1

MicroD

National Library
of Canada

Bibliothèque nationale
du Canada

Canadian Theses Service

Service des thèses canadiennes

Ottawa, Canada
K1A 0N4

NOTICE

The quality of this microform is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us an inferior photocopy.

Reproduction in full or in part of this microform is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30, and subsequent amendments.

AVIS

La qualité de cette microforme dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de qualité inférieure.

La reproduction, même partielle, de cette microforme est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30, et ses amendements subséquents.

Carleton University

Levels of Self-Reflectiveness

In REM and NREM Dream Reports

Catherine A. Sharp

M.A. Thesis

Submitted to the Graduate Faculty of Arts

In Partial Fulfillment of the Requirements for the Degree
of Masters of Arts

Psychology

Ottawa, Ontario

© September 1989

National Library
of Canada

Bibliothèque nationale
du Canada

Canadian Theses Service Service des thèses canadiennes

Ottawa, Canada
K1A 0N4

The author has granted an irrevocable non-exclusive licence allowing the National Library of Canada to reproduce, loan, distribute or sell copies of his/her thesis by any means and in any form or format, making this thesis available to interested persons.

The author retains ownership of the copyright in his/her thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without his/her permission.

L'auteur a accordé une licence irrévocable et non exclusive permettant à la Bibliothèque nationale du Canada de reproduire, prêter, distribuer ou vendre des copies de sa thèse de quelque manière et sous quelque forme que ce soit pour mettre des exemplaires de cette thèse à la disposition des personnes intéressées.

L'auteur conserve la propriété du droit d'auteur qui protège sa thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

ISBN 0-315-54429-5

The undersigned hereby recommend to the Faculty of
Graduate Studies and Research acceptance of
the thesis, submitted by
Catherine A. Sharp
in partial fulfilment of the requirements for
the degree of
Master of Arts

.....
Chairperson, Department of
Psychology

.....
Thesis Supervisor

Carleton University

September, 1989

Abstract

This study attempted to replicate the findings of Purcell, Mullington, Moffitt, Hoffmann and Pigeau (1986) who reported that levels of self reflectiveness differed in dream reports elicited after REM and NREM sleep. Each dream report was divided into information units and each information unit was assigned a level of self reflectiveness. The present study failed to find differences between REM and NREM reports for the level of self reflectiveness or for the length of reports. The findings of this study suggested that the experience of dreaming differed between subjects but not between stages of sleep. The ability to recall the details of the dream experience and the ability to express the experience were most likely responsible for any differences in the content of dream reports from stages REM, 2 and 4.

Acknowledgements

I would like to thank the people of the Sleep Lab for their company and support for the past two years. In particular, I would like to mention my supervisors, Bob Hoffmann and Al Moffitt, for their guidance, endless patience and humor. I would like to thank Monique Lortie-Lussier, Bill Walther and Bill Jones for donating their time to my committee. I gratefully acknowledge the support and enrichment provided by Tom Tombaugh throughout my degree. I would like to thank Janet Smith for scoring my interrater reliability. Finally, a special thank you to Peter for keeping me motivated not just for this project but in all things.

Table of Contents

Chapter	Page
1. Introduction	1
1.1 Differences between REM and NREM reports.	1
1.2 Self Reflectiveness in Dream Reports	11
1.3 The Present Study	14
2. Method	22
2.1 Subjects	22
2.2 Apparatus	22
2.3 Procedure	23
3. Results	27
3.1 Frequency of Recall	27
3.2 Length of Reports	27
3.3 Interrater Reliability	28
3.4 Distribution of Information Units	28
3.5 Length and the Level of SR	32
3.6 Distribution of the Levels of SR	35
3.7 Pattern of the Levels of SR in Reports ..	42
4. Discussion	48
4.1 Quantitative Differences	49
4.1.1 Frequency of Recalling a Report ..	49
4.1.2 Length of Reports	51
4.2 Qualitative Differences	56
4.2.1 Length and the Level of SR	56
4.2.1.1 Length of Reports	56

Chapter	Page
4.2.1.2 Length of the Information Unit and the Level of SR ..	61
4.2.2 Distribution of Levels of SR	66
4.2.2.1 Distribution of the Maximum Level of SR	66
4.2.2.2 Distribution of the Average Level of Sr	68
4.2.2.3 Distribution of Information Units at Levels of SR	72
4.2.3 Pattern of the Levels of SR in Reports	78
4.3 Summary	86
5. References	91
6. Appendices	95

List of Figures

Figure	Description	Page
1.	Length of reports from stages REM, 2 and 4	29
2.	Relative frequency of information units at levels of SR	31
3.	Report length and the maximum level of SR	33
4.	Report length and the average level of SR	34
5.	Distribution of reports for the maximum level of SR	36
6.	Average number of words per IU at SR levels 1-5	40
7.	Average number of words per IU at SR levels 1-9	41
8.	Significant chi squared distributions for the first five levels of self reflectiveness	45
9.	Distribution of the change in levels of SR between subsequent IU's	47

Differences Between REM and NREM Reports

Dreaming was once thought to be equivalent to rapid eye movement (REM) sleep, accounting for approximately 25 percent of the individual's total sleep time (Foulkes, 1985). Researchers now believe that dreaming occurs throughout sleep and sleep onset including stages 1, 2, 3 and 4 collectively known as NREM sleep. Although some research (eg. Foulkes, 1962; Schwartz, Weinstein, & Arkin, 1978) has suggested that the experience of dreaming is different for REM and NREM sleep, other research (Foulkes & Schmidt, 1983; Antrobus, 1983) suggests that differences between REM and NREM sleep reports are attributable to memory for the experience or linguistic factors such as the ease of ability with which the subject can express the experience. The variable self reflectiveness or the "examination of one's thoughts, feelings or behaviour" (Rossi, 1972) has previously been found to differentiate whether a report has been elicited after a REM or a NREM arousal (Purcell et al., 1986). The present study also examined REM and NREM reports for levels of self reflectiveness. The present study reanalyzed the data base of Purcell et al. (1986), using a scoring technique which permitted the comparison of self reflectiveness between reports but unlike the scoring technique used in Purcell et al.

(1986), also permitted the examination of changes in the levels of self reflectiveness within a single report. The examination of reports through discrete units of analysis was thought to provide a better perspective of the nature of dream experiences and the production of dream reports after awakenings from stages REM, 2 and 4 sleep.

The electrophysiology of REM sleep is most similar to the pattern of brain activity found in wakefulness. Both wakefulness and REM sleep are characterized by relatively low voltage, mixed frequency EEG activity (Rechtschaffen & Kales, 1968). The similarity between wakeful and REM EEG was thought to reflect the presence of mentation in wakefulness and dreaming in REM sleep. Researchers believed that mentation was absent from NREM sleep since the EEG activity was so qualitatively different from wakefulness. Stage 2 sleep is characterized by 12-14 cycles per second sleep spindles and K complexes on a background of low voltage, mixed frequency EEG activity while stage 4 is characterized by large amounts of high amplitude, slow wave activity (Rechtschaffen & Kales, 1968). However, dream reports have been elicited from both stage 2 and stage 4. NREM awakenings have a lower incidence of successfully recalling a dream experience than REM awakenings and the reports generated after NREM sleep are usually

documented as characteristically different in terms of the length of the report and the nature of the content produced.

Consistent and predictable differences between reports from REM and NREM sleep have yet to be determined. Dream reports can often be very similar in terms of the length, number of characters, etc. despite the fact that they are produced from the electrophysiologically distinct states of REM and NREM sleep. The experience of dreaming also appears to be similar in different stages of sleep. For example, Schachter (1987) found that participants were unable to label their previously occurring dream experience as arising from REM or NREM sleep when provided with criteria from the available literature. No single characteristic has consistently succeeded in distinguishing dream reports from different stages of sleep.

Researchers rely upon both quantitative (number of awakenings for which the subject successfully recalls a pre-awakening experience and the length of the report) as well as qualitative (e.g. intensity of affect in the report) variables when attempting to classify reports as being produced from REM or NREM sleep. Quantitative differences between REM and NREM reports have been documented. Even when reports of "thoughts", single

images and other fragments produced after arousal were included as instances of dreaming, the incidence of reporting some preawakening mentation from NREM sleep (67%) was less than the incidence of recalling mentation from REM sleep (93%) (Foulkes & Schmidt, 1983). However, the frequency of recall tended to increase for both REM and NREM reports across a single night and differences between stages for the overall number of dreams recalled disappeared over a series of nights in the laboratory (Pivik & Foulkes, 1967). Measured by the total number of words or some other unit (for example, information units) reports collected after REM sleep were usually longer (Fiss et al., 1966; Antrobus, 1983; Foulkes & Schmidt, 1983) but if reports included references to sleeping or waking, reports generated after stage 2 arousals were found to be longer (Antrobus, 1983). Fiss et al. (1966) found that reports elicited after REM arousals had a greater number of idea units, an idea unit being the shortest sentence or phrase expressing a complete thought (Fiss et al., 1966).

Foulkes and Schmidt (1983) found that a variety of variables such as the intensity of affect in the report, the type and detail of visual imagery, bizarreness, i.e. odd or unusual elements in the report, etc. failed to distinguish REM from NREM

reports. However, judges have successfully distinguished REM from NREM reports when potential sources of experimental error due to intersubject, internight and intranight variables were considered and controlled (Monroe, Rechtschaffen, Foulkes & Jensen, 1965). Differences between REM and NREM in the quality of the content of reports have included such characteristics as the amount of affective involvement of the dreamer, the type of visual imagery, the psychomotor involvement of the dreamer (Foulkes, 1962), the denseness of characterization and the classification of cognition (e.g. reports involving 'thinking' vs. 'acting')(Schwartz, et al., 1978). REM reports more often contained content involving emotional processes (Foulkes, 1962; Schwartz et al., 1978; Fiss et al., 1966). REM reports were more often described as having vivid elaboration, perceptual distortions and bizarre content. Together, these characteristics have been referred to as the tendency for reports from REM sleep to be more "dreamlike" (Antrobus, 1983). Reports from NREM sleep were more often described as "thoughtlike", involving conceptual thinking and memory processes (Schwartz et al., 1978; Foulkes, 1962) and more likely to make sense (Schwartz et al., 1978). REM reports had more characterization per unit (Foulkes & Schmidt, 1983) and more character's

actions for which both initiating event(s) and consequence(s) were described (Nielsen, Kuiken, Moffitt, Hoffmann & Wells, 1983). REM reports were also more likely to have more than one temporal sequence of units which were at least partly dramatized (Foulkes & Schmidt, 1983).

Despite the previously mentioned findings, the nature of the structure and the content of reports tended to overlap considerably between REM and NREM sleep (Foulkes, 1962). Comparing mentation from different stages of sleep is problematic because the 'dreamlike' quality of both REM and NREM reports has been found to increase as the night progressed and the characteristics of reports of dream experience varied from participant to participant (Pivik & Foulkes, 1967). 'Dreamlike' quality or 'vivid' dreaming, once employed to differentiate reports from different stages of sleep, is no longer considered to be a reliable source of information since vivid dreaming has been found for all stages of sleep (Foulkes, 1985).

Differences in dream reports from REM and NREM sleep have been attributed to differences between stages of sleep in the production of the dream experience or in the retrieval and subsequent expression of the dream experience.

Differences in reports elicited after REM and NREM

sleep may reflect differences in the production of the dream (Antrobus, 1983). In other words, finding a contrast between reports from REM and NREM periods may indicate differences in experience for the dreamer between REM and NREM sleep (i.e. dreams during REM sleep are more "dreamlike", "vivid", etc. to the dreamer). However, Schachter (1987) found that participants who were awakened in the laboratory from either stage 2 or REM sleep were unable to label their own dream experiences as being from stage 2 or REM sleep when provided with criteria from the available literature of characteristics of REM and NREM sleep. This failure for participants to correctly identify what stage of sleep their experiences were from suggests that the nature of the dream experience does not differ between REM and NREM sleep and therefore differences between REM and NREM reports do not reflect differences in the quality of memory from REM and NREM sleep. One explanation for the differences between REM and NREM reports is that the encoding of the dream experience in memory may differ as a result of the stage of sleep prior to arousal. In this case, different information is stored in memory during REM sleep than during NREM sleep so that when the participant is asked to produce a report after REM sleep, the report is qualitatively and quantitatively

different than a report elicited after NREM sleep.

Differences in reports between REM and NREM sleep have also been attributed to factors involved in the recall and encoding of the dream experience into language. Differences between REM and NREM reports are interpreted by Antrobus (1983) to be a result of faulty memory at the time of awakening and less available capacity for attention arising from the lower levels of cortical activation in NREM sleep. Antrobus claimed that the fundamental difference between REM and NREM dreaming is in the ability of the subject to recall and describe the events which he/she was aware of prior to waking.

The expression of the dream experience may differ after REM and NREM sleep because of the nature of the experience being described or because of the ability of the participant to communicate. First, the nature of the dream may be such that it is difficult to translate into a verbal report. For example, the dream may contain material which the participant is verbally incapable of describing. Arousals after REM sleep have a greater likelihood of producing a report suggesting that dream experiences in REM are easier to describe. However, Schachter (1987) reported that participants were unable to differentiate experiences as from REM or NREM sleep. This indicates that participants did not

perceive differences between REM and NREM dream experiences when they were translating the experiences into dream reports.

Second, the fluency of speech after REM and NREM arousals may be responsible for differences in reports from different stages of sleep (Fiss et al., 1966). Difficulties in the fluency of speech upon awakening include verbal blocking most commonly expressed by the statement "I can't think", or verbal perseveration when the subject repeats words or phrases over and over (Fiss et al., 1966). However, difficulties in producing speech are likely not responsible for differences in the nature of the content of REM and NREM reports since reports with extraneous speech edited out (editorial comments, etc) were more highly associated with the variance between REM/NREM reports than unedited reports (Antrobus, 1983).

Third, the mechanism used to encode the dream information from memory into language may be different for REM and NREM sleep. In this case, participants would report the same types of experiences from REM and NREM sleep but the surface structures of their reports would be different. For example, dreamers may ignore grammatical rules e.g. "I didn't not want it", select incorrect vocabulary, e.g. "He was going like unreasonably crazy" or delete implicit information e.g.

(I was) by a river. Irregularities in grammar may responsible, for instance, for the likelihood of NREM reports to make more sense than REM reports (Schwartz et al., 1978).

The separation of REM and NREM reports may also be concerned with differences in the ability to recall information from some recent point in time namely, recalling the dream experience after awakening. Foulkes and Schmidt (1983) have suggested that REM and NREM sleep have the same underlying mechanism for the synthesis of a report and therefore incomplete or short reports from NREM awakenings could reflect faulty encoding or recall of the preceding experience (Pivik & Foulkes, 1967). However, differences in reports from REM and NREM sleep could also be explained by a generative mechanism which provides more continuous and diffuse stimulation during REM sleep. More continuous and diffuse stimulation would allow greater integration and extension of dream fragments and would therefore produce longer dream reports after REM sleep (Foulkes & Schmidt, 1983).

The separation of the processes involved in the production of the dream such as the quality of the dream experience and the encoding of the experience into memory, from the processes involved in the retrieval of the dream experience such as recall and

encoding of the experience into language, is virtually impossible. Therefore, the examination of differences in the content of reports cannot be assumed to necessarily reflect the experience of dreaming since evidence has suggested that REM and NREM dreaming may be similar (Schachter, 1987). However, the examination of reports does provide information about the nature of recalling an experience, the capabilities of expression after arousal from a particular stage of sleep and the type of information chosen to be encoded into memory in that particular stage of sleep. In order to further explore the nature of dreams from REM and NREM sleep, the present study measured self reflectiveness, a variable which addresses the degree of attention to the self as represented within the report. The present study examined self reflectiveness in order to assess differences between REM and NREM reports in the way dreamers translate their dream experiences into reports.

Self Reflectiveness in Dream Reports

Regardless of the stage of sleep, dreams have been described as singleminded experiences which are unlike the type of cognition found in wakefulness. Rechtschaffen (1978) defined singlemindedness as "the

strong tendency for a single train of related thoughts and images to persist over extended periods without disruption or competition from other simultaneous thoughts or images". However, recent research (e.g. Purcell, 1987; LaBerge & Gackenbach, 1986) has suggested that dreams are not as isolated or as unlike waking mentation as Rechtschaffen (1978) proposed. Self reflectiveness is one aspect of mentation that appears to be present in both dreaming and wakefulness although it has been found to be of a higher degree in wakefulness (Mullington, 1988). According to Rossi (1972), self reflectiveness is necessary for a healthy pattern of personal development. Growth of the individual's personality can occur as a result of feedback coming from the examination of the behaviour of the self. Rossi conceptualizes self reflectiveness as occurring in levels with growth of the personality occurring as the individual moves progressively from one level of self reflectiveness to a higher level of self reflectiveness. Purcell (1987) and Darling (1988) found that the level of self reflectiveness in reports could be increased as a result of training attention to dreaming during wakefulness.

Self reflectiveness ranges from none at all, when and if no mentation is reported to have occurred, to multiple, simultaneously occurring levels of self

awareness. In dreams, lucid dreaming is one instance of the presence of a high degree of self reflectiveness. Lucid dreaming involves the individual's awareness that he is dreaming while the dream is occurring and is sometimes accompanied by a stabilized capacity for intentional dreaming where the dreamer is able to control aspects of his dream experience. For example, the dreamer may realize that he is dreaming during a nightmare and consequently wake himself up in order to escape the unpleasant situation.

Lucid dreams are most typically reported as occurring out of REM periods (LaBerge & Gackenbach, 1986). Rossi (1972) believed that psychosynthesis, the process of personal growth as a result of self reflectiveness, was also associated with REM sleep. Weinstein, Schwartz and Ellman (1988) found no evidence to separate REM from NREM reports in terms of self reflectiveness as measured in their study by a self-participation scale. They were however, defining self reflectiveness in terms of the amount of self participation in the dream. They were able to differentiate reports from states within REM sleep (tonic REM sleep vs. phasic REM sleep) with their measure of self reflectiveness.

Purcell, Mullington, Moffitt, Hoffmann and Pigeau (1986) examined the level of self reflectiveness for

dream reports collected from stages REM, 2 and 4. A single score, the maximum level of self reflectiveness, was assigned to each report representing the highest level of self reflectiveness present in the report. Self reflectiveness was scored on the basis of the Self Reflectiveness Scale (see Appendix A), a nine point scale expanded from the seven level continuum of self reflectiveness proposed by Rossi (1972). Purcell et al. (1986) found that REM reports were given significantly higher levels of self reflectiveness than reports collected after NREM sleep. The findings of Purcell et al. (1986) also suggested that the experience of dreaming was not isolated or deficient compared to waking mentation since high levels of self reflectiveness were found in reports from REM and NREM sleep.

The Present Study

In order to further assess self reflectiveness as a variable contributing to the examination of the nature of mentation from REM and NREM sleep, the present study reanalyzed data reported by Purcell et al. (1986) using a different scoring procedure designed to examine self reflectiveness between and within reports. Each report was divided into information

units. An information unit is defined as "any simple sentence or sentence fragment and the independent clauses of compound and complex sentences when joined by "and" or "then" (Moffitt, Hoffmann, Wells, Armitage, Pigeau & Shearer, 1982). Each information unit within a report was given a separate self reflectiveness score from the Self Reflectiveness Scale. Assigning multiple levels of self reflectiveness to a single report was thought to present a more accurate perspective of the nature of self reflectiveness within reports than provided by the single score representing the maximum level of self reflectiveness used by Purcell et al. (1986). In addition, the scoring method used by Purcell et al. was thought to be biased by experimenter inference. The procedure of scoring information units employed strict criteria for the assignment of levels of self reflectiveness and was thought to minimize experimenter inference.

The present study hypothesized that REM and NREM reports could be distinguished on the basis of a variable describing one aspect of the quality of the dream experience namely, self reflectiveness and also on the basis of quantitative variables such as the frequency of recalling a report and the length of a report as measured by the number of information units in the report. Purcell et al. (1986) found that the

level of self reflectiveness differed between REM and NREM reports but did not find the length of REM and NREM reports to be significantly different although there was a trend towards longer reports from stage REM reports than from stages 2 and 4. The procedure involving the scoring of information units more stringently assessed the length of reports than did Purcell et al.'s procedure (1986) because in the present study, text not directly relevant to the content of a report was omitted before scoring of the level of self reflectiveness was conducted. Supporting previously documented (Foulkes & Schmidt, 1983) differences in the recall of reports after REM and NREM arousals, the data for Purcell et al. (1986) included a greater number of REM than NREM protocols which suggested that after REM sleep the ability to recall a dream is greater. Purcell et al. (1986) also found that participants who normally had a high rate of dream recall received higher levels of self reflectiveness for their reports generated during the study than those individuals who normally had low rates of dream recall. However, the difference in self reflectiveness between reports from individuals with high and low rates of dream recall was less than one level of self reflectiveness.

Dividing the report into information units permits

analysis of the structure within reports and therefore, the level of self reflectiveness can be compared for each information unit to determine whether a pattern exists across the report. Rossi (1972) suggested a progression of levels of self reflectiveness where the thoughts of the dreamer develop from lower to higher levels of self awareness. Purcell et al. (1986) and Purcell (1987) suggested that intentional dreaming and lucidity, the two highest levels of the self reflectiveness scale (SR8 and SR9), may be triggered by SR7, the noticing of bizarre or odd occurrences in the dream by the dreamer. Purcell (1987) suggested that shifts from one level of self reflectiveness to another should typically occur toward the end of the dream. However, Darling (1988) found a pattern of self reflectiveness within dream diary reports where an information unit was most likely to have the same level of self reflectiveness as the information unit immediately preceding it no matter what the self reflectiveness level of that particular information unit was or where it was located in the report. Darling (1988) found no evidence to support the hypothesis that higher levels of self reflectiveness were triggered by lower levels of self reflectiveness. For example, there was no indication that information units scored at SR7 (the dreamer notices oddities in the dream) were

followed by information units scored at SR9 (lucidity). The shifts in the levels of self reflectiveness that did occur between information units did not suggest that one level of self reflectiveness acted as a precursor to any other level of self reflectiveness. These results suggested that self reflectiveness is a relatively stable quality in a dream report. Darling's (1988) results do not deal with comparisons of reports from different stages of sleep since her study examined reports written down at home by participants who were being trained in the amounts of attention paid to dreaming during wakefulness.

The present study examined the pattern of the levels of self reflectiveness by assessing the association between a particular information unit and its level of self reflectiveness. This allowed an examination of possible progressions of self reflectiveness and instances of one level of self reflectiveness triggering another level of self reflectiveness. As well, the likelihood of an information unit being followed by an information unit assigned the same level of self reflectiveness was assessed to examine whether stability in the levels of self reflectiveness between sequential information units existed.

In the present study, reports were elicited across

four nights in the environment of the sleep laboratory. Based on the findings of previous studies involving REM and NREM reports, differences between reports collected after REM and NREM arousals were expected in terms of the levels of self reflectiveness present and for quantitative measures such as the length of the reports and the length of the information units.

REM reports have previously been found to be longer and contain more elaboration (Antrobus, 1983; Fiss et al., 1966; Foulkes & Schmidt, 1983). Therefore, reports from REM sleep were expected to contain a greater number of information units than reports from either stages 2 or 4. Differences in the length of reports from REM and NREM sleep were expected to reflect differences in the types of dreams experienced or in the ability to recall information after awakenings from REM and NREM sleep. For example, longer length for reports was predicted to be associated with higher maximum and average levels of self reflectiveness. Within reports, more words were thought to be required to explain complex ideas such as high levels of self reflectiveness. Therefore, information units with high levels of self reflectiveness were expected to be longer than information units with lower levels of self reflectiveness.

A comparison of the distribution of the maximum

levels of self reflectiveness for stages REM, 2 and 4 was expected to replicate the findings of Purcell et al. (1986) where REM reports were found to have higher maximum levels of self reflectiveness than reports from stages 2 or 4. REM reports were also hypothesized to have higher average levels of self reflectiveness and greater numbers of information units scored at higher levels of self reflectiveness than NREM reports indicating that higher levels of self reflectiveness were sustained within REM reports.

The pattern of self reflectiveness across information units for all stages was expected to be a nonrandom sequence of levels of self reflectiveness such as suggested by Darling (1988). In this case, the level of self reflectiveness of an information unit would most likely be the same as the level of self reflectiveness of the immediately preceding information unit suggesting stability in the quality of the dream experience or in the mechanism involved in recalling and expressing details of the dream experience.

Individuals who normally had high rates of dream recall were expected to have longer reports and higher maximum and average levels of self reflectiveness than those individuals who normally reported low rates of dream recall. Differences in the level of self reflectiveness for REM and NREM reports were expected

to diminish across the four nights of the present study.

Methods

Subjects

Twenty-four volunteers were selected from a larger population of college students consisting of 401 females and 233 males who had completed a questionnaire concerning their habits of sleeping and dream recall. One half of the participants were high-frequency recallers (self reported ability to recall at least five dreams per week) and half were low frequency recallers (self reported ability to recall one dream per week or less). Both groups were composed equally of men and women. None of the participants suffered from known sleep or medical disorders. All were asked to refrain from the consumption of alcohol and/or drugs during the experiment. None were taking prescription medication.

Apparatus

The equipment for data collection consisted of four Grass (P511) EEG amplifiers with power supply, a four channel Beckman (RN) dynograph, a dual beam Tektronix oscilloscope, a Vetter (Model 1) FM tape

recorder and a square wave timing generator. The participants slept in a 10' x 6' x 8' air-conditioned anechoic chamber equipped with an intercom for communication during the night.

Procedure

EEG recordings were made from sites C3 and C4 referenced to linked ears (sites A1, A2; Beckman Ag/AgCl electrodes). A pair of submental electrodes were used for EMG recording and a bipolar array was used for EOG (sites E1, E2). A gain of 10000x was used for EEG and EOG with filter settings of 0.3 Hz. and 100 Hz. Participants spent approximately 8 hours in bed each night and 4 consecutive nights in the sleep laboratory.

On each night, reports were elicited from four awakenings. Two orders of awakenings counterbalanced stage REM and 2 sleep: 1) Stage 4, 2, REM and morning wakeup; 2) Stage 4, REM, 2 and morning wakeup. Wakeups always occurred at least ten minutes into the sleep stage and were always preceded by at least one hour of uninterrupted sleep. The morning wakeup was prescheduled by the volunteer and thus could occur during any stage of sleep. Dream reports were also collected from any spontaneous wakeups occurring during

the night. All stage scoring was done online by the experimenter according to standard criteria (Rechtschaffen & Kales, 1968).

Participants were familiarized with the experimental procedures prior to participation in the experiment. Each volunteer was awakened by hearing his name called loudly on the intercom. The lights were turned on in the sleep chamber and he was instructed "...try to recall any experience you were having before your name was called".

Awakenings were followed by a four minute interval in which the participant was to mentally rehearse the dream experience (participant lying supine, eyes closed, lights on). The participant was then asked to give a free recall mentation report of his pre-awakening experience, if any. A successful recall was defined as any report containing the description of at least a single image, thought or feeling attributed by the subject to the pre-awakening period. The report was taped and later transcribed. Data were transferred to a microcomputer for purposes of scoring.

Scoring of the reports elicited from stages 2, 4 and REM sleep involved several steps. First, the text was broken down by the rater into information units. There are 3 types of expressions found in reports of dream experience: 1) irrelevant expressions, 2) editorial

comment about the experience and 3) reports of experience. The first two types of expressions are classified as extraneous text and are omitted. Only the third type of expression is used in the scoring of information units. A single information unit may be of three types: 1) sentence fragments, e.g. "the ball", 2) simple sentences: N-V, V-N, N-V-N, e.g. "I hit the ball" and 3) compound, complex or compound-complex sentences when joined by conjunctions other than 'and' or 'then', e.g. "I didn't hit the ball but I wanted to".

Next, each information unit is assigned a score by the rater representing the level of self reflectiveness present (see appendix A). Scoring of the information units was conservative in order to reduce inferences by the rater to an absolute minimum. The rater did not use any of the subject's waking associations to any dream content as part of the scoring procedure and all scored elements were explicitly stated in the reports. No attempt was made to evaluate bizarreness or uniqueness of the dream images from the perspective of an observer.

The maximum level of self reflectiveness for the report was established as the highest level of self reflectiveness present in any information unit in the report. Finally, the program used to score the reports

for self reflectiveness automatically calculated the number of words in the report and the number of words in each information unit.

To establish the reliability of the scoring of the self reflectiveness level for each information unit, a second rater independently scored approximately 50 of the reports.

Results

Frequency of Recall

A total of 164 dream reports were analyzed in the study. Of these 86 were from REM, 58 from stage 2 and 20 from stage 4. Reports were produced on approximately 42% of the total number of arousals. Awakenings from REM sleep were more likely to produce reports (60%) than stage 2 (41%) or stage 4 (21%) awakenings. The total frequency of information units generated was 1740; 1181 information units from REM reports, 463 information units from stage 2 reports and 96 information units from stage 4 reports.

Length of Reports

There was considerable variability between stages REM, 2 and 4 for the length of reports as measured by the total number of information units in a report. Reports elicited after REM sleep had the greatest range for length from 1 information unit to over 60 information units. Stage 4 reports were the least variable for length ranging from 1 information unit to 14 information units. REM reports were most commonly 4

information units in length while stage 2 and stage 4 reports were most frequently 2 information units in length. Overall, reports were most likely to be 2 information units long.

For all stages of sleep there were very few long reports collected. For this reason, only the first 30 information units were included in the analyses. This criterion included approximately 88% of the total number of dream reports (included 85% of REM reports, 91% of stage 2 reports and 100% of stage 4 reports).

Interrater Reliability

To examine the reliability of the scoring of self reflectiveness, the information units of approximately 50 reports were rescored by an independent rater. The two raters reached 87.5% agreement.

Distribution of Information Units

The number of information units in a report was compared for reports from stages REM ($\bar{M}=14.40$, $\underline{SD}=9.17$), 2 ($\bar{M}=13.99$, $\underline{SD}=8.50$) and 4 ($\bar{M}=6.90$, $\underline{SD}=4.13$) using a chi-squared analysis (see figure 1). No significant differences were found for the three groups $\chi^2(42, N=146)=31.73$. The majority of reports were

Figure 1. Length of reports from stages REM, 2 and 4.

between 1 and 5 information units in length (52% of REM reports, 75% of stage 2 reports and 75% of stage 4 reports). The effects of gender, subject type and night on the number of information units in a report were not assessed due to the low number of reports of greater than 5 information units in length.

The distribution of information units at various levels of self reflectiveness was also investigated (see figure 2). The mean number of information units for stages REM, 2 and 4 were 193.00 ($\underline{SD}$ =140.84), 76.60 ($\underline{SD}$ =72.06) and 19.20 ($\underline{SD}$ =17.94), respectively. Because of the low number of information units scored at the upper end of the self reflectiveness scale, only the first 5 levels of self reflectiveness were considered in the chi-squared analysis. Significant differences between reports from stages REM, 2 and 4 were found $\chi^2(8, \underline{N}=1444)=37.04, p<.001$. For the paired group comparisons, significant differences were found between REM and stage 4 reports $\chi^2(4, \underline{N}=1061)=20.30, p<.001$ and between REM and stage 2 reports $\chi^2(4, \underline{N}=1348)=18.99, p<.001$. Approximately 50% of all information units from stage 4 and stage 2 were scored at SR3. In comparison, 35% of REM reports were scored at SR3. Information units from stage 4 reports were more often scored at SR1 (27%) than Stage 2 (16%) or REM (16%). Information units from stage 4 were also

Figure 2. Relative frequency of information units at levels of SR.

less likely to be scored at SR2 (16%) than information units from stage 2 reports (30%) or stage 4 reports (30%). Information units scored as SR4 were uncommon (less than 5%) in all of the reports from stages REM, 2 and 4.

Length and the Level of Self Reflectiveness

The association between the length of a report as measured by the number of information units and the maximum level of self reflectiveness attained in the report was examined (see figure 3). The mean maximum levels of self reflectiveness from reports from stages REM, 2 and 4 were 5.37 (SD=1.45), 4.43 (SD=1.50) and 3.64 (SD=.93), respectively. The length of the report in information units was found to be significantly correlated in a negative direction with the maximum level of self reflectiveness for stages REM and 2. In order, the correlations for stages REM, 2 and 4 were $r = -.48$, $p < .01$, $r = -.53$, $p < .01$ and $r = -.60$. The association of the length of the report and the average level of self reflectiveness in the report was assessed by correlating the number of information units with the average level of self reflectiveness (see figure 4). The mean average levels of self reflectiveness for reports from stages REM, 2 and 4 were 2.56 (SD=.31),

Figure 3. Report length and the maximum level of SR.

Figure 4. Report length and the average level of SR.

2.62 ($\underline{SD}=.45$), and 2.33 ($\underline{SD}=.55$), respectively. There were low correlations between the length of the report and the average level of self reflectiveness in stage REM ($\underline{r}=.15$), 2 ($\underline{r}=-.01$) and 4 ($\underline{r}=-.12$) reports.

Distribution of Levels of Self Reflectiveness

To determine whether the differences found between reports from REM and NREM sleep by Purcell et al. (1986) were replicated, the distributions of the maximum level of self reflectiveness in reports from stages REM, 2 and 4 were analyzed using a chi-squared analysis (see figure 5). In order, the mean maximum levels of self reflectiveness for reports from stages REM, 2 and 4 were 3.87 ($\underline{SD}=1.57$), 3.50 ($\underline{SD}=1.47$), and 3.20 ($\underline{SD}=1.01$). No significant differences were found, $\chi^2(8, N=164)=8.45$, failing to replicate the findings of Purcell et al. (1986) that reports from REM sleep had higher maximum levels of self reflectiveness than those reports from stage 2 or stage 4 sleep.

The data were re-examined using a one-within (stage of sleep) one between (recall ability of subject) regression analysis. Only those subjects who had generated reports after both REM and stage 2 sleep were included in the analysis. This included 77 reports from stage REM and 58 reports from stage 2 sleep. Due

Figure 5. Distribution of reports for the maximum level of SF

to the low number of reports from stage 4, only stage 2 and REM reports were considered. In the first part of the regression analysis, each subject was given a maximum self reflectiveness score which represented the average of all the maximum levels of self reflectiveness for their REM reports ($\bar{M}=4.00$, $\underline{SD}=.83$) and for their stage 2 reports ($\bar{M}=3.76$, $\underline{SD}=1.50$). No significant main effects for either stage of sleep $F(1,24)=0.00$ or for the ability to recall a report $F(1,18)=0.64$ were found.

In the second part of the examination of the maximum levels of self reflectiveness in reports, subjects were assigned a maximum self reflectiveness score which represented the highest maximum levels of self reflectiveness found in any information unit in their reports from REM sleep ($\bar{M}=5.00$, $\underline{SD}=1.41$) and a second score which represented the highest maximum levels of self reflectiveness from their stage 2 reports ($\bar{M}=4.60$, $\underline{SD}=1.57$). No significant main effects for stage of recall $F(1,24)=1.07$ or for the ability to recall a report $F(1,18)=0.00$ were found. Most of the variance in the analysis of the maximum level of self reflectiveness could be attributed to the variability between subjects. Further analyses for the effects of gender or night were not permitted due to the scarcity of information units scored at the higher levels of

self reflectiveness and the low numbers of reports elicited after stage 2 arousals.

The distribution of the average level of self reflectiveness for the report was compared for reports from stages REM, 2 and 4 using an ANOVA procedure. The mean levels of self reflectiveness for reports from these stages were 2.52 (SD=.65), 2.56 (SD=.80) and 2.60 (SD=.96), respectively. No significant effect of the stage of sleep prior to arousal on the average level of self reflectiveness was found $F(2,161)=.17$. The data were then broken down by the ability of the subjects to recall dream experiences (high, low). Only subjects with reports from both stages REM and 2 reports were included in the analysis. This included 77 reports from REM sleep and 58 reports from stage 2. Each subject had two scores - 1) the average level of self reflectiveness for all of his/her reports from REM (M=2.73, SD=.59) and 2) the average level of self reflectiveness for all of his/her stage 2 reports (M=2.54, SD=.51). The data were then analyzed in a one-within (stage of sleep) one-between (ability to recall reports) regression analysis. In order to correctly account for the coding of subjects and the effect of the repeated measures design where the same subject contributed reports more than once, it was necessary to adjust the degrees of freedom and the error terms used

in the calculation of the F statistic. No main effects for either the stage of sleep $F(1,24)=1.22$ or for the ability to recall reports $F(1,18)=.00$ were significant. Most of the variance in the analysis of the average level of self reflectiveness in reports appeared to be accounted for by differences between subjects.

The relationship between the average number of words per information unit and the level of self reflectiveness was not statistically analyzed for reports from stages REM, 2 and 4 due to the low frequencies of information units at the various levels of self reflectiveness (see figure 6). The average number of words per information unit did not appear to differ for information units from stages REM, 2 or 4 for SR1. The three groups then diverged such that information units from stage 4 had a lower average number of words per information unit at SR2 and a higher average number of words at SR3, SR4 and SR5 than either stage 2 or REM information units (stage 4>stage REM>stage 2). Information units from all stages of sleep showed a general increase in the average number of words per information unit as the level of self reflectiveness increased. The length of an information unit was considerably more variable at SR6 through SR9 likely because of the low frequency of information units collected at these levels (see figure 7).

Figure 6. Average number of words per IU at SR levels 1-5.

Figure 7. Average number of words per IU at SR levels 1-9.

Pattern of the Levels of SR in Reports

Analyses were conducted to examine whether the level of self reflectiveness occurred in a particular pattern in the report and whether the higher maximum levels of self reflectiveness found for REM reports than NREM reports in Purcell et al. (1986) reflected sustained levels of self reflectiveness in the reports. The pattern of sequential changes in the level of self reflectiveness for consecutive information units in a report was examined across reports from stages REM, 2 and 4 sleep. Possibilities for changes in the level of self reflectiveness in consecutive information units included random changes in the level of self reflectiveness or a nonrandom pattern of change in the level of self reflectiveness where the amount of change of the level of self reflectiveness between information units was dependent on the level of self reflectiveness of the immediately preceding information unit in that report.

To establish whether the levels of self reflectiveness increased progressively across the dream report as proposed by Purcell (1987), a correlation between the ordinal position of information units and their corresponding levels of self reflectiveness was

performed. There was no evidence to support an association between information units and their corresponding level of self reflectiveness. The mean levels of self reflectiveness for reports from REM, 2 and 4 were 2.61 (SD=1.16) 2.55 (SD=1.05) and 2.40 (SD=1.08). Correlations between information units from stages REM, 2 and 4 and their levels of self reflectiveness were very low ranging from r=-.07 (stage 4) to r=+.07 (REM).

To test whether the level of self reflectiveness of an information unit was dependent on the value of the preceding information unit, a comparison was made between the distribution of the relative frequency of information units at the first five levels of self reflectiveness for all information units, with the relative frequency of information units at the first five levels of self reflectiveness for information units which followed a specific level of self reflectiveness in the report.

The distributions for each level of self reflectiveness were analyzed separately, with significance indicating that the sequence of levels of self reflectiveness for information units in a report was not random, but was dependent upon the level of self reflectiveness of the preceding information unit. Due to the low frequency of information units scored at

the upper end of the self reflectiveness scale, only the first five levels of self reflectiveness were examined. The mean number of information units following information units scored at SR1, SR2, SR3, SR4 and SR5 were 80.96 (SD=29.28), 189.16 (SD=97.54), 222.03 (SD=116.45), 14.28 (SD=6.03) and 38.57 (SD=12.78). The overall mean number of information unit changes was 301.82 (SD=113.45). Statistical significance was found for stage REM, 2 and 4 reports for the first level of self reflectiveness. All of the remaining levels of self reflectiveness reached significance in reports from at least one of the other stages of sleep (see figure 8). The results indicated that the level of self reflectiveness was relatively stable between information units occurring sequentially. An information unit at a particular level of self reflectiveness was most likely to be followed by another information units at the same level of self reflectiveness.

		Level of Self Reflectiveness				
		1	2	3	4	5
Stage	REM	**	**	**		**
	Two	**	*	**		
	Four	**				

**= $p < .001$, *= $p < .01$.

Figure 8. Significant chi squared distributions for the first five levels of self reflectiveness.

The degree of variation in the level of self reflectiveness between sequential information units within a report was measured. The sum of the absolute change scores of levels of self reflectiveness between information units occurring sequentially in each report was divided by the total number of information units in the report. The distribution of the difference scores ranging from zero to eight was analyzed. The average number of levels of self reflectiveness changed between sequential information units from stages REM, 2 and 4 were .90 ($SD=1.02$), .87 ($SD=1.08$) and .76 ($SD=.99$), respectively. No significant differences between reports from stages REM, 2 and 4 in the degree of variation in the level of self reflectiveness between sequential information units were found $\chi^2(10, N=1676)=17.52$. For information units from all stages of sleep, approximately half of the information units were

immediately followed by an information unit with the same level of self reflectiveness. As the number of levels of self reflectiveness between information units increased, the incidence of cases decreased. Almost none of the information units occurring sequentially changed 3 or more levels of self reflectiveness (see figure 9).

Figure 9. Distribution of the change in levels of SR between subsequent IU'

Discussion

The present study compared reports from stages REM, 2 and 4 for the frequency of recalling a report after arousal and the length of the report as well as for differences in the levels of self reflectiveness in reports. REM reports and information units from REM reports were expected to be of longer length than reports and information units from NREM sleep. Length was hypothesized to relate to the level of self reflectiveness in the report such that longer reports and information units would have higher levels of self reflectiveness than shorter reports and information units. REM reports were expected to have higher maximum and average levels of self reflectiveness than reports from stages 2 and 4. Finally, the levels of self reflectiveness in the report were hypothesized to have a stable, nonrandom pattern where an information unit of a particular level of self reflectiveness was most likely to be followed by an information unit with the same level of self reflectiveness.

The purpose of the present study was to replicate the findings of Purcell et al. (1986) that the maximum level of self reflectiveness differentiated reports from REM and NREM sleep. This study used a scoring

procedure involving the assignment of levels of self reflectiveness to information units within reports. The maximum level of self reflectiveness failed to indicate differences between REM and NREM reports. However, the procedure of dividing reports into information units and then scoring the information units for the level of self reflectiveness provided a new perspective in the examination of the structure of reports from REM and NREM sleep.

Quantitative Differences

Frequency of Recalling a Report

Awakenings from REM sleep produced a higher frequency of reports than awakenings from NREM sleep. Approximately half of the reports used in the study were elicited from stage REM awakenings whereas stage 4 reports were extremely uncommon. The incidence of recalling a report in this study (REM - 60%, stage 2-41% and stage 4 - 21%) was lower than the rate of recall reported by Foulkes and Schmidt (1983) who also found that reports were elicited after NREM awakenings (67%) less often than REM awakenings (93%). Differences between previous studies for the incidence of REM/NREM recall have been attributed by Foulkes and Schmidt

(1983) to experimenter criteria for the classification of post awakening responses as reports. The present study included any post awakening expression that met the information unit scoring criteria, i.e. not an expression irrelevant to the actual dream experience.

Differences between REM and NREM sleep in the rate of recalling a dream experience may have been due to a number of factors. First, the type of dream experience in REM sleep may have been more easily recalled than the type of dream experience in NREM sleep. However, this was unlikely since Schachter (1987) has shown that participants did not perceive a difference between the experience of REM and NREM dreaming. As well, the average and maximum levels of self reflectiveness which were used to examine the qualitative nature of the dream experience in this study did not differ between reports from stages 2, 4 and REM.

When the number of awakenings for which participants reported "knowing they'd had a dream but being unable to recall the content" were examined, the inability to recall the content occurred more often after NREM awakenings (7 cases) than REM awakenings (3 cases). The incidence of 'contentless' reports where the participant recalls having a dream but cannot remember content, suggests that the lower rate of recall reported after NREM arousals is attributable to

difficulties in encoding the dream experience in memory and/or retrieving the dream from memory.

Length of Reports

Most reports were between 1 and 5 information units in length. In Darling's (1988) home diary study, report length was found to be slightly longer. This suggests that when participants recall dreams at home, they remember more information for reports or they are more elaborate in their expression of reports than in the setting of the sleep laboratory. One difference between the present study and Darling's study (1988) is that in the present study, participants did not transcribe their own reports. As well, in most cases, reports were elicited between periods of sleep while in Darling's study (1988), participants recorded their dreams upon arousal in the morning. The methodology used in Darling's study (1988) may have led to particular types of dreams being reported or forgotten, e.g. more bizarre dreams may have been easier to remember but would not have been representative of the overall nature of the dream experience for the participant. In the present study however, the forgetting of the dream experience was not as much of a concern as the influence of the prior stage of sleep on

the content of the report.

Purcell et al. (1986) found a trend for REM reports to be longer than NREM reports. This study found on average that REM reports were similar in length to reports from stage 2 and longer than reports from stage 4. The length of reports from stage REM, 2 and 4 was not statistically different. The analysis of differences in length between reports from REM, 2 and 4 was influenced by a small number of extremely long (30+ information units) reports collected after REM arousals and the low total number of NREM reports generated. For the purpose of this study, analyses were limited to the first 30 information units in the report. However, even with this limitation, there were few instances of NREM reports of over 15 information units in length. For example, the longest stage 4 report was only 14 information units in length. NREM reports of longer lengths might have been produced if sufficient NREM reports had been collected. However, other researchers have found that REM reports are usually longer except if there is specific mention of 'sleeping' or 'waking' in the report, in which case stage 2 reports are longer (Antrobus, 1983; Foulkes & Schmidt, 1983).

Foulkes and Schmidt (1983) matched reports for length and found REM reports to contain more temporal sequences. Fiss et al. (1967) found that when

participants were asked to produce stories after REM and NREM awakenings, their REM reports contained more idea units. However, Purcell et al. (1986), using word count as the dependent measure for the length of reports, found no significant difference in length between REM and NREM reports. In the present study, reports from REM sleep were also not significantly different in length as measured by the number of information units in a report than reports from stages 2 and 4. REM reports were slightly more variable in length than stage 2 reports but this may have been an artifact of low NREM recall. Reports from stage 4 were the least variable in length.

Thus, report length does not provide any insight into differences in dreaming from REM and NREM sleep. There were differences in the frequency of reports recalled from REM and NREM sleep but the reports generated contained approximately the same number of information units. If the participant recalled an experience from the previous sleep period, the length of his report was approximately the same regardless of the stage of sleep. The similarity in length between reports from REM and NREM sleep suggests that participants produced the same amount of information units regardless of the stage of sleep because they were describing similar experiences after REM and NREM

arousals. The length of reports appeared to involve the capacity to encode information into memory or to retrieve information and translate it into a verbal report.

One explanation for the similarity between the length of reports from different stages of sleep may be the nature of the mechanism used to encode the dream material into memory. Since participants produced approximately the same number of information units after REM sleep as after NREM sleep, this suggests that the dreamer must encode into memory the same amount of information for each stage of sleep. In order to produce the same amount of information units, REM and NREM sleep must have a similar mechanism for encoding information.

A single mechanism for encoding dream material for both REM and NREM dreaming would explain the similarity in report length found in this study. However, it does not explain why the rate of NREM recall is lower than the rate of REM recall. One possibility is that NREM sleep may effect the dreamer's ability to remember or use the appropriate cues to retrieve the dream information. In other words, the dream experience may still exist in memory but is inaccessible for expression. If the participant is able to recover the appropriate cues for accessing the dream experience,

the participant would then be able to report as much of his experience from NREM as he would be able to after REM awakenings. Therefore, if the participant is able to recall an experience, there would be no difference in the length of his reports between REM and NREM awakenings.

However, the similarities in the number of information units between reports from REM and NREM sleep does not necessarily mean that participants reported the same types or sequences of information units from different stages of sleep. For example, NREM reports have previously been found to be more likely to make sense (Schwartz et al., 1978). In this case, NREM information units may be more logically sequenced. REM information units may be poorly linked or contain nonsensical unrelated expressions. This is suggested by the findings of Antrobus (1983) of more perceptual distortions and bizarre content within REM reports. To determine if differences in the internal structure of reports occurred, reports were examined for the distribution of information units across levels of self reflectiveness.

Qualitative Differences

In the present study, self reflectiveness was considered between and within reports from REM and NREM sleep. Self reflectiveness was examined in conjunction with the length of the entire report and elaboration within an information unit. Finally, the pattern of self reflectiveness between sequential information units was explored.

Length and the Level of Self Reflectiveness

Length of Reports

The length of reports from REM and NREM sleep was further assessed to determine the effect of the length of the report on the maximum level of self reflectiveness assigned to any information unit in the report. More words and more information units were expected to be necessary in order to explain concepts of greater complexity. Therefore, a report of longer length was expected to have a higher maximum level of self reflectiveness than a short report. Higher levels of self reflectiveness such as lucidity (SR9) are more cognitively complex to express than lower levels such

as SR3 - being completely involved in the dream drama. Higher levels of self reflectiveness involve more metacognitive processes and in order for the participant to convey such experiences, more words were expected to be required.

However, the length of the report was found to be inversely associated with the maximum level of self reflectiveness. Stage REM and 2 reports with high levels of self reflectiveness were more likely to have fewer information units than reports with lower levels of self reflectiveness. There was a trend for the length of reports from stage 4 sleep to be negatively correlated with higher levels of self reflectiveness. In other words, the highest values of self reflectiveness occurred in the shortest reports from any stage of sleep. For example, this stage 2 report had a maximum level of level of reflectiveness of SR7 because it involved a dream within a dream.

<I felt I had, I had woken up> <I woke up in a crowd of people> <There was an old friend of high school I went with> <He was in a boyscout troop> <He was there with his boyscout troop> <There was a dog, a dox, a doberman pincher> <It was chasing me around the room>

This short report from REM had a maximum level of self reflectiveness of SR8 because it contained an awareness of controlling actions of the self in the dream.

<I was thinking about rocks> <I wasn't visible but I could have been and acted easily><I wasn't there> <I was thinking about these two people> <It was very unlikely to get together> <It was in a place where I was very recently> <I wasn't there when I was>

Reports with high levels of self reflectiveness may be shorter than reports with lower levels of self reflectiveness for a number of reasons. First, a dream experience with a high maximum level of self reflectiveness may be very brief or vague and therefore the dreamer produces only a few information units to describe the experience. Second, the dreamer may lack the ability to describe an experience of higher self reflectiveness with detail because the experience does not easily translate into a verbal report. Third, information units with high levels of self reflectiveness may be more salient. That is, highly self reflective aspects of the dream may stand out and thus be more easily recalled. Highly self reflective segments also have a greater involvement of the dreamer in the dream and these segments may be more easily recalled because they are more personally relevant to the dreamer. However, in recalling these information units with high levels of self reflectiveness, the dreamer may forget segments of his experience which were not as highly self reflective.

Purcell et al. (1986) used the maximum level of self reflectiveness scored in the report to represent self reflectiveness for the entire report. However, the present study treated the maximum level of self reflectiveness as the peak of the fluctuations of levels of self reflectiveness in the report. The first interpretation treats the maximum level of self reflectiveness as a cumulative level of self reflectiveness. The interpretation of the present study was that the maximum level of self reflectiveness was the upper limit of self reflectiveness in the reports and did not necessarily reflect the overall content of the report. Therefore, while Purcell et al. (1986) reported the effect of report length on self reflectiveness across stages, this study examined the effects of length on the peak value of self reflectiveness in the report. To examine the effect of the length of reports on the level of self reflectiveness for the entire report, the average of levels of self reflectiveness for all information units in the report was used as a more representative measure of self reflectiveness in the report.

The length of reports from stages REM, 2 and 4 was not significantly correlated with the average level of self reflectiveness. This indicated that reports with a higher overall level of self reflectiveness did not

require more information units to describe the experience because of their increased complexity nor did these reports require fewer information units because the dream experience was short or difficult to describe. The failure to establish a relationship between the length of reports and the average level of self reflectiveness suggests that the type of experience in the dream did not contribute to the length of reports but instead, the important factors were the ability of the participant to recall information from the dream and to encode this information into a verbal report. A longer report may indicate that the participant was able to remember more of the dream experience and subsequently express more information in his report.

Longer reports may be composed of information units which are used to detail the dream experience. These information units would be used, for example, to describe the dream environment or characters in the dream other than the dreamer. Because these units do not involve the presence of the dreamer directly, they are given lower levels of self reflectiveness and therefore, a report with a great deal of detail would contain a large number of these information units with lower levels of self reflectiveness. The information units which provide detail to the dream may be the

information units which are most easily forgotten or omitted from the report. The dreamer may forget or omit details from the report when trying to describe instances of the dream which were particularly self reflective and therefore, the dreams with the highest maximum levels of self reflectiveness were likely to be the shortest in length. The failure to find an association between the average level of self reflectiveness and the length of the report and the low frequency of information units scored at SR6, SR7, SR8 and SR9 indicate that high levels of self reflectiveness were not sustained in reports which had the highest maximum levels of self reflectiveness.

Length of the Information Unit and the Level of Self Reflectiveness

Information units from stage REM, 2 and 4 reports were assigned increasingly higher levels of self reflectiveness from SR1 to SR5 as the length of the information unit increased. The relationship between the level of self reflectiveness on the length of the information unit suggests that participants differed in the number of words used per information unit because of the complexity of the ideas that were being expressed SR1 utterances were typically 1 or 2 word

fragments, for example, "monkeys" or "a bike". Some information units scored at this level were in statement form, for example, "It was night" or "The sun was shining". SR3 utterances were more complex, for example, "I was driving around with a friend in a very old orange Volkswagen Beetle". SR5 information units contained direct or indirect dialogue and could be extensive in length, for example, "I said well I'd like to but I've lost my drivers license".

The length of the information unit had a very different relationship to the level of self reflectiveness than did the length of the entire report in information units. The quality of the dream experience when measured by the average level of self reflectiveness in the report was not affected by the number of information units that the participant required to express the experience. The maximum level of self reflectiveness in a report was inversely related to the length of the report. However, the number of words in an information unit increased with higher levels of reflectiveness. Therefore, the hypothesis that more words were required to describe complex ideas such as higher levels of self reflectiveness was supported in this study but only in the examination of information units.

In addition, the average number of words in an

information unit was different for reports from stages REM, 2 and 4. Contrary to expectations, stage 4 and stage 2 information units were the most dissimilar in terms of the average number of words. Information units from stage 4 reports had the highest average number of words. An examination of the dream protocols suggested that after a stage 4 arousal, the participant may have been less succinct in his presentation of the dream experience. Information units from stage 4 were often unstructured and rambling.

Examples:

<I sold a ham and cheese sandwich on a kaiser where I work>.

<It's just water> <It's like the bicycles> <It was water, or swimming> <a body of water something you could swim in like a lake or river, that kind of water>

<I was with a friend trying to figure out which would be the best way to go travel this long distance by train or by whatever>.

Information units from stage 2 reports were more clearly expressed than information units from stage 4 reports and generally contained more detail. Examples:

<Everybody was showing me how to plant these rare trees>

<I was thinking about a chair that was in the lab>

<Four police cars on Elgin street>

Reports elicited after REM sleep contained information units which were clearly expressed and detailed. These information units appeared to be closer than the information units from stages 2 and 4 to the structure of ordinary speech in wakefulness. Examples:

<We were all having a nice time outside> <It was a nice day> <We saw this rummage sale sign across the street across the river> <We all jump in our cars, go across the bridge and park>

<My mother and I had come by some big amount of money> <We piled it neatly by the door> <It was really windy outside>

The speech of participants after NREM awakenings has been reported to show deficits such as perseverations (Fiss et al. 1966). Difficulties in expression and poor memory may handicap the participant's choice of words producing longer information units. REM reports may contain information units with structures most similar to waking cognition because the prearousal conditions were more similar to wakefulness in terms of memory and verbal capabilities. The electrophysiology of stage 2 sleep has characteristics of stage 4 and REM sleep. Information units from stage 2 sleep also showed characteristics of information units from stage 4 and REM sleep. Specifically, information units from stage 2 reports were more structured than stage 4 information units but

were not as well elaborated as information units from REM sleep.

Within reports, the length of an information unit appeared to be influenced by two factors - the stage of sleep the report was from and the level of self reflectiveness of the information unit. This suggested that the length of an information unit was affected by the ability of the participant to verbalize his experience and the availability of information for recall. In information units from REM sleep, participants provided more detail suggesting that they were better able to recall aspects of the dream experience than in stage 4 or 2 reports. As well, information units from REM were more clearly expressed than information units from stage 4 suggesting that the shorter lengths of REM information units were due to the ability to edit extraneous material from the information units while encoding them from memory into speech. The type of information recalled influenced the selection of the levels of self reflectiveness. Higher levels of self reflectiveness required more words to describe because of their increased level of complexity. Therefore, both the ability to recall information and the ability to translate this information into a verbal report influenced the length of the information unit.

To further explore the nature of the relationship between the stage of sleep prior to arousal and the levels of self reflectiveness in the report, reports from stages 2, 4 and REM were examined for the distributions of the maximum and average levels of self reflectiveness and the distribution of information units at levels of self reflectiveness.

Distribution of Levels of Self Reflectiveness

Distribution of the Maximum Level of Self Reflectiveness

Purcell et al. (1986) assigned each report a single self reflectiveness score which represented the maximum level of self reflectiveness found in the report. Reports from REM and NREM sleep were then compared for the distributions of the maximum level of self reflectiveness. Purcell et al. (1986) found a significant difference between reports from stages REM and 2 for the distributions of the maximum level of self reflectiveness. Participants who normally reported high rates of dream recall were found to have reports containing higher levels of self reflectiveness than those participants who normally reported low rates of recall of dreams. However, the maximum level of self

reflectiveness in reports differed less than one level of self reflectiveness between participants with high and low rates of recall.

Using the same reports as Purcell et al. (1986) but assessing the level of self reflectiveness for individual information units, the present study found that the stage of sleep and the ability to recall failed to account for the variance in the distributions of the maximum levels of self reflectiveness. Reports were matched for stages REM and 2 for each participant. When the data were analyzed for differences between REM and NREM arousals and then for differences between the stage of sleep and the ability to recall, none of the analyses approached statistical significance. Participant variability and not the stage of sleep or the ability to recall an experience accounted for most of the variance between scores. Other researchers have also found participant variability to be important. Pivik and Foulkes (1967) reported that the 'dreamlike' quality of dream experience varied from participant to participant.

In the present study, only a small number of reports had a maximum level of self reflectiveness of SR6 to SR9. For example, there were only 2 lucid dreams (SR9) reported in the entire collection of reports. A majority of reports were given a maximum level of self

reflectiveness of SR3 or SR5. There were no significant differences between stages for the maximum level of self reflectiveness present. However, REM reports were equally likely to have reports where the dreamer was totally involved in the dream drama (SR3) and reports with direct or indirect speech (SR5). However, reports from stages 2 and 4 were more likely to have information units in which the participant was more involved in the dream drama (SR3) suggesting that globally there is a trend for NREM reports to have a peak level of self reflectiveness that is cognitively less complex.

Distribution of the Average Level of Self Reflectiveness

In order to present a more appropriate assessment of the level of self reflectiveness in the dream report than suggested by the maximum level of self reflectiveness, the levels of self reflectiveness were averaged across information units and the resulting score was used to represent the overall degree of self reflectiveness in a report. Reports were analyzed for the effects of stage alone and also the stage of sleep and the ability to recall an experience. There were no significant differences found between groups.

The failure to separate REM and NREM reports on the basis of a single summary score (the average or maximum level of self reflectiveness) suggests that using the information unit scoring procedure, self reflectiveness does not differentiate REM from NREM reports. Intersubject variability accounted for most of the variance in the analysis of the distribution of the maximum and average levels of self reflectiveness. The average level of self reflectiveness failed to have an effect on the length of the reports from stages REM, 2 and 4. The level of self reflectiveness also did not appear to interact with the stage of the report to effect changes in the length of the information unit. These findings suggest that participants have different experiences from one another yet had similar types of experiences from different stages of sleep. In other words, the quality of the dream experience as measured by the level of self reflectiveness did not differ across stages of sleep for the same individual. This supports Schachter's (1987) findings that participants were unable to differentiate dream experiences from stage 2 from dreams from REM sleep. Differences between REM and NREM reports such as in the length of information units appear to be, as Antrobus (1983) has suggested, a product of the ability of the participant to recall and express his experience after arousals

from different sleep periods.

Both Purcell et al. (1986) and the present study determined the interrater reliability for the assessment of the maximum level of self reflectiveness indicating that experimental error was not to blame for the failure to replicate. The major difference between the two studies was in the treatment of the report. Purcell et al. (1986) examined each report as a single unit. However, the present study divided each report into component units. The failure to replicate Purcell et al.'s findings suggests that methodology in scoring has a large role in determining the pattern of self reflectiveness in a report.

The information unit scoring procedure was felt to minimize the likelihood of experimenter inference. Any attempt to link information units was assumed to rely upon experimenter-based inferences. This procedure allows an assessment of self reflectiveness change within and between reports. However, the assignment of a single maximum self reflectiveness score is limited by its inability to describe the moment to moment change in self reflectiveness within a single report. It limits the researcher to inter report comparisons. In addition, a single maximum score is unrepresentative of the total contents of the report.

Purcell (1989) argued that treating the report as

the sum of individual parts or information units does not provide a true picture of the process of self reflectiveness involved within the dream report. Purcell suggested that the information unit procedure ignores contextual effects reflecting the overall integration of the report. An information unit may provide descriptive information for subsequent units. Purcell suggested that reports from REM and NREM differ in terms of overall impression and are therefore assigned significantly different maximum levels of self reflectiveness. Differences in 'impression' may be, for example, the succinctness of expression, the integration of information or the logical sequencing of events. Purcell et al. (1986) may have assigned REM reports higher levels of self reflectiveness because the text was better elaborated or thought to reflect higher cognitive processing.

The methodology of Purcell et al. (1986) and the information unit scoring procedure are on opposite ends of the same continuum. The optimal tool for report analysis would allow examination at the information unit level yet make provision for contextual effects. Assignment of a single score to the report increases experimenter inference and therefore, experimenter bias. However, the analysis of information units fails to examine the importance of report cohesiveness.

Unfortunately, the benefit of the greater scope of information gained by the combination of the two procedures is balanced by the increase in possible error from the two methods.

Distribution of Information Units at Levels of Self Reflectiveness

The distribution of information units for reports from stage 2 was significantly different from the distribution of information units from REM reports but not from the distribution of information units from stage 4 reports. However, there was some indication that the distribution of information units from stage 2 reports were similar to the distributions of information units from both REM and stage 4 reports. The distribution of information units from stage 2 resembled the distribution for REM information units for SR1 and SR2 then more closely approximated the distribution of information units of stage 4 reports at SR3. Information units from stage 4 reports were more likely to be scored as containing unfamiliar places or objects (SR1) than information units from reports from the other stages of sleep and less likely to contain familiar items and humans (SR2). The distributions of information units from all stages of sleep had few

instances of SR4 information units (noticing, watching from a distance).

The absence of information units scored as SR4 is most likely an artifact of the scoring procedure. The expression of these units is usually of the form "I notice(d) that..." or "I am/was watching...". The procedure for marking information units assumes conservatism when the inclusion of text is in question. Unfortunately, the grammatical structure of information units assigned a self reflectiveness level of 4 is easily confused with editorial comment. For example, "I notice that I am leaving out details" appears to be an editorial comment. However, if it is preceded by "I am giving a lecture on a mathematical model (I notice that I am leaving out details)", the text in question may be a valid information unit. The scoring of levels of self reflectiveness does not allow for contextual effects. Therefore, information units may have been conservatively assessed as editorial comment and omitted rather than assigned a self reflectiveness level of SR4.

Similarly, information units which should have been given a level of SR5 may have been misscored. These involved expressions likely to have been correctly included as information units but improperly scored due to a lack of context. For example, the

utterance "coffee" would be scored conservatively as SR1. However, if the report text is "'Coffee', I said the word again and again", the utterance of the single word 'coffee' should be scored as a direct quote or SR5. Again, the procedure for assigning levels of self reflectiveness does not allow for contextual effects and the unit would receive a lower level of self reflectiveness than would seem to be indicated by the surrounding text.

The use of information units did provide more insight into the overall level of self reflectiveness in a report. In particular, the maximum level of self reflectiveness in the report did not necessarily represent the content of the report. For example, 35% of reports from REM arousals were scored at a maximum level of SR5 yet only 10% of all information units from REM were scored as SR5. Therefore, a report which contained mostly lower self reflectiveness scores (SR1 to SR3) and a single high self reflectiveness score would be represented by the higher score.

The distribution of information units from reports from stages REM, 2 and 4 can be explained by stage related differences in the memory and expression of the dream experience. For example, the nature of the encoding or recall of the dream experience may be responsible for the types of information reported by

participants after REM and NREM arousals. Information units of particular levels of self reflectiveness may be easier to remember when producing a report. This is suggested by the inverse relationship between the maximum level of self reflectiveness and the length of the report. The participants remembered aspects of the dream with higher levels of self reflectiveness but did not provide a great deal of additional information.

Statistically, the distributions of information units from stages 2 and 4 were not different. However, there was a trend for information units from stage 2 reports to be more broadly spread across levels of self reflectiveness. Information units from Stage 2 reports were somewhat like information units from REM but had fewer instances of high levels of self reflectiveness and contained a greater incidence of the self involved in the dream drama (SR3). Information units from stage 4 reports appeared to be mostly singleminded references to the self (SR3) or references to unfamiliar objects. This suggests that after NREM arousals, participants had encoded or retrieved only particular types of ideas such as actions directly affecting the self. Since the overall levels of self reflectiveness did not differ between stages, this suggests that the experience of dreaming may be the same during REM and NREM sleep. However, since the types of information units selected

differed between reports from REM and NREM periods, this suggests that REM and NREM have different mechanisms for encoding dream information or that there is a difference in the manner in which information is recalled and expressed after REM and NREM sleep. Previously, a failure to find differences in length between reports from stages REM, 2 and 4 was reported indicating that participants appeared to encode the same amounts of information into memory. Thus, differences in the distributions of information units appear to be primarily involved with the type of information recalled and the encoding of this information into speech.

The difference in the distributions of information units from reports from stages REM, 2 and 4 may be a result of the type of information units used in the description of the experience. For example, information units from REM reports appeared to be more evenly distributed across levels of self reflectiveness than information units of reports from stages 2 and 4. After a REM arousal, the participant may be able to report his experience using a wide range of perspectives including first person, dialogue, familiar objects, etc. as though in wakefulness. This may explain why most of the information units scored at SR6 to SR9 occurred after REM sleep. Or, the wider range of levels

of self reflectiveness for information units from REM reports may indicate the presence of 'bizarre content' or a lower likelihood of 'making sense' such as reported by Antrobus (1983). In this case, the participant jumps from perspective to perspective (i.e. first person to third person) when presenting the dream experience and these shifts in perspective create a sense of distortion or bizarreness in the report.

Participants may be affected by linguistic factors such as the ability to verbally elaborate the report. For example, the inclusion of possessive pronouns is one form of elaboration which appeared to be relatively absent in reports from stage 4 sleep. Failure to include the possessive pronoun for a noun, e.g. 'the' bicycle versus 'my' bicycle, automatically changed the scoring of an information unit from SR2 to SR1 because it altered the status of the object in the unit from familiar to unfamiliar.

In addition, omission of detail may change an information unit from SR3 to SR2. For example, "She was there with me" is scored at SR3. However, the omission of 'with me' reduces the score to SR2. The unit "She was there" may implicitly carry the information 'with me' but because this information is inferred and not directly stated in the report, the unit received a lower level of self reflectiveness. Therefore, a lower

level of SR may indicate less elaboration but need not reflect a difference in the dream experience or in the encoding of the information unit into memory.

The length of the information unit was shown to differ for stage REM, 2 and 4 reports. The increased length of information units from reports from stage 4 did not suggest elaboration of the information units but rather, a lack of succinctness in expression after stage 4 arousals. Participants used different distributions of information units after NREM versus REM periods to report their dreams and may have had more difficulty selecting the words to explain their experiences. Therefore, reports following stage 4 sleep were least like waking mentation in terms of the detail and ease in communicating an experience. On the other hand, REM reports were most like waking mentation because on average, they were clearly expressed and provide a wider range of information from the experience.

Pattern of the Levels of Self Reflectiveness

Within a Report

There were several hypotheses for the pattern of the levels of self reflectiveness within the report. First, Rossi (1972) proposed that self reflectiveness

occurred in a progressive manner and therefore, should increase from lower levels of self reflectiveness to higher levels of self reflectiveness. Purcell et al. (1986) further suggested that lower levels of self reflectiveness such as noticing oddities in the dream (SR7) would trigger higher levels of self reflectiveness for example, lucidity (SR9). Second, based on the results of Darling's study (1988), self reflectiveness was proposed to have a stable pattern where an information unit scored at a particular level of self reflectiveness would most likely be followed by an information unit with the same level of self reflectiveness. For example, an information unit scored at SR3 would most likely be followed by another unit scored at SR3. In the present study, self reflectiveness was found to exhibit the third pattern of stability. There was little change in the level of self reflectiveness between subsequent information units.

Purcell et al. (1986) proposed a pattern of self reflectiveness where as the dream continued, the dreamer would become increasingly self reflective. Theoretically, Rossi (1972) proposed that examination of the self and the subsequent feedback would lead to the resolution of internal conflicts and higher self awareness. The upward movement to higher levels of self

reflectiveness through the process of self examination was what Rossi felt was necessary for growth of the personality. Purcell (1987) suggested that higher levels of self reflectiveness could be triggered by previously occurring levels of self reflectiveness in the dream. For example, the noticing of oddities (SR7) in the dream could trigger lucidity (SR9). The dreamer would notice something unusual in his dream surroundings or actions (SR7) and surmise that he was not awake but in fact, experiencing a dream (SR9).

In the present study, there was no evidence to suggest that dreamers were engaged in a process of self examination that led to increased levels of self reflectiveness in reports. The ordinal positions of information units were not correlated with their corresponding levels of self reflectiveness. There was no indication that a particular level of self reflectiveness was triggered by any other level of self reflectiveness since the maximum level of self reflectiveness appeared in any position in the report. Instead, the maximum level of self reflectiveness was inversely related to the length of the report suggesting that information units with high levels of self reflectiveness were easier to remember. The average level of self reflectiveness for reports indicates that high levels of self reflectiveness were

not sustained as would be expected if the participant was engaged in an ongoing process of psychosynthesis.

The second hypothesis for the pattern of the levels of self reflectiveness between information units in a report proposed a completely random pattern of self reflectiveness where any level of self reflectiveness is likely to follow any other level of self reflectiveness in subsequent information units. To test this hypothesis, each information unit was compared to its immediately preceding information unit in terms of the level of self reflectiveness. However, the level of self reflectiveness did not occur randomly. Instead, the evidence suggested a stable pattern for the level of self reflectiveness such as found by Darling (1988). Darling found that an information unit was most likely to be followed by another information unit of the same level of self reflectiveness. Her study compared three groups who differed in terms of training for waking attention to dreams. The present study examined stages REM, 2 and 4 for this pattern of stability of the level of self reflectiveness between information units.

The pattern of stability for the level of self reflectiveness was found in varying degrees in reports from stages REM, 2 and 4. Reports from REM arousals had the most stable pattern with information units scored

at SR1, SR2, SR3, and SR5 most often followed sequentially by information units with the same level of SR. Information units in reports from stage 4 sleep were the least likely to have sequential information units with the same level of self reflectiveness. The pattern of levels of self reflectiveness appeared to be less stable than in stage 2 and REM reports. In stage 4 reports, only information units at SR1 were reliably followed by information units scored at the same level. Reports from stage 2 appeared to mediate between stages 4 and REM for the stability of the levels of self reflectiveness. Analyses were problematic because of the low frequency of information units at SR4, SR6, SR7, SR8 and SR9 and the low frequency of reports generated after NREM sleep. However, with this consideration, the pattern of the levels of self reflectiveness appeared to be stable in REM reports and becoming gradually more variable in NREM reports with stage 4 reports being more variable than stage 2 reports. However, when the distributions of the changes in the levels of self reflectiveness scores were examined, the apparent greater instability in NREM reports was not statistically supported.

A trend towards differences in variability in the levels of self reflectiveness between information units was not surprising since there were significant

differences between REM and NREM reports in the number of information units at particular levels of self reflectiveness. Information units in REM reports were more evenly distributed across levels of self reflectiveness than in reports from NREM sleep. Therefore, there was a greater probability of an information unit being followed by an information unit with a similar level of self reflectiveness in a REM report. However, within NREM reports there was a lower proportion of information units scored as SR2 and SR5 and therefore a lower probability of an information unit of SR2 or SR5 following another information unit of SR2 or SR5.

The difference in the sequencing of information units between reports elicited after REM and NREM sleep may be associated with the memory or expression of the dream experience. Reports from stage 4 contained references to actions of the self (SR3) and unfamiliar objects (SR1). Reports from REM sleep contained a variety of types of information including dialogue (SR5) and familiar objects (SR2). Finally, stage 2 reports are most similar to reports from stage 4 but have a higher incidence of references to familiar objects (SR2) than do stage 4 reports. The difference between REM and NREM reports in the types of information units recalled suggests that participants

described an experience after REM sleep with a greater degree of flexibility since an even distribution of information units across levels of self reflectiveness was produced. In other words, after REM arousals the participant reported not only his own actions in the dream (SR3) but also more characterization, setting descriptions, conversations, etc. This supports previous findings of more characterization and elaboration in reports from REM sleep than in NREM reports (Antrobus, 1983; Foulkes 1962; Schwartz et al., 1978). The distribution of information units from REM reports would also lead to less cohesiveness in the structure of reports since there were more types of information made available, creating more difficulties in integrating material into a single report.

The levels of self reflectiveness in reports from stages REM, 2 and 4 had been expected to differ based upon previous research into qualitative differences between reports from different stages of sleep, e.g. Purcell et al. (1986). Previous studies such as Purcell et al. (1986) suggested that the experience of dreaming was not the same during REM and NREM sleep and that differences between dream reports reflected these differences in experience. However, the present study suggests that the experience of dreaming is the same regardless of the stage of sleep it occurs in. This

study supported the findings of Schachter (1987) who found that participants could not determine what stage of sleep they had been awakened from on the basis of their previous mentation. Therefore, differences between reports from stages REM, 2 and 4 must have been due to other factors such as the encoding of the dream experience into memory or the recall and encoding of the dream material into the verbal report.

The results of this study did not support a model where differences in reports from stages REM, 2 and 4 were a result of encoding the dream experience into memory. The possibility that differences in reports resulted from the encoding of material into memory could not explain the similarity in length between reports from different stages. As well, if different information was encoded for REM and NREM reports, this could not explain the similarity in the overall levels of self reflectiveness found in reports. Finally, information units from stages REM and 4 appeared to be qualitatively different but not in terms of the type of information encoded. Instead, information units appeared to be influenced by how much detail was recalled about a particular aspect of the dream experience and how well the participant was able to verbally construct the information unit.

Summary

In the present study, reports elicited after REM and NREM sleep were examined for differences in the level of self reflectiveness by a procedure involving the scoring of information units within a report. Reports from REM and NREM periods differed in a number of aspects including the frequency of recalling a report after awakenings and the distributions of the level of self reflectiveness for information units in the report. However, the results of this study failed to demonstrate that the variable 'self reflectiveness' was capable of differentiating between reports from REM and NREM sleep as previously reported by Purcell et al. (1986). The findings of this study suggest that the experience of dreaming differed between participants but did not differ between REM and NREM sleep. The ability to recall the details of the dream experience and the ability to clearly express the experience were most likely responsible for differences in the content of reports.

Reports from REM and NREM sleep did not differ in

terms of the length of the report as measured by the number of information units suggesting a single generative mechanism for both stages of sleep which controls the encoding and/or retrieval of dream information. The length of the report was inversely related to the maximum level of self reflectiveness which might indicate that participants remember information units of higher levels of self reflectiveness at the expense of recalling additional detail. However, the length of the report had little to do with the overall type of information recalled in the report. There was no evidence to relate the average level of self reflectiveness to the length of the report thus discrediting hypotheses that longer reports had greater elaboration and higher sustained levels of self reflectiveness. Regardless of the length of the report, there was no difference between REM and NREM reports for the average and maximum levels of self reflectiveness in reports.

When the report was considered as a whole, there was no evidence, except for the frequency of recalling a report, that dreaming in REM sleep differed from dreaming in NREM sleep. The length of the report and the overall levels of self reflectiveness do not differ between reports from different stages. This supports Schachter's (1987) work that the experience of dreaming

is the same for dreamers despite the stage of sleep they are in.

One difference found in this study between REM and NREM sleep was in the frequency of recalling a report. REM awakenings were more likely to elicit a report. The other difference between reports from REM and NREM sleep was in the type of information recalled in information units and the way in which the information units were expressed. Stage 4 reports contained longer information units and more references to the first person. These information units were often poorly expressed and simplistic. On average, information units from stage 2 reports were shorter than information units from either REM or stage 4 reports. These information units were clearly expressed as were information units from REM reports but information units from stage 2 lacked the detail present in REM information units. In addition, information units from REM reports were evenly distributed across the first five levels of self reflectiveness suggesting a perspective after REM sleep most similar to waking mentation or alternately, a lack of cohesiveness in the structure of the report.

Information units occurring sequentially were most likely to have the same level of self reflectiveness or a minimum of change between levels of self

2

OF/DE

2

1.0

2.8

2.5

3.2

2.2

2.0

2.0

1.1

2.0

1.8

1.25

1.4

1.6

Microl

reflectiveness. This suggests that the type of information unit was not randomly chosen but was likely a product of encoding and recall mechanisms whereby similar types of information were stored in or accessed from memory together. Since a broader distribution of levels of self reflectiveness was recalled in REM reports than NREM reports, reports from REM periods may have been more detailed or bizarre than NREM reports although the overall level of self reflectiveness did not differ between REM and NREM reports. NREM reports were more restrained in the types of information recalled and expressed. In general, reports from stage 2 sleep exhibited characteristics of reports from both REM and stage 4 sleep suggesting that whatever factors appeared to influence the memory and expression of the dream experience after NREM arousals, those factors are less severe as the EEG of sleep more closely resembles that of wakefulness.

The average and maximum levels of self reflectiveness for each report failed to discriminate between reports from stages 2, 4 and REM thus failing to replicate the findings of Purcell et al. (1986). The failure to replicate the findings of Purcell et al. (1986) was attributed to the conservatism of the information scoring procedure and its inability to assess contextual effects. However, using this

procedure allowed an examination of the construction of the report by measuring the level of self reflectiveness between information units. The procedure of scoring information units for the level of self reflectiveness indicated that self reflectiveness is not a particularly valuable variable for differentiating overall differences between REM and NREM reports. It did, however, provide more evidence suggesting that the experience of dreaming does not differ across stages of sleep and that the memory and expression of the dream experience are most likely responsible for differences between reports generated after stages REM, 2 and 4.

References

- Antrobus, J. (1983). REM and NREM sleep reports: comparison of word frequencies by cognitive classes. Psychophysiology, 20(5), 562-568.
- Darling, M. (1988). The pattern of self-reflectiveness in dream reports. Unpublished M.A. thesis, Carleton University, Ottawa.
- Fiss, H., Klein, G.S. & Bokert, E. (1966). Waking fantasies following interruption of two types of sleep. Archives of General Psychiatry, 14, 543-551.
- Foulkes, D. (1962). Dream reports from different stages of sleep. J of Abnormal Psychology, 65, 14-25.
- Foulkes, D. (1978). A Grammar of Dreams. New York: Basic Books Inc.
- Foulkes, D. & Schmidt, M. (1983). Temporal sequence and unit composition in dream reports from different stages of sleep. Sleep, 6(3), 265-280.

Foulkes, D. (1985). A cognitive psychological analysis of dreaming. NJ:Lawrence Erlbaum Associates, Publ.

LaBerge, S. & Gackenbach, J. (1986). Lucid dreaming. In Wolman & Ullman (Eds.), Handbook of states of consciousness. Van Nostrand Reinhold Publ.

Moffitt, A., Hoffmann, R., Wells, R., Armitage, R., Pigeau, R. & Shearer, J. (1982). Individual differences among pre- and post-awakening EEG correlates of dream reports following arousals from different stages of sleep. Psychiatric Journal of the University of Ottawa, 7(2), 111-125.

Moffitt, A., Hoffmann, R., Purcell, S., Mullington, J. & Darling, M. (1987). Scoring manual for self-reflectiveness in dream reports, versions I and II. Laboratory for Sleep and Chronopsychology, Carleton University, Ottawa.

Monroe, L., Rechtschaffen, A., Foulkes, D., & Jensen, J. (1965). Discriminability of REM and NREM reports. J of Personality and Social Psychology, 2, 456-60.

Mullington, J. (1988). Cross-state analysis of indices of continuity and cognitive integration in verbal reports of experience. Unpublished M.A. thesis, Carleton University, Ottawa.

Nielsen, T., Kuiken, D., Moffitt, A., Hoffmann, R. & Wells, R. (1983). Comparisons of the story structure of stage REM and stage 2 mentation reports. Sleep Research, 12, 181.

Pivik, T. & Foulkes, D. (1967). NREM mentation: relation to personality, orientation time, and time of night. J of Consulting and Clinical Psychology, 37, 144-151.

Purcell, S., Mullington, J., Moffitt, A., Hoffmann, R., & Pigeau, R. (1986). Dream self-reflectiveness as a learned cognitive skill. Sleep, 9(3), 423-437.

Purcell, S. (1987). The education of attention to dreaming in high and low frequency dream recallers: the effects on dream self-reflectiveness, lucidity and control. Unpublished PhD dissertation, Carleton University, Ottawa.

Purcell, S. (1989). Personal communication.

Rechtschaffen, A. (1978). The singlemindedness and isolation of dreams. Sleep, 1, 97-109.

Rechtschaffen, A. & Kales, A. (1968). A manual of standardized terminology, techniques and scoring system for sleep stages of human subjects. Brain Information Service. L.A., California.

Rossi, E. L. (1972). Dreams and the growth of personality. New York: Permagon Press, Inc.

Schachter, H. (1987). Psychophysiological relations during sleep: the role of individual differences. Unpublished PhD dissertation, Carleton University, Ottawa.

Schwartz, D., Weinstein, L. & Arkin, A. (1978). Qualitative aspects of sleep mentation. In Arkin, Antrobus & Ellman (Eds.), The mind in sleep. NJ: Lawrence Erlbaum Assoc, 203-213.

Weinstein, L., Schwartz, D. & Ellman (1988). The development of scales to measure the experience of self-participation in sleep. Sleep, 11(5), 437-447.

Appendix A. Self-reflectiveness scale - abbreviated form

<u>Level</u>	<u>Description</u>
1	Dreamer not in information unit; objects unfamiliar; no people
2	Dreamer not in information unit; people or familiar objects present
3	Dreamer completely involved in dream drama; no other perspective
4	Dreamer present predominantly as observer
5	Dreamer thinks over idea or has definite communication with someone
6	Dreamer undergoes a transformation of body, role, emotion, age, etc.
7	Dreamer had multiple levels of awareness; simultaneous participating and observing; dream within a dream; noticing oddities while dreaming
8	Dreamer has significant control in, or control over dream story; can wake up deliberately
9	Dreamer can consciously reflect on the fact that he is dreaming

END

19|09.9|0

FIN