AID Ratings for Different Sleep Conditions: Denial Scale

Personality Measure	REM	NREM	Tonic REM	Phasic REM	REM -NREM Difference	All Reports
K	.27	.06	.30	.13	-.27	-.07
Hypochondriasis	.31	.23	.27	.34	-.14	-.23
Depression	.25	.30	.07	.39*	-.01	.30
Hysteria	.48**	.42*	.35	.45**	.16	.51***
Psychopathic Deviate	.47**	.30	.15	.62****	.27	.43*
Masculine-Feminine	.21	.20	-.02	.30	.05	.30
Paranoia	.39*	.00	.23	.34	.49**	.22
Psychasthenia	-.24	.11	-.35	-.03	.41*	.01
Schizophrenia	.20	.45**	.00	.40*	-.23	.43*
Hypomania	.28	-.21	-.25	-.12	-.12	-.27
Social Introversion	.00	.15	-.14	.15	-.16	.13

*$p < .05$ (one-tail)
**$p < .025$ (one-tail)
***$p < .01$ (one-tail)
****$p < .005$ (one-tail)

Table 19

Correlations between Personality Measures and Subjects' Mean AID Ratings

for Different Sleep Conditions: Global Scale

Personality Measure	REM	NREM	Tonic REM	Phasic REM	REM-NREM Difference	All Reports
Imaginal Processes Inventory						
Flexibility	-.59****	.22	-.40*	-.44**	-.53***	.11
Frequent Vivid	-.57****	.21	-.37*	-.44**	-.51***	.14
Acceptance	-.49**	.58****	-.30	-.38*	-.66****	.43*
Positive Reactions	-.59****	.33	-.42*	-.43*	-.59****	.14
Fluidity	-.17	-.15	-.18	-.06	-.04	-.06
Neurotic Daydreaming	-.16	-.06	-.24	.07	-.08	.00
Articulate	-.08	-.10	.09	-.26	.00	-.02
Guilt Daydreams	.31	-.21	.23	.27	.33	.03
Fear of Failure	-.13	-.10	-.27	.17	-.03	-.08
Bizarre-Improbable	-.16	-.10	-.12	-.10	-.05	-.07
MMPI						
L	-.04	-.17	.21	-.29	.07	-.24
F	-.01	.11	-.09	.12	-.07	.23

(Cont'd.)

Table 19 (Cont'd.)

Correlations between Personality Measures and Subjects' Mean AID Ratings

for Different Sleep Conditions: Global Scale

Personality Measure	REM	NREM	Tonic REM	Phasic REM	REM-NREM Difference	All Reports
K	.32	-.13	.51***	-.06	.30	-.11
Hypochondriasis	.27	-.44**	.46**	-.05	.43*	-.17
Depression	.16	-.05	.04	.22	.14	.17
Hysteria	.09	-.06	.04	-.03	.09	.11
Psychopathic Deviate	.07	-.06	-.03	.07	.08	.09
Masculine-Feminine	-.10	-.28	-.26	.03	.08	-.11
Paranoia	.06	-.12	-.07	.09	.11	-.08
Psychasthenia	.18	-.07	.16	.09	.16	.12
Schizophrenia	.24	-.08	.01	.31	.21	.15
Hypomania	-.15	-.05	-.23	.02	-.08	-.02
Social Introversion	.01	.15	-.08	.14	.04	.11

*$p < .05$ (one-tail)
**$p < .025$ (one-tail)
***$p < .01$ (one-tail)
****$p < .005$ (one-tail)

Table 20

Correlations between Personality Measures and Subjects' Mean AID Ratings

for Different Sleep Conditions: Responsivity Scale

Personality Measure	REM	NREM	Tonic REM	Phasic REM	REM-NREM Difference	All Reports
Imaginal Processes Inventory						
Flexibility	-.05	.06	-.28	.10	-.16	.04
Frequent Vivid	.13	.13	-.07	.15	.02	.13
Acceptance	-.17	.07	-.44**	.17	-.36	.00
Positive Reactions	-.27	-.16	-.53***	.11	-.18	-.20
Fluidity	.27	.26	.13	.20	.04	.27
Neurotic Daydreaming	.16	.21	.10	.08	-.06	.20
Articulate	.09	-.01	-.16	.25	.15	.02
Guilt Daydreams	-.15	-.22	.02	-.34	.09	-.22
Fear of Failure	-.34	-.34	-.17	-.46**	-.01	-.36
Bizarre-Improbable	.00	-.15	-.12	.02	.21	-.11
MMPI						
L	-.27	-.32	.15	-.26	.06	-.32
F	.34	.25	.32	.11	.15	.29

(Cont'd.)

Table 20 (Cont'd.)

Correlations between Personality Measures and Subjects' Mean AID Ratings

for Different Sleep Conditions: Responsivity Scale

Personality Measure	REM	NREM	Tonic REM	Phasic REM	REM-NREM Difference	All Reports
K	.02	-.14	-.12	.12	.18	-.12
Hypochondriasis	.39*	.02	.16	.31	.56****	.12
Depression	.21	.08	.09	.12	.20	.12
Hysteria	.26	.07	.16	.13	.29	.13
Psychopathic Deviate	.16	.03	.21	.00	.20	.07
Masculine-Feminine	-.07	-.17	.00	-.18	.14	-.15
Paranoia	-.01	.03	.07	.00	-.06	.03
Psychasthenia	.24	.13	-.01	.28	.18	.17
Schizophrenia	.27	.17	.20	.09	.16	.20
Hypomania	.35	.41*	.08	.32	-.07	.41*
Social Introversion	-.14	-.20	.03	-.30	.08	-.20

*$p < .05$ (one-tail)
**$p < .025$ (one-tail)
***$p < .01$ (one-tail)
****$p < .005$ (one-tail)

Table 21

Correlations between Personality Measures and Subjects' Mean AID Ratings

for Different Sleep Conditions: Self-Representation Scale

Personality Measure	REM	NREM	Tonic REM	Phasic REM	REM-NREM Difference	All Reports
Imaginal Processes Inventory						
Flexibility	-.02	.42*	-.03	-.03	-.37*	.41
Frequent Vivid	.28	.45**	.21	.20	-.13	.52***
Acceptance	.14	.35	-.02	.19	-.17	.36
Positive Reactions	-.06	.45**	-.11	-.01	-.44**	.41*
Fluidity	.26	.33	.15	.21	-.04	.38*
Neurotic Daydreaming	.10	.27	-.18	.28	-.14	.23
Articulate	-.22	.12	-.16	-.27	-.30	.06
Guilt Daydreams	.28	-.19	.24	.18	.42*	-.10
Fear of Failure	.17	-.26	-.02	.25	.37*	-.15
Bizarre-Improbable	-.09	.03	-.07	-.09	-.11	.02
MMPI						
L	-.28	-.37*	-.15	-.28	.06	-.36
F	.46**	.10	.17	.49**	.32	.19

(Cont'd.)

Table 21 (Cont'd.)

Correlations between Personality Measures and Subjects' Mean AID Ratings

for Different Sleep Conditions: Self-Representation Scale

Personality Measure	REM	NREM	Tonic REM	Phasic REM	REM-NREM Difference	All Reports
K	-.11	-.37*	.11	-.26	.21	-.34
Hypochondriasis	.19	-.16	.26	.01	.30	-.09
Depression	.21	-.08	-.02	.26	.25	-.02
Hysteria	.35	-.16	-.15	-.44**	-.18	-.23
Psychopathic Deviate	-.01	-.21	.09	-.12	.17	-.16
Masculine-Feminine	-.25	.13	-.13	-.29	-.34	.07
Paranoia	.00	.33	.25	-.20	-.27	.27
Psychasthenia	-.16	.05	-.34	.02	-.18	.02
Schizophrenia	-.08	-.13	-.09	-.08	.04	-.15
Hypomania	-.02	.17	-.24	.15	-.16	.11
Social Introversion	.40*	.25	.02	.55***	.14	.33

*$p < .05$ (one-tail)
**$p < .025$ (one-tail)
***$p < .01$ (one-tail)
****$p < .005$ (one-tail)

Table 22

Correlations between Personality Measures and Subjects' Mean AID Ratings

for Different Sleep Conditions: Temporal Scale

Personality Measure	REM	NREM	Tonic REM	Phasic REM	REM-NREM Difference	All Reports
Imaginal Processes Inventory						
Flexibility	-.36	-.08	-.24	-.37*	-.30	-.20
Frequent Vivid	-.40*	-.05	-.34	-.34	-.36	-.23
Acceptance	-.59****	.04	-.42*	-.52***	-.57****	-.28
Positive Reactions	-.35	.11	-.25	-.34	-.38*	-.06
Fluidity	-.10	.01	-.34	.06	-.10	-.06
Neurotic Daydreaming	-.07	.11	-.13	-.03	-.12	.07
Articulate	-.19	-.33	-.11	-.24	-.02	-.29
Guilt Daydreams	.17	-.39*	..09	.18	.34	-.21
Fear of Failure	-.07	-.55***	-.14	.03	.19	-.45**
Bizarre-Improbable	-.58****	-.38*	-.39*	-.58****	-.36	-.64****
MMPI						
L	.19	-.23	.46**	.02	.29	-.06
F	-.02	.19	-.14	.07	-.10	.13

(Cont'd.)

Table 22 (Cont'd.)

Correlations between Personality Measures and Subjects' Mean AID Ratings

for Different Sleep Conditions: Temporal Scale

Personality Measure	REM	NREM	Tonic REM	Phasic REM	REM-NREM Difference	All Reports
K	.12	-.25	.43*	-.12	.23	-.17
Hypochondriasis	-.24	-.25	-.03	-.35	-.11	-.39*
Depression	-.02	-.22	-.03	-.03	.08	-.21
Hysteria	.02	-.17	.19	-.11	.10	-.13
Psychopathic Deviate	.24	-.30	.32	.07	.37*	-.07
Masculine-Feminine	-.18	-.36	-.30	-.08	-.06	-.36
Paranoia	.00	-.04	-.03	-.03	.02	-.03
Psychasthenia	.11	.01	.11	.06	.10	.10
Schizophrenia	.12	.11	-.03	.17	.06	.13
Hypomania	-.04	.12	-.03	-.02	-.09	.08
Social Introversion	.03	.00	-.26	.24	.03	.03

*$p < .05$ (one-tail)
**$p < .025$ (one-tail)
***$p < .01$ (one-tail)
****$p < .005$ (one-tail)

Table 23

Differences Between REM and NREM Correlations,

and Between Phasic and Tonic REM Correlations, with Personality Measures

	Reality		Affect		Global		Self Representation		Temporal	
	NREM - REM	T-REM - P-REM	NREM - REM	T-REM - P-REM	NREM - REM	T-REM - P-REM	NREM - REM	T-REM - P-REM	NREM - REM	T-REM - P-REM
Flexibility	+.21	- .06	0	+.05	+ .81***	+.04	+.44*	0	+.28	+.13
Frequent Vivid D. D.	+.25	- .11	+.02	+.13	+ .78**	+.07	+.17	+.01	+.35	0
Acceptance of D. D.	+.63***	+ .18	+.22	+.46*	+1.07****	+.08	+.21	-.21	+.63**	+.09
Positive Reaction in D. D.	+.31	+ .08	-.06	+.01	+ .92****	+.01	+.51*	-.10	+.46	+.09
Fluidity	0	- .49	0	-.07	+ .02	-.12	+.07	-.06	+.11	-.40
Neurotic D. D.	-.02	- .83**	-.14	-.08	+ .10	-.31	+.17	-.46	+.18	-.10
Articulate D. D.	-.27	+ .34	-.06	-.13	- .02	+.35	+.34	+.11	-.14	+.13
Guilt D. D.	-.62***	-1.07****	-.79****	-.37	- .52	-.04	-.47*	+.06	-.56*	-.09
Fear of Failure D. D.	-.17	- .51	-.50	-.08	+ .03	-.44	-.43	-.27	-.48	-.17
Bizarre-Improbable D. D.	+.32	- .02	+.15	+.03	+ .06	-.02	+.12	+.02	+.20	+.19

(Cont'd.)

Table 23 (Cont'd.)

Differences Between REM and NREM Correlations,

and Between Phasic and Tonic REM Correlations, with Personality Measures

	Reality		Affect		Global		Self Representation		Temporal	
	NREM - REM	T-REM - P-REM	NREM - REM	T-REM - P-REM	NREM - REM	T-REM - P-REM	NREM- REM	T-REM - P-REM	NREM - REM	T-REM - P-REM
MMPI L	-.03	+ .68	+.10	+.17	- .13	+.50	-.09	+.13	-.42	+.44
MMPI F	-.11	- .99****	-.19	-.20	- .12	-.21	-.36	-.32	+.21	-.21
MMPI K	-.12	+ .48	+.05	+.19	- .45	+.57**	-.26	+.37	-.37	+.55**

*$p < .05$ (one-tail)
**$p < .025$ (one-tail)
***$p < .01$ (one-tail)
****$p < .005$ (one-tail)

Table 24

Differences Between Phasic and Tonic

REM Correlations with MMPI Clinical Scales

	Reality	Affect	Global	Self Representation	Temporal
Hypochondriasis	-.43	-.03	+.51*	+.25	+.32
Depression	-.92****	-.10	-.18	-.28	0
Hysteria	-.26	-.40	+.07	-.29	+.30
Psychopathic Deviate	-.66**	-.47*	-.10	+.21	+.25
Masculine-Feminine	-.43	-.41	-.29	+.16	-.22
Paranoia	-.52	-.40	-.16	+.45	0
Psychasthenia	-.34	+.06	+.06	-.32	+.05
Schizophrenia	-.88****	-.42	-.30	-.01	-.20
Hypomania	-.09	+.02	-.25	-.39	-.01
Social Introversion	-.76***	-.04	-.22	-.53**	-.50*

*$p < .05$ (one-tail)
**$p < .025$ (one-tail)
***$p < .01$ (one-tail)
****$p < .005$ (one-tail)

Figure 1

Reality Scale as a Function of REM vs. NREM and Phasic vs. Tonic REM

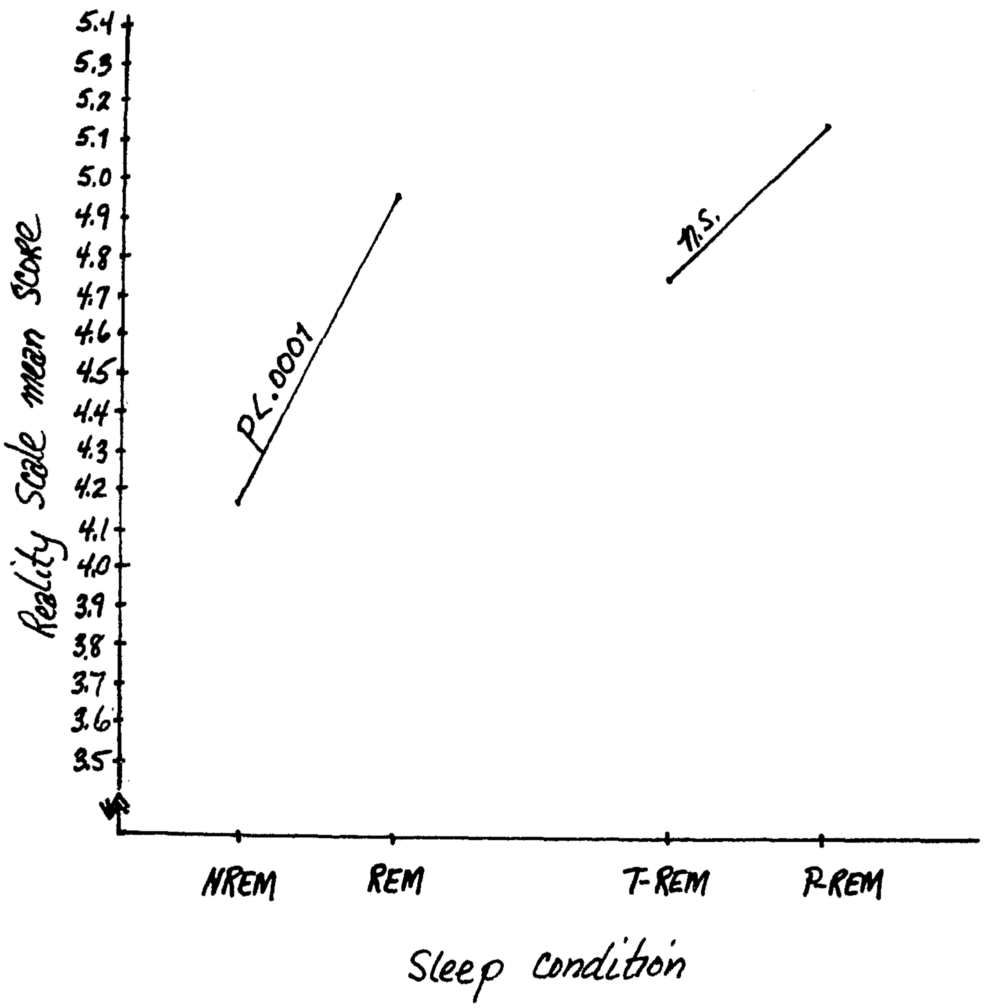


Figure 2

Affect Scale as a Function of REM vs. NREM and Phasic vs. Tonic REM

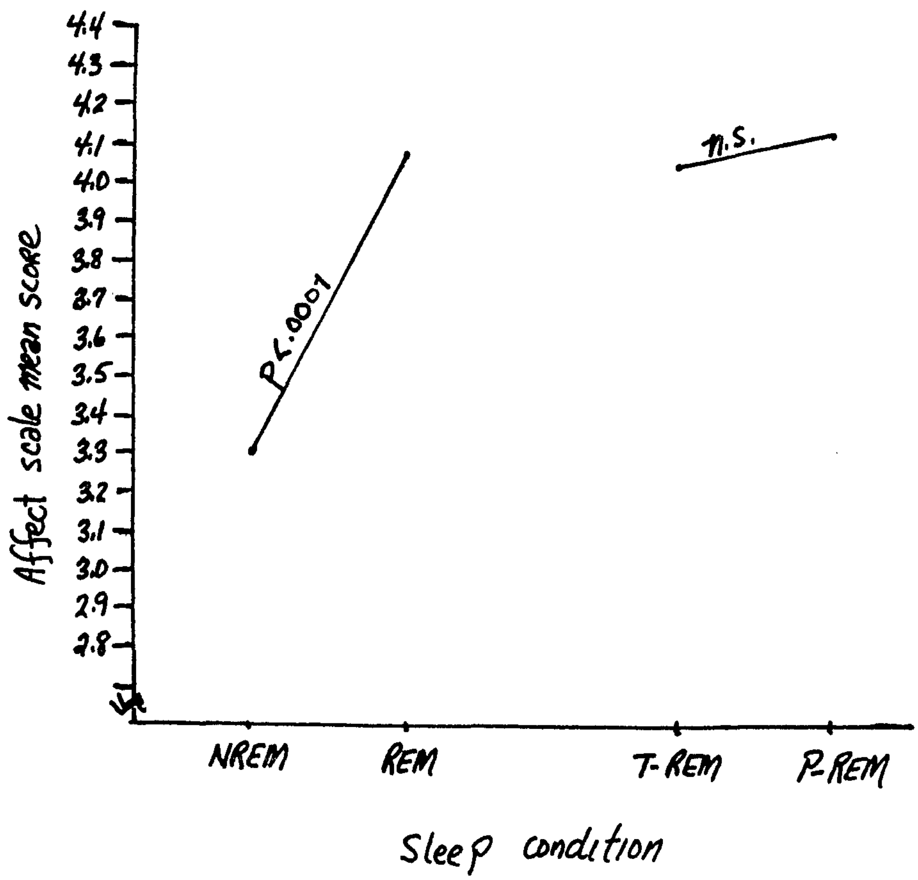


Figure 3

Denial Scale as a Function of REM vs. NREM and Phasic vs. Tonic REM

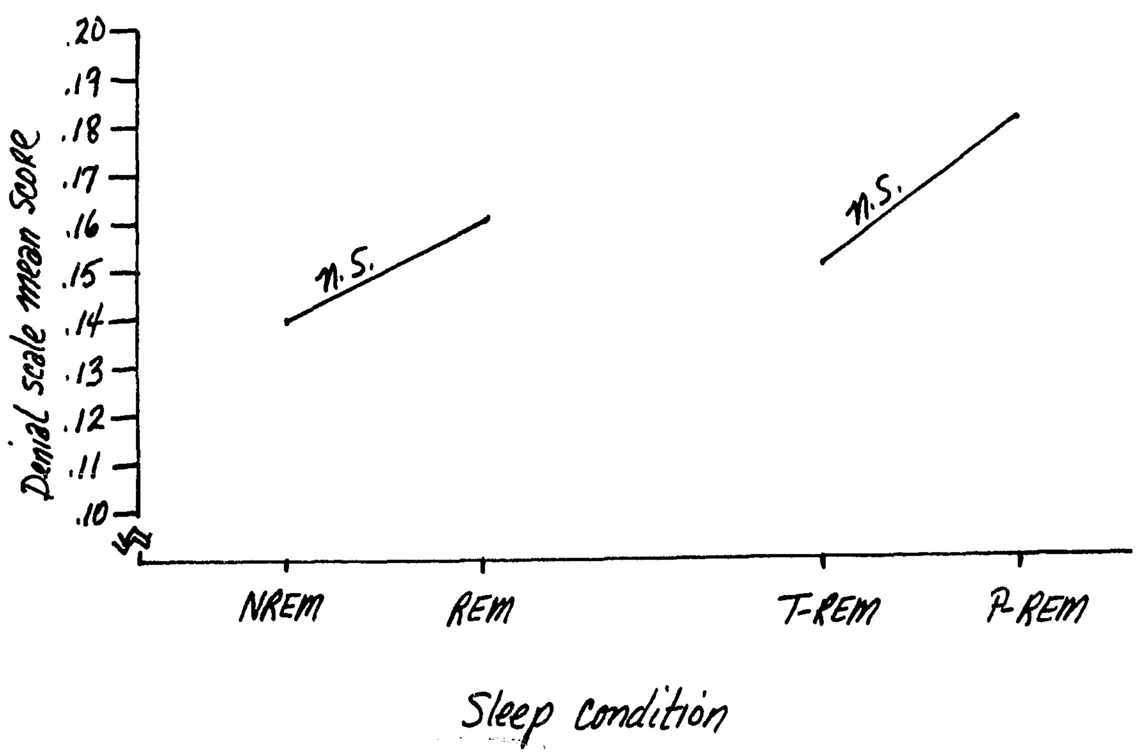


Figure 5

Responsivity Scale as a Function of REM vs. NREM and Phasic vs. Tonic REM

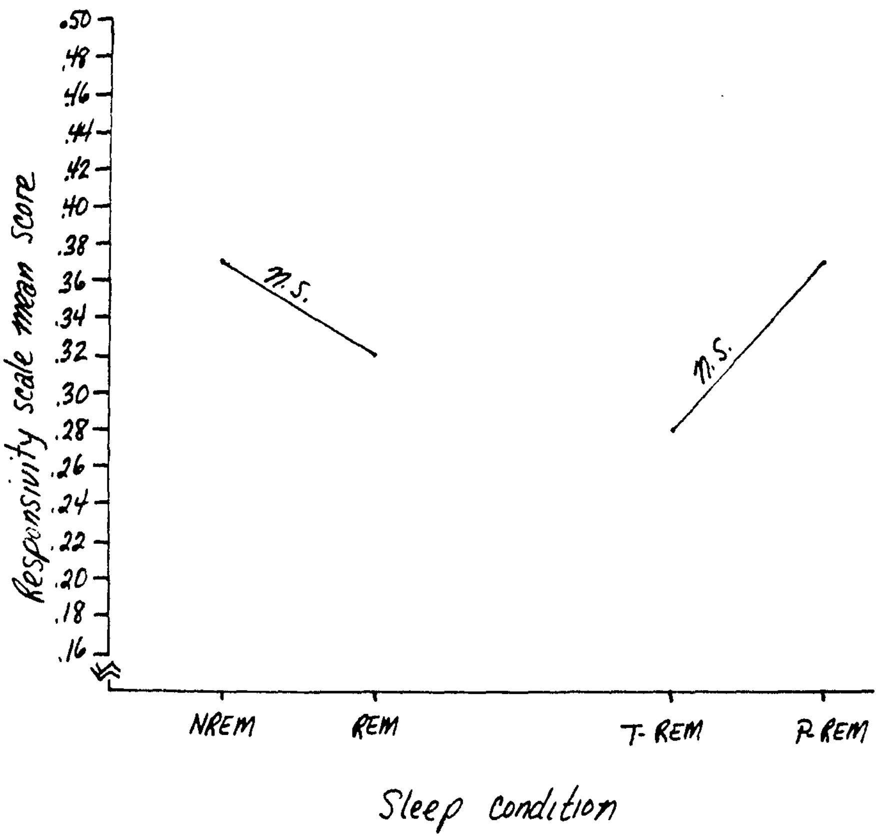


Figure 6

Self-representation Scale as a Function of REM vs. NREM and Phasic vs. Tonic REM

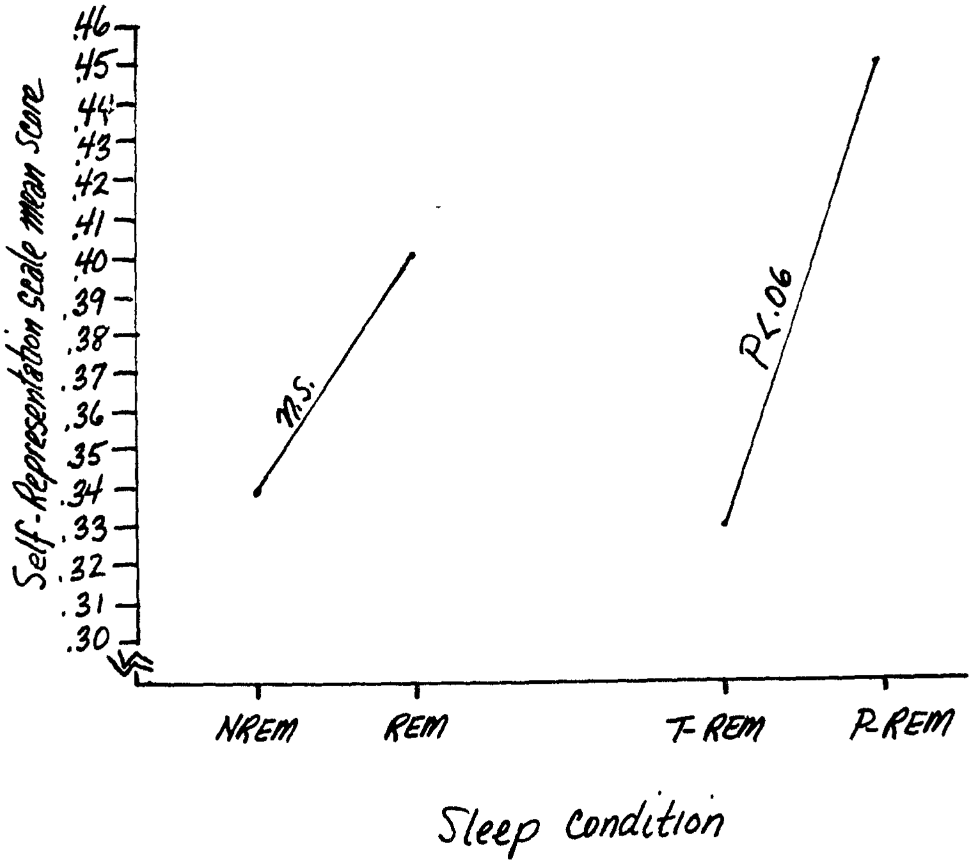
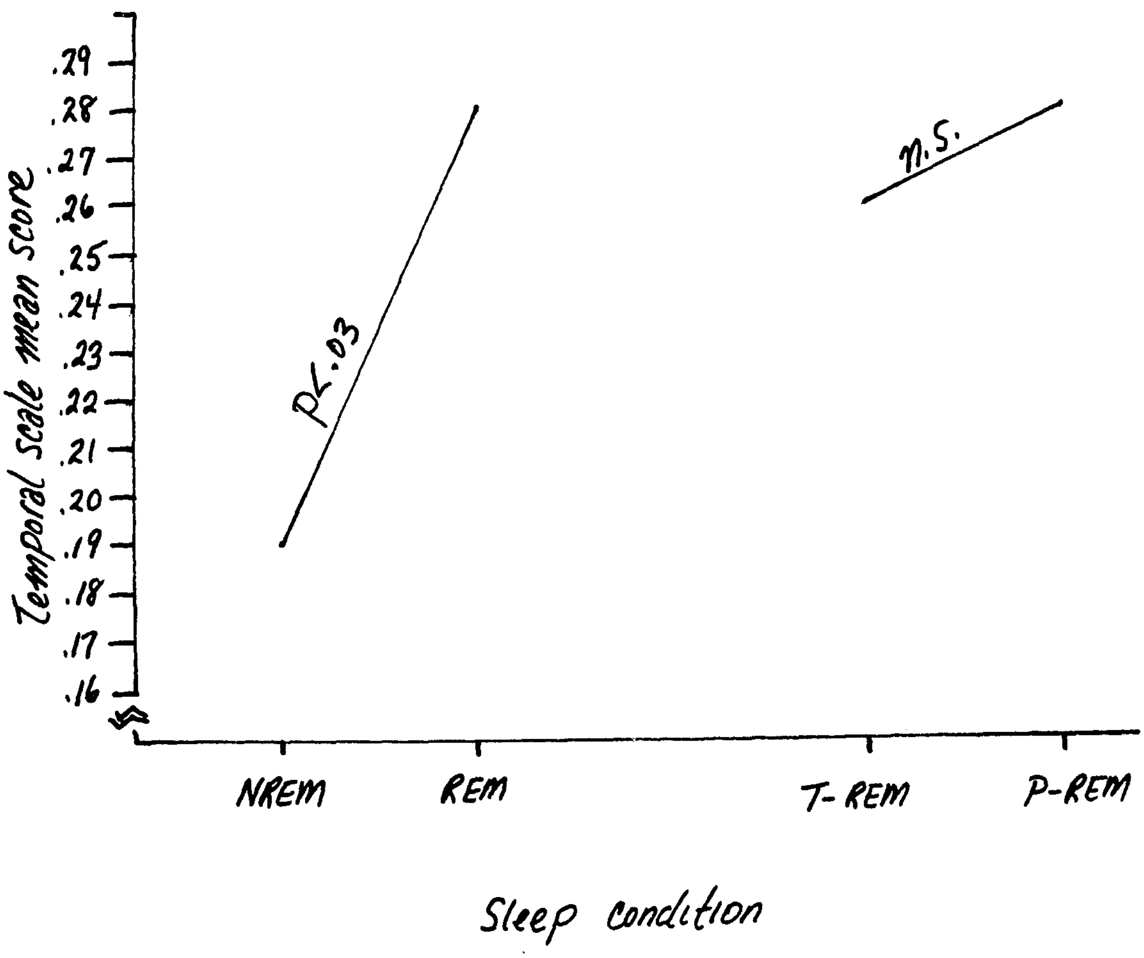


Figure 7

Temporal Scale as a Function of REM vs. NREM and Phasic vs. Tonic REM



Procedures for the Collection of the Raw Data

Method

Twenty "normal" college men who were light sleepers and good dream recallers were paid subjects. They were run in accordance with the schedule described below. Each initially acceptable applicant was required to satisfy the following criterion on a trial laboratory night: report of some clear mentation with at least one specific item of content in two or more of eight NREM reports elicited throughout the night. Suitable subjects were then asked to stabilize their sleep cycles for 5-7 nights at home and to keep standardized daily sleep logs for the remainder of the experiment. Then, they spent 3 consecutive adaptation nights in the laboratory, the first 2 of which merely provided the subject with an opportunity to accustom himself to the laboratory bedroom. Thus, electrodes were not attached, no wakeups were performed, and they were permitted to sleep from 11:00 p.m. - 7:00 a.m. or 12:00 m. - 8:00 a.m. On the third adaptation night, however, electrodes were attached, and six stage 2 and two stage REM mentation reports were obtained. After the adaptation series was completed, the experimental schedule proper was carried out as follows:

Nights 1, 2	Initial baseline
3, 4, 5	REMP deprivation
6	Recovery

Then, after a rest period at home for 3-8 nights, the subject continued in the laboratory as follows:

Nights 7, 8	Middle baseline
9, 10, 11	NREM control deprivation
12	Recovery
13, 14	Terminal baseline

Electrographic measurements included the EEG, EOG, and submental EMG with standard elctrode placements, monitored throughout each laboratory night.

The Mentation Report Schedule

The schedule was devised so as to enable us to test whether dreaming during sleep onset, stage 2, or REMP sleep is increased by REMP deprivation. Thus, on each experimental night, the same typical ground plan was employed as follows:

1. A sleep onset mentation report was elicited during the first sequence of rolling eye movements against a stage 1 NREM EEG background.
2. As a rule, no additional mentation reports were obtained until 70-90 minutes of sleep time had elapsed.
3. The remainder of the night was divided into two approximately equal intervals. During each of these, one REMP and three stage 2 mentation reports were elicited, all in counterbalanced order, yielded a total of nine mentation reports per night (including the sleep onset report).
    a. REMP reports were elicited between 2-4 minutes after REMP onset and equal numbers were obtained in close association with and remote from REM bursts.
    b. Stage 2 mentation reports were elicited at least 15 minutes after a previous REMP termination and equal numbers obtained in close association with, and remote from, phasic events (phasic EMG suppression and K-complexes occurring together or separately.)

The technique of mentation report elicitation involved an initial neutral question as to what had been going through the subjects' minds just prior to awakening and was followed by a standardized interview program to obtain descriptions of the vividness and clarity of the sleep experience, its emotional content, and feeling of reality.

Phasic REM was defined as three rapid eye movements within a 4-second interval.

Tonic REM was defined as the first 30-second interval following 1½ minutes of the REM period without REM's.

Phasic NREM was defined as 5-10 seconds or less after an abrupt EMG' suppression in combination with a K complex, <u>or</u>, if that is unavailable, an EMG suppression alone, <u>or</u> a K complex alone.

Tonic NREM was defined as at least five minutes after a preceding REM period, in stage 2 and at least one minute after any EMG suppression, or 30 seconds after any K complex.

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