Examining Emotionality in Recalled Dreams of High Frequency and Low Frequency Dream Recallers

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Abstract

Dreaming is a universal human experience and there are many theories that attempt to explain its purpose. One such theory, the Mood Regulatory Function of Dreaming, states that dreaming is the mechanism through which the regulation of emotion is achieved during REM sleep. Based on this, one could assume that a greater number of dreams would result in more emotion regulation. There is some research which indicates that a higher dream recall frequency and greater emotional content present within the dream, are associated with greater emotion regulation during sleep. Hence, it was hypothesized that the REM sleep dreams of individuals who recalled more dreams (High Frequency dream Recallers) would have greater emotionality than the HFR NREM sleep dreams and the Low Frequency dream Recaller (LFR) REM and NREM sleep dreams. Emotionality is defined as the degree to which a dream report presents both positive, & negative emotional content. The emotionality of N = 27 UCT students' recalled dream reports were scored using the overall Emotion score (generated by the LIWC software program) as well as the Emotional Intensity rater scores. The results of the study did not confirm the main hypothesis. Instead the study found that LFRs had greater emotionality present within their recalled dream reports in comparison to HFRs (p = 0.015). Hence, no definitive conclusion can be drawn on the relation between the emotionality present in dream reports and emotion regulation. Therefore, further research is needs to be conducted to investigate this relationship.

Keywords: Dreaming; Emotion regulation; Emotionality; Dream recall; Rapid-eye movement; Non-rapid eye movement

Dreaming can be thought of as a mental experience that occurs during sleep and is characterised by sensorimotor imagery, that is experienced as being 'real' (similar to waking reality), despite spatial-temporal distortions or improbability of time, place, person or action (Hobson & McCarley, 1977; Hobson, Pace-Schott, & Stickgold, 2000). Sleep comprises of two primary alternating sleep stages: non-rapid eye movement (NREM) sleep and rapid eye movement (REM) sleep (Carskadon, & Dement, 2005). Dreaming is mostly associated with (REM) sleep (Aserinsky, & Kleitman, 1953); however, it has been well established that dreaming may also occur during NREM sleep (Eichenlaub et al., 2014; Solms, 2000; Vallat, Eichenlaub, Nicolas, & Ruby, 2018).

A current dominant theory that seeks to explain the possible purpose of dreaming is the Mood Regulatory Function of Dreaming, proposed by Kramer (1991). Kramer (1991) explains that "mood is systematically and differentially altered by sleep and dreams across the sleep period" (Kramer, 1991, p. 277). Adding to that, the theory postulates that dreaming is the mechanism through which the regulation or modulation of emotion is achieved during REM sleep cycles (Kramer, 1991; Levin, & Nielsen, 2009)). The changes in emotions throughout the night are reflected in the dream content. Hence, examining dream reports provides insight into the change of one's emotions during sleep. Moreover, during dreaming, negative emotions are downregulated through the night and changed into more positive emotions (Agargun, & Cartwright, 2003; Cartwright, Luten, Young, Mercer, & Bears, 1998a; Cartwright, Young, Mercer, & Bears, 1998b; Levin, & Nielsen, 2009). In other words, dreams transform difficult emotional states to those that are less difficult for the individual. If this theory is true, then one could say that a greater number of dreams would result in more emotional regulation. Evidence for this has been provided by sleep scientists including Cartwright and colleagues. Cartwright's studies on depressed individuals have shown that those who dreamt more (i.e. had a higher dream recall frequency) and had more emotional content in their dreams showed greater emotion regulation and were no longer depressed at follow-up evaluation (Cartwright, Agargun, Kirkby, & Friedman, 2006; Cartwright, Baehr, Kirkby, Pandi-Perumal, & Kabat, 2003).

To elaborate further, Cartwright, et al., 2003, examined the variables that accounted for the remission of 60% of the 20 depressed participants in their study. The study found that one of the variables that accounted for the variance in remission was the ability to recall dreams when they were awakened from REM sleep. The dream reports were rated for dream-like fantasy and results showed that individual's whose dream reports were rated 4 (a dream report which contains two or more images and shows a connection between them) and 5 (a

well-developed dream– a dream report that contains two or more images and a well-developed story or plot) were no longer depressed at follow-up. Adding to that the study concluded that individuals who report few dreams will have little chance of remission (especially if they do not receive treatment). Furthermore, Cartwright, et al., 2006, examined the REM sleep recalled dream reports of 20 depressed individuals who were going through a divorce (N = 12 participants were in the remitted group and N = 8 were in the non-remitted group). Those who were in remission at follow-up recalled more dreams and well-developed dreams than individuals in the non-remitted group. What's more, the dream reports of the remitted group had more emotionality than the non-remitted group (Cartwright, et al., 2006).

Despite the knowledge that these studies provide on the possible emotion regulatory function of dreaming, research is still very limited in this field. One could argue that this is possibly due to the predominate focus on studying dreaming and emotion regulation centred on depression – as studies show that those suffering with depression display altered sleep patterns and mood dysregulation (Agargun, & Cartwright, 2003; Cartwright et al., 2003; Cartwright et al., 1998b). This is not surprising as with most psychological research, when trying to uncover more about 'normal' human functioning researchers tend to study when things go wrong or 'abnormalities' of 'normal' functioning. Nevertheless, it is clear from the Cartwright studies, that more dreams and greater emotionality (both positive and negative emotional content) are the two elements that are needed for greater emotion regulation. A novel way to study the emotion regulatory function of dreaming is to examine the dream reports of those who recall many dreams (HFRs) with those who recall fewer dreams (LFRs), and to see if individuals who report more dreams also have higher emotionality in their dream reports. Hence, this study aims to investigate whether the recalled REM dream reports of High Frequency Dream Recallers (HFRs) are associated with greater emotionality than HFR NREM recalled dream reports and Low Frequency Dream Recallers (LFRs) REM and NREM recalled dream reports.

Regarding differences in dream reports gathered from HFRs and LFRs, some older research notes that the recalled dreams of HFRs contain greater "vividness (sensory impact), emotionality (of a positive or negative valence), bizarreness (credibility, likelihood, strangeness), and activity (pace of events)" (Cohen, & MacNeilage, 1974, p. 699) than the recalled dreams of LFRs. But not all dreams are the same: research findings show that NREM and REM sleep dreams differ in the kinds of dream content and emotionality that is reported. For example, it is often noted that REM dreams contain bizarre elements and are more vivid and emotionally colourful (i.e. they contain a greater number of both positive and negative

emotions) in comparison to NREM sleep dreams, which are more 'thought-like' (Fosse, Stickgold, & Hobson, 2001; McNamara et al., 2010; Smith, et al., 2004; Vandekerckhove, & Wang, 2018). In addition, Smith et al. (2004) found that the total emotionality (especially negative emotions) in REM dream reports were significantly more intense than NREM sleep reports. Furthermore, when examining differences in emotionality between HFRs and LFRs, it is important to take into account which sleep stage the dream report was recorded from, because the sleep stage differences in emotionality may be a confound to between-group differences.

The value of this study is its novelty. There are no known studies that attempt to understand emotion regulation and dreaming through investigating whether HFR recalled dreams have greater emotionality than LFR recalled dreams. Researchers have not investigated emotion regulation in this context before, thus, this current study adds a different perspective to the existing literature. Moreover, it is beneficial to have multiple methods when examining the same construct as one can see whether the results converge onto the same conclusion or not. Moreover, the effectiveness of the different methods can then be compared and evaluated.

Rationale, Aims and Hypotheses

Dreaming is likely to perform an emotion regulation function (Kramer, 1991). There is some evidence in the literature that individuals who report more dreams have greater emotionality in these dreams and subsequently greater emotion regulation. However, evidence for this finding primarily comes from one research group (depressed individuals). A novel way to replicate this finding is by studying HFRs and LFRs, as dream recall frequency has been linked to emotion regulation. More specifically, dream reports of HFRs contain greater emotionality than LFRs. Furthermore, when investigating the differences in emotionality in dream reports recorded from HFRs and LFRs, the study should also take into account the sleep stage from which the dream was recorded. As REM sleep dream reports tend have greater emotionality and emotional intensity in comparison to NREM sleep dream reports. This study has three specific hypotheses:

1. Greater emotionality is associated with High Frequency Recaller dream reports rather than Low Frequency Recaller dream reports.
2. REM sleep recalled dream reports have greater emotionality than NREM sleep recalled dream reports.
3. HFR REM recalled dream reports have greater emotionality than HFR NREM recalled dream reports and LFR REM and NREM reports.

Methods

Design and Setting

This cross-sectional study examined the emotionality of recalled dream reports using a 2 x 2 factorial design. The independent variables were (1) group (two levels: HRFs or LFRs), and (2) sleep stage from which the dream emerged (two levels: NREM or REM). The dependent variable was the emotionality present in the recalled dream reports. This study used dream reports that were collected from a quasi-experimental PhD study that investigated the relationship between dreaming, sleep and functional neuropsychology that are associated with HFRs and LFRs (Van Wyk, 2017). The setting of the study was the Department of Psychology's Sleep Laboratory at the University of Cape Town, South Africa.

Participants

The parent student had $N = 36$ participants, however, 9 participants were excluded from this present study (see Table 1). Therefore, the overall sample size of this study was $N = 27$ participants. Below, I have described the recruitment method and eligibility criteria for participation that was used by the parent study.

Table 1

Attrition of Study Participants

Attrition Due to…	HFRs	LFRs
	n	*n*
No dream recalled by participant	2	
Dream report obtained from Stage 1 NREM sleep upon awakening	1	2
Participant already awake before dream report was obtained		1
Dream reports were obtained from different sleep stages upon awakening*	3	

Note. HFR = High Frequency Dream Recallers; LFR = Low Frequency Dream Recallers

* in total there were 10 participants who recalled two dream reports (one on the adaptation night & one on the experimental night). Seven of them recalled dreams from the same sleep stage (NREM or REM) and thus their emotionality score could be averaged in order to obtain one score.

Participant recruitment. A recruitment email (see Appendix A) describing the study, was sent four times over the academic year to the entire student body at the University of Cape Town which at that time had approximately 26, 500 students. Moreover, the survey was specifically sent out on more than four occasions to the Psychology undergraduate

student population so they could earn SRPP (Student Research Participation Programme) course points to meet the requirements of their relevant undergraduate courses. The first step in determining eligibility, required prospective participants to complete an online survey that collected data on their demographics, medical information, substance use, psychiatric illness, sleep and dreams (see Appendix C).

According to the dream frequency questions posed in this survey two groups of participants were identified: individuals who reported recalling more than three dreams per week were classified as HFRs and individuals who reported recalling less than two dreams per month were classified as LFRs. Only students who fell into these two categories were then considered for participation. There was a total of 2, 041 students who followed the link to the survey, however only 1, 591 of them successfully completed the entire online survey. 370 of the 1, 591 potential participants reported that they could remember more than three dreams weekly and 170 of them reported that they could remember less than two dreams per month. The total number of eligible participants was thus 540. However, after the in-person screening interview process, during the second phase of the study (to be discussed below), those that met the exclusionary criteria were excluded which resulted in a total final study sample size of $N = 36$. Nineteen participants were allocated to the HFR group and 17 were allocated to the LFR group. Regarding gender, the HFR group consisted of 8 male and 11 female students, while the LFR group consisted of 9 male and 8 female university students.

Exclusionary Criteria. The following exclusionary criteria was based on the entire parent study. Individuals who met any of the following criteria were subsequently excluded from participating in the parent study:

1) Individuals who reported between two and twelve dreams per month. As the study was looking for participants who were on the two opposite ends of the ‘dream recall spectrum’ (less than 2 dreams per month or more than 12), not those who report an ‘average’ number of dreams per month.
2) Participants who were below the age of 20 years or those above 40 years old. Research shows that there are sleep architecture changes in adolescence and older adults (Blackman, 2000).
3) Individuals who had a past and current history of alcohol abuse or dependence. Because research has shown that consuming excessive amounts of alcohol alters sleep architecture – decreases in slow wave sleep, shortening of REM sleep latency and extended sleep latency (Irwin, Miller, Gillin, Demodena, & Ehlers, 2000).

4) Individuals that had a current or past history of a sleep disorder. For example, individuals with sleep disorders such as Narcolepsy with cataplexy (NC) have an altered sleep architecture (Cipolli et al., 2008).
5) Individuals who had a current or past history of a psychiatric disorder, as many such disorders are also accompanied by altered sleep architecture (Wulff, Gatti, Wettstein, & Foster, 2010).
6) Individuals who used sedative medication to treat sleep difficulties, or other psychoactive medication to treat psychiatric disorders. The reason for this is because these pharmacological agents have been shown to alter the sleep stages (Pagel, & Parnes, 2001).
7) Individuals who had any medical condition that is known to cause a disturbance to emotional processes, sleeping patterns, and dreaming.
8) Individuals who were pregnant because the sleep architecture of pregnant women is quite different from non-pregnant women (Lee, 1998).

Measures and Materials

Screening Measures. Below is a description of the screening tools used in the parent study:

Dream Details. In the online survey potential participants were asked four questions regarding the frequency of their dreams. (See Appendix C for details of these questions).

The Michigan Alcoholism Screening Test (MAST; Selzer, 1971) is a structural interview which is used to detect alcoholism and is comprised of 25 questions that aim to identify past and current alcohol behaviours (see Appendix C for details). It has been shown to demonstrate good consistency and validity. Individuals who score ≥ 5 on the MAST were excluded from the parent study. Moreover, the MAST has been proven as a useful screening test within South African populations (Bekker, & Van Velden, 2003).

The Beck Depression Inventory – Second Edition (BDI-II; Beck, Steer, & Brown, 1996) is 21-item self-report questionnaire that assess the severity of depressive symptoms over the past two weeks in adults. Individuals who score ≥14 (indicative of minimal depressive symptomology), were excluded from the study (Beck, et al., 1996). The BDI-II is reported to be a valid and reliable tool that can be used in both clinical settings and as a research tool. Furthermore, it has been successfully used in research studies that were conducted in South Africa (Seedat, Nyamai, Njenga, Vythilingum, & Stein, 2004).

The Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989) is a self-rated questionnaire that was used to evaluate participant's sleep

quality over the past month (see Appendix C for details). The PSQI has been reported to have both clinical and psychometric properties that make it well suited for use in both clinical practice as well as research studies. Potential participants that scored > 5 on the questionnaire were excluded from the parent study, as this represents the cut-off for sleep disturbance. The PSQI has also been successfully utilised within the South African population (Rockwood, Mintzer, Truyen, Wessel, & Wilkinson, 2001).

The Mini International Neuropsychiatric Interview (English version 5.0.0; MINI; Sheehan et al., 1998) is a structured diagnostic interview that is used to screen individuals for the presence of any major psychiatric disorder listed in the Diagnostic & Statistical Manual of Mental Disorders, fourth edition (DSM-IV). According to its developers the MINI is said to have good psychometric properties and ease of administration (it takes approximately 15 minutes to conduct and it can be administered by both clinicians and lay people who have undergone the appropriate training). Those individuals who met the criteria for any of the disorders mentioned in the MINI (mood disorders, anxiety disorders, substance use/dependence, and posttraumatic stress disorder) were excluded from partaking in the study. The MINI seems to have high validity and reliability scores when it has been used in studies located within the South African context (Olley, Zeier, Seedat, & Stein, 2005).

Experimental Measures.

The Most Recent Recall form (Domhoff & Shneider, 1998; see Appendix D) was filled out by participants upon awakening (both on the adaptation and experimental nights) in order to obtain their dream report (see Appendix D for details).

Sleep laboratory equipment. The Sleep laboratory was equipped with a Polysomnograph (PSG) and electroencephalograph (EEG) that is adjusted for sleep research and was used to determine sleep stages (which allowed the stage in which the dream report came from to be determined). The equipment also contained various electrodes: electrooculography (EOG) electrodes to measure eye movement, electromyography (EMG) electrodes to measure muscle tone and to measure heartrate an electrocardiogram (ECG) was used. All the electrodes were gold plated and placed on the scalp according to the 10–20 international standards, except for the ECG electrodes which were placed on the participants' chest (Klem, Lüders, Jasper, & Elger, 1999).

The Linguistic Inquiry and Word Count Programme (LIWC) The Linguistic Inquiry and Word Count program (LIWC; Pennebaker, Booth, Boyd, Jordan, & Francis, 2015) which analyses the content of the transcribed texts or linguistic files was used to analyse emotionality present in the recalled dream reports. The program uses word categories, which

are groups of words that converge around a similar meaning (e.g. positive emotions). The LIWC program functions by reading each target word from an input text (e.g. dream reports in my study). It searches the 6,400-word dictionary file to identify words that match the input text. Matched words are then linked to a word category (e.g. negative or positive emotion categories). The LIWC programme then calculates the percentage of words within a category from the total number of words in the input text. The category of interest in this study is the overall Emotion (emotion words that have both negative and positive valence).

The Visual Analogue Scale (VAS). A Visual Analogue Scale (VAS) constructed as a 14 cm line with well-defined end points (0: low emotional intensity, 14: high emotional intensity) was used to allow the raters to rate the emotional intensity present in the recalled dream reports.

Procedure

After completing both the online survey and in-person interview, potential participants who were eligible after the screening procedures were invited to come for a sleep adaptation night between two and ten days after the administration of the phase 2 screening measures.

Phase 3 of the parent study was the sleep adaptation night. This was required to allow participants to become acquainted with the study's sleep environment. An adaptation night is important because with sleep studies, participants' sleep is often always disrupted due to sleeping in a novel environment, this is known as the 'first night effect' (Agnew, Webb, & Williams, 1966). Upon arrival at the Sleep Lab the full procedure was then explained to participants and their questions were addressed, thereafter they were prepared for their night's sleep. They were attached throughout the night to the PSG. All participants were allowed to sleep uninterruptedly for 7-8 hours and upon awakening, they were requested to fill in the *Most Recent Dream Form.*

The final phase of the parent study was the sleep testing night. The sleep nights were scheduled non-consecutively as to avoid sleep rebound (that is, deeper sleep) because of the consequences of the 'first night effect' where individuals commonly experience disrupted sleep due to the first night in a novel environment. After arriving at the sleep laboratory, participants completed several tasks relevant to the parent study. Thereafter the procedure was identical to that of the adaptation night. Before leaving the laboratory, participants were paid R300 for their participation and were then debriefed about the study's aims, and procedures etc.

Ethical Considerations

Ethical approval was granted by the Department of Psychology's Ethics Board as well as from the Faculty of Humanities at UCT (see Appendix G). No participant reported an adverse reaction to the experiment. Below is a brief summary of the study's ethical considerations. Consent was obtained before the screening phases. For the first phase, potential participants followed the link to the online survey where they were provided with the details of the study. They were then requested to provide their consent if they wished to participate in the study (see Appendix B for consent form). It was stipulated on the online survey that all participant's information would remain confidential and they would able to withdraw from the study at any time. During the second screening phase participants were provided with an information sheet (see Appendix E) describing the study, its risks and benefits. Following this, consent (Appendix F) was then obtained before the in-person screening interview.

Data Management and Statistical Analyses

Statistical analyses were performed using both Microsoft Excel and SPSS (version 25.0). In terms of statistical significance, α was set at = .05 (Field, 2009). All the data sets were examined for errors before continuing with the analyses. There were no missing values and there was one outlier however it was not removed as none of the assumptions of the parametric tests (homogeneity of variance, independence of observations, & normality) were violated. In terms of the sample characteristics, I generated a complete set of descriptive statistics (means and standard deviations) which allowed me to investigate the sample characteristics.

Deriving outcome variables. I transcribed each of the participants' recalled dream reports and then I ran these transcribed reports through the LIWC 2015 programme in order to obtain the percentage of emotional words present in each dream report in the overall Emotion category (Pennebaker, et al., 2015). This overall Emotion score (%) for each dream report was used in the statistical analysis. Where participants reported two dream reports, the overall Emotion percentages were averaged so that there was a single percentage (emotionality score) for each participant.

To further assess the overall emotionality of the dream reports, I (the researcher) as well as two independent raters used a Visual Analogue Scales (a subjective rating scale) to determine the intensity of emotions (either negative or positive emotions) present in the dream reports. The interrater reliability estimate, the intraclass correlation coefficient was computed using the three raters scores; ICC = 0.80 which indicated good reliability (Koo, & Li, 2016). However, the 95% confidence interval ranged from 0.43 and 0.92, which showed

that the level of interrater reliability varied widely from ‘poor’ to ‘excellent’ (Koo, & Li, 2016). Because of this variation in reliability, a fourth rater was consulted to discuss ratings of dream reports where the three original raters differed by more than 2 cm. This rater, in consultation with me, discussed each dream report and the original three ratings and decided on an overall emotional intensity score based on the validity of the original ratings. Similar to the outcomes derived from the LIWC program, the emotional intensity scores for participants with two dream reports was averaged to obtain one score.

Inferential analyses. The two independent variables Group and Sleep Stage, were the two factors in the study. Each factor had two levels: Group was divided into High Frequency dream Recall individuals (HFRs) and Low Frequency dream Recall individuals (LFRs). Factor two, Sleep Stage, was divided into Non-rapid eye movement sleep (NREM) and Rapid eye movement sleep (REM). The dependent (outcome) variable, Emotionality, was determined by using the overall Emotional percentages generated by the LIWC programme and the Emotional intensity ratings provided by the raters. Firstly, I ran a Chi Square Goodness of Fit test to examine whether there is an even distribution of the number of dream reports from REM and NREM for HFRs and LFRs. The Chi Squared test was computed because REM sleep recalled dream reports are known to have greater emotionality than NREM sleep recalled dream reports, which may account for the group’s higher emotionality scores. Thereafter I ran two Factorial ANOVAs which allowed me to test all three of my hypotheses as follows: the first hypothesis – HFR recalled dream reports will have greater emotionality than LFR recalled dream reports, was the first main effect. The second hypothesis – REM sleep dream reports will have greater emotionality than NREM sleep dream reports, was the second main effect. The third hypothesis – HFR REM sleep recalled dream reports will have greater emotionality than HFR NREM and LFR REM and NREM sleep recalled dream reports, represented the interaction between the two factors. Testing all my hypotheses simultaneously also decreased the chance of type 1 error. The first Factorial ANOVA I ran was using the overall Emotion scores (%) that were generated by the LIWC programme. Once these results were computed, the second Factorial ANOVA was run, using the Emotional Intensity scores that were based on the average of the VAS rater scores.

Results

Sample Characteristics

Table 2 summarises the sociodemographic characteristics: age, Highest Level of Education (HLOE), sex and sleep stages derived from polysomnographic data of the 27 individuals who participated in the study. Participants were divided into two groups; High

Frequency Dream Recallers (HFRs) and Low Frequency Dream Recallers (LFRs). A Mann-Whitney U Test (non-parametric test) was computed for age and Highest Level of Education (HLOE) as the data for these variables was not normally distributed (positively skewed) even after log transformations were performed. The analyses detected no significant differences on any of the socio-demographic or sleep stage variables. These results suggest that subsequent study analyses are not likely to be confounded by between-group differences on any of the measured sample sociodemographic variables, nor is there a between-group bias in sleep stages experienced by HFRs and LFRs.

Table 2

Sample Characteristics (N = 27)

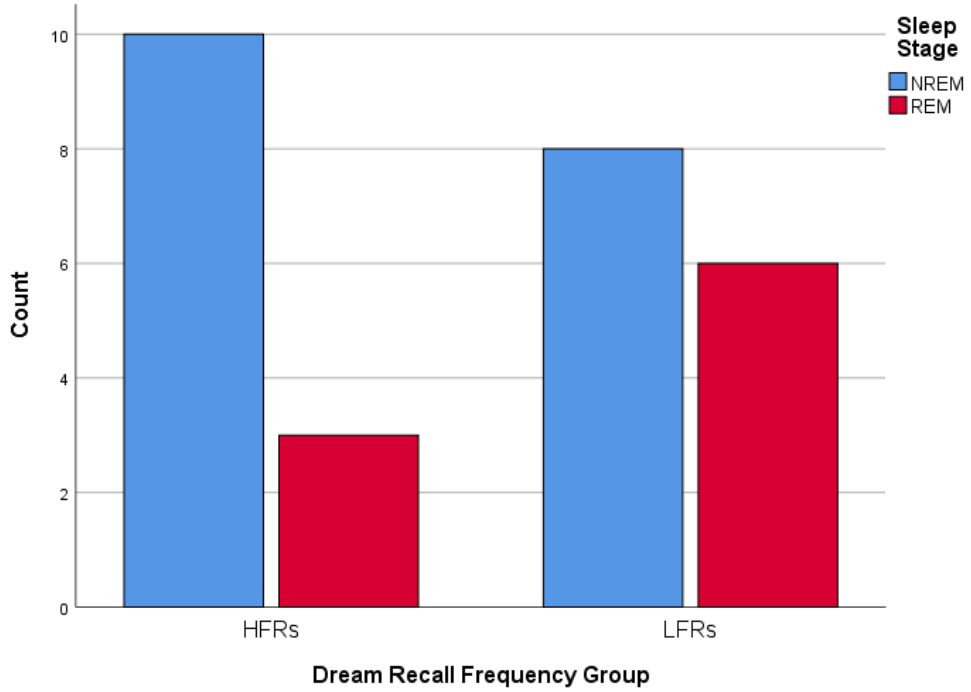
	Group				
Variable	HFR (n = 13)	LFR (n = 14)	χ^2/U	p	ESE
Age (years)					
M (*SD*)	21.08 (1.38)	23.36 (4.89)	60.50	0.125	-0.30
Range	20-25	20-38			
HLOE			82.50	0.592	-0.10
M (*SD*)	12.62 (1.33)	13.14 (1.92)			
Range	12-16	12-17			
Sex			0.36	0.547	-0.12
Female	8 (29.63%)	7 (25.95%)			
Male	5 (18.52%)	7 (25.95%)			
Sleep Stage			1.19	0.420	0.21
NREM	10	8			
REM	3	6			

Note. For all the variables except for *Sex* and *Sleep Stage* the means are displayed with standard deviations in parentheses. Chi Square Statistics was computed for *Sex;* a Mann-Whitney *U* test for *Age* and *HLOE*. HFR = High Frequency Dream Recall Individuals; LFR = Low Frequency Dream Recall Individuals; HLOE = highest level of education (in years); REM: rapid eye movement sleep; NREM: non-rapid eye movement; ESE = effect size estimate (for χ^2 tests, φ Phi, for *U, r*).
All the listed *p*-values are two-tailed.

A Chi Square Goodness of fit test was computed to see if there was a significant difference in the distribution of the number of dream reports recalled from either NREM or REM sleep for the two groups (see Figure 1). The results indicted a nonsignificant difference $\chi 2$ (1, N = 27) = 3.00, p = 0.083, suggesting that although there was some difference in how many reports were recalled by HFRs and LFRs from NREM and REM sleep, this difference was not a confound for further analyses.

Figure 1

The Distribution of REM and NREM dream reports per Group



Testing Hypothesis 1: Emotionality in HFRs and LFRs. This aim of the factorial ANOVA tested whether HFRs in comparison with LFRs reported greater emotionality in their dreams. Regarding the overall Emotion scores, the results indicated a significant main effect for *Group*. The mean overall Emotion for HFRs and LFRs indicated, that contrary to the hypothesis, LFRs had significantly greater emotionality in their dreams than HFRs. Regarding the emotional intensity scores, the results did not indicate a significant main effect for *Group.* Even though it was not significant, it appears that on average, the recalled dream reports of LFRs had greater emotional intensity than the recalled dream reports of HFRs. See Table 3 for the means, standard deviations, *F* statistic and effect sizes for LIWC overall Emotionality scores and emotional intensity scores.

Table 3
Overall Emotion Scores and Emotional Intensity Scores per Group

	HFRs		LFRs				
Measure	*M*	*SD*	*M*	*SD*	*F*(1, 23)	*p*	η_p^2
LIWC Emotionality Score	2.82	2.14	5.05	1.72	6.96	0.015*	0.23
Emotional Intensity Score	4.41	3.27	6.87	3.14	3.14	0.090	.12

Note. HFR = High Frequency Dream Recall Individuals; LFR = Low Frequency Dream Recall Individuals;
*$p > 0.05$.

Testing Hypothesis 2: Emotionality in REM and NREM sleep. This aim of the factorial ANOVA was to test whether REM sleep dream reports had greater emotionality in comparison with NREM sleep dream reports. This second hypothesis of the study was not confirmed indicating that dreams reported from REM sleep in comparison to NREM sleep, were not associated with a higher degree of overall Emotion or emotional intensity. The results show no main effect for Sleep Stage on any of the outcome variables (Table 4).

Table 4
Emotionality Scores and Emotional Intensity Scores per Group

	REM		NREM				
Measure	*M*	*SD*	*M*	*SD*	*F*(1, 23)	*p*	η_p^2
LIWC Emotionality Score	3.77	2.66	4.10	1.89	0.15	0.702	0.01
Emotional Intensity Score	5.04	3.81	6.24	3.08	0.75	0.397	0.03

Note. REM = rapid eye movement sleep; NREM = non-rapid eye movement sleep

Testing Hypothesis 3: Interaction between Group and Sleep Stage. The third hypothesis that HFR REM recalled dream reports will have greater emotionality than HFR NREM recalled dream reports and LFR REM and NREM recalled dream reports, was not confirmed. The results for both the LIWC overall Emotion score and Emotional Intensity scores indicated that there is a nonsignificant interaction effect between *Group* and *Sleep Stage* (see Table 5).

Table 5

Interaction of Emotionality Scores between Groups and Sleep Stage

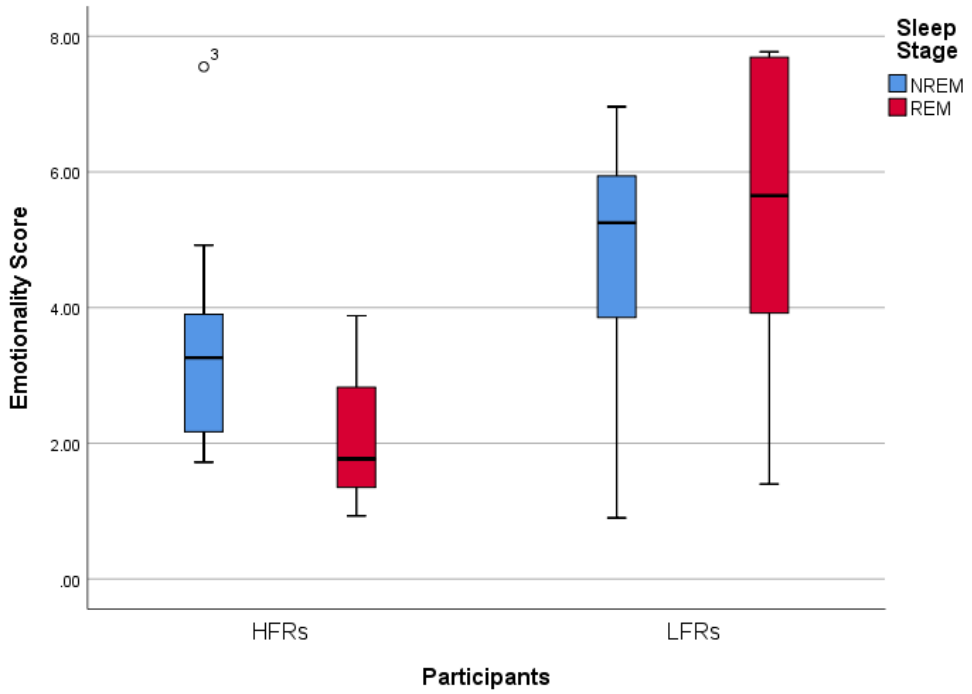
Variable	HFRs		LFRs		$F(1, 23)$	p	η_p^2
	REM	NREM	REM	NREM			
Overall Emotion					1.22	0.281	0.05
M	2.19	3.45	5.35	4.74			
(*SD*)	(1.52)	(1.74)	(2.54)	(1.92)			
Emotional Intensity					0.61	0.442	0.03
M	3.27	5.55	6.81	6.92			
(*SD*)	(2.17)	(3.44)	(4.04)	(2.57)			

Note. HFR = High Frequency Dream Recall Individuals; LFR = Low Frequency Dream Recall Individuals. REM = rapid eye movement sleep; NREM = non-rapid eye movement sleep

Figures 2 and 3, show the spread of the distribution of the overall Emotion score and Emotional Intensity scores, for the two groups and sleep stages. From figure 2, it appears that the spread within the HFR group is quite similar, however, within the LFR group, the spread of the overall Emotion scores for the REM sleep dream reports is larger than the spread for the NREM sleep dream reports. Moreover, from Figure 3, within the HFR group, the spread of the NREM sleep dream reports is much larger than that of the REM sleep dream reports. The spread of the REM sleep dream reports for the LFRs is slightly more wide spread than that of the NREM sleep dream reports.

Figure 2

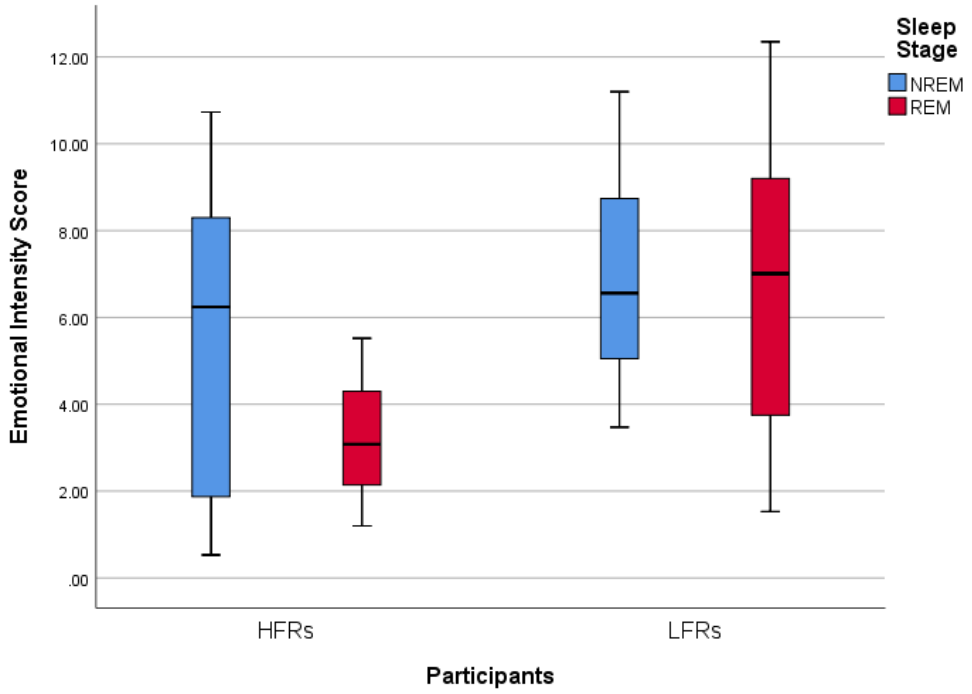
The Distribution of overall Emotion Scores for Groups and Sleep Stages



Note. HFR = High Frequency Dream Recall Individuals; LFR = Low Frequency Dream Recall Individuals.

Figure 3

The Distribution of Emotional Intensity Scores for Groups and Sleep Stages



Note. HFR = High Frequency Dream Recall Individuals; LFR = Low Frequency Dream Recall Individuals.

Summary of Results. A 2x2 factorial ANOVA indicated that the first hypothesis (main effect for *Group*) was statistically significant, based on the LIWC overall Emotion score. However, this was in the opposite direction to the hypothesis. In other words, *LFR* recalled dream reports had significantly more emotionality than *HRF* recalled dream reports. Emotionality, based on the Emotional intensity ratings, was not significant. With regard to hypothesis 2 (main effect for *Sleep Stage*), none of the results were statistically significant. Moreover, there was no significant interaction between *Group* and *Sleep Stage*, which suggests that there is no additional combined influence of Group (HRFs, & LFRs) and Sleep Stage (NREM, & REM) on Emotionality.

Discussion

The main aim of this research study was to investigate the emotionality in dream reports produced by High Frequency Dream Recallers (HFRs) in comparison to Low Frequency Dream Recallers (LFRs). Furthermore, the study aimed to replicate well-established findings that dreams recalled from REM sleep have higher emotionality than dreams recalled from NREM sleep (Fosse et al., 2001; McNamara et al., 2010; Smith, et al., 2004; Vandekerckhove, & Wang, 2018) for both groups of participants. Taken together, I aimed to show that the dream reports recalled from REM sleep by HFRs would have higher emotionality than (a) their NREM-recalled dreams and (b) LFRs REM or NREM-related dream reports. The study showed that (a) LFRs have higher emotionality than HFRs, (b) REM dreams do not have higher emotionality than NREM dreams and that dream reports generated from REM sleep by HFRs do not have higher emotionality than reports generated either from NREM sleep or by LFRs.

The literature shows that a high dream recall frequency and greater dream emotionality, represent greater regulation of emotion. To explain further, the Mood Regulatory Function of Dreaming proposed by Kramer (1991), explains that dreaming is the mechanism through which emotion is regulated during sleep (Levin, & Nielsen, 2009). Adding to that, the theory postulates that during dreaming, negative emotions are downregulated through the night and transformed into more positive emotions (Cartwright, et al., 2003; Cartwright, et al., 1998a; Levin & Nielsen, 2009). If this is the case, then a natural speculation is that a greater number of dreams would result in more emotional regulation. Research has provided some indirect evidence for this, for example Cartwright, et al., (2006) found that depressed individuals who were in remission at follow-up evaluation, had a higher percentage of dreams and well-developed dreams. Moreover, they also reported more affect in their recalled dream reports, in comparison to those individuals who were not in remission.

In other words, the individuals who were in remission displayed greater emotion regulation and were no longer depressed. Below, I will discuss the results of the three specific hypotheses, in relation to the relevant published literature. I will then address this current study's limitations and provide some recommendations for future research.

Hypothesis 1: <u>do HFRs report more Emotionality in their dreams than LFRs?</u> In this current study, I hypothesized that the recalled dream reports of HFRs would have greater emotionality than dream reports recalled by LFRs. Contrary to prediction, LFRs had more emotionality in their recalled dreams than HFRs. The results of the overall Emotion scores indicate that the dream reports of LFRs had significantly greater emotionality than dream reports of HFRs. The Emotional intensity scores followed the same trend although the results were not significant. It was expected that the dream reports of HFRs would have greater Emotionality, as in terms of emotion regulation, individuals who report more seem to have greater emotion regulation (Cartwright, et al., 2006; Cartwright, et al., 2003). Moreover, it is also noted in the literature that the recalled dream reports of HFRs contain more emotional content than the recalled dream reports of LFRs (Cohen, & MacNeilage, 1974).

To explain this finding, I initially attributed the result to the distribution of REM sleep dream reports between the Groups. As LFRs had more REM sleep dream reports than HRFs and literature indicates that REM sleep dreams tend to have greater emotionality than NREM sleep dreams (Fosse et al., 2001; McNamara et al., 2010; Smith, et al., 2004; Vandekerckhove, & Wang, 2018). This would have account for LFRs' dream reports containing more Emotionality than dream reports of HFRs. However, the Chi Square Goodness of fit test, which was computed to see if there was a significant difference in the distribution of NREM and REM sleep dream reports for the Groups, yielded a nonsignificant result. Thus, an alternative explanation that could account for the results could be that mundane dreams are not brought into the awareness of LFR individuals; however, emotionally salient dreams are. The Salience Hypothesis of dream recall explains that dreams that are emotionally intense, unusual or novel are more readily remembered and are therefore more likely to be recalled (Cohen, 1974). So, when LFR individuals are asked to recall their dreams, they may be more likely to recall dreams that have greater emotionality as these dreams are brought into their awareness due to their emotional salience. Whereas, both mundane and emotionally salient dreams are brought into HFR's awareness and hence they are able to recall both mundane and emotionally salient dreams. Hence, when asked to provide a dream report, there is an 'equal' chance that HFRs could recall either mundane or emotionally salient dreams. However, LFRs have a greater chance of recalling emotionally

salient dreams. Moreover, it is unknown whether LFRs have fewer dreams or remember less of what they dream. If the latter is the case, then they may only remember what is emotionally charged/salient. If HFRs are better at remembering dreams then they may remember both salient and mundane dreams. This is of course speculation and would therefore need to be proven through further research.

Hypothesis 2: <u>do REM sleep dream reports contain greater Emotionality than NREM sleep dream reports?</u> The results did not confirm the hypothesis that dreams recalled from REM sleep will have greater Emotionality than dreams recalled from NREM sleep. The findings showed that dreams recalled from REM and NREM sleep had similar degrees of overall Emotion and Emotional intensity. This finding is in opposition to a well-established body of literature that demonstrates that REM dreams are characterised by a higher degree of emotion than NREM dreams. Studies have demonstrated that dream reports gathered from REM contain greater bizarre elements and are more 'emotionally colourful' in comparison to NREM sleep dreams, which are more 'thought-like' (Fosse et al., 2001; McNamara et al., 2010; Smith, et al., 2004; Vandekerckhove, & Wang, 2018). What's more, REM sleep dream reports are found to be considerably more emotionally intense than NREM sleep recalled dreams (Smith, et al., 2004). One possible explanation for the results could be that HFRs and LFRs are two extremes of the population that do not have the same degree of emotionality in their REM and NREM dreams as the average person. Therefore, the distinction in emotionality between the two stages is not demonstrated in this study.

Hypothesis 3: <u>do dream reports generated from REM sleep by HFRs have higher emotionality than reports generated either from NREM sleep or by LFRs?</u> The results for the interaction between Group (HFRs vs. LFRs) and Sleep Stage were nonsignificant. Meaning that HFR REM dream reports did not have significantly greater emotionality than the HFR NREM recalled dream reports and the LFR REM and NREM reports. This is in opposition to the literature of emotion regulation and dreaming, which explains that REM sleep dreaming assists in the regulation of mood (Cartwright, et al., 1998a; Kramer, 1991). Moreover, literature on emotion regulation and dreaming have examined REM sleep dream reports of depressed individuals and have shown that a has shown that who report more dreams when they are awakened from REM sleep a have greater chance of remission (Cartwright, et al., 2003). Adding to that, REM sleep dream reports of depressed individuals who recalled more dreams and had greater emotionality in their dream reports, were in remission at follow-up (Cartwright, et al., 2006). The nonsignificant result of the interaction is therefore not in agreement with the literature on emotion regulation and dreaming. One

possible explanation for this is that previous research has been conducted on a clinical sample whereas this current study specifically excluded anyone with psychopathology. Hence, the results seen in this study are not in agreement with previous literature. Moreover, there does not seem to be literature which investigates emotion regulation and dreaming specifically during NREM sleep. Therefore, it is not really known if NREM sleep plays a role in emotion regulation and whether individuals who recall more dreams from NREM and have greater emotionality in these dream reports would have greater emotion regulation.

Limitations and Directions for Future Research

The main limitation of this study was that it was statistically underpowered. The results of the parent study's Power analysis, with Power (1-β) set at 0.8, an alpha of $\alpha = 0.05$, assuming one-tailed tests, and Cohen's *d* as high as 3.89, showed that a minimum sample size of 4 participants in each group would be sufficient. The ideal sample size was thus set at $N = 36$. For the current study, I calculated the ideal sample size using the G*Power software. An a prior power analysis for a Factorial ANOVA was computed. Using a power $(1 - \beta) = 0.80$, an alpha $\alpha = 0.05$, and a large effect size (Cohen's $f = 0.4$) revealed an ideal sample size of 52 participants. However, given that this study's sample size was limited to the parent study data, a Post Hoc power analysis, using a sample size of $N = 36$, $\alpha = 0.05$, and a large effect size (Cohen's $f = 0.4$), revealed a statistical power $(1 - \beta) = 0.65$. However, due to attrition, the sample size was reduced to $N = 27$. The achieved power (using the effect size generated by averaging the overall emotion effect sizes: 0.10) power $(1 - \beta) = 0.38$). Having an ideal sample size ($N = 52$) or slightly larger, would have increased the probability of detecting statistically significant effects. Therefore, future studies that wish to replicate this study should aim to accumulate the ideal sample size.

Furthermore, since this study used archival data (i.e. data that was previously collected), I therefore did not have a direct (conventional) measure to investigate the emotion regulatory function of dreaming. I could have used this measure beside this current study in order to compare the results. The conventional method to investigate the emotion regulatory function of dreaming is to examine participants' dream reports from early on in the night as well as those toward the end of the night. If the dream reports at the end of the night have more positive emotions than negative emotions, one would assume that emotion regulation took place. I.e. the negative emotions were downregulated through the night and transformed into positive emotions (Agargun, & Cartwright, 2003; Cartwright, et al., 1998a; Cartwright et al., 1998b). My study which looked at dream recall frequency and emotionality in dream

reports, was intended to be a novel way to study emotion regulation and dreaming. As studies have shown that depressed individuals who recall more dreams and have more affect in their dream reports would have greater emotion regulation and are more likely to be in remission (Cartwright et al., 2006; Cartwright et al., 2003). Having a direct measure of emotion regulation would have allowed me to compare whether the conventional or novel method of investigating emotion regulation and dreaming is more effective. It is often beneficial to have multiple methods of measuring the same construct because one would be able to investigate whether the results converge onto the same conclusion or not. I unfortunately, only had one way to study the construct (emotion regulatory function of dreaming) as I was bound by the confines of the parent study. In future, it would also be beneficial for researchers to a design that incorporates both the conventional and novel way used to examine the emotion regulatory function of dreaming in individuals. For example, REM and NREM sleep dream reports of HFRs and LFRs could be examined from the beginning of the night and towards the end of the night. The presence of positive and negative emotions could be analysed to see if dream reports toward the end of the night are more positive, which would indicate emotion regulation. Moreover, the overall Emotionality score of the dream reports could examined in order to determine whether HFR dream reports have greater emotionality than LFR reports.

Questions that remained unanswered

Due to the results of my study, I was not able to draw a conclusion on emotion regulation and dreaming. The question thus still remains as to whether individuals who recall more dreams and have greater emotionality in their dream reports, display greater emotion regulation. Moreover, the emotion regulatory function of dreaming has been studied using REM sleep dream reports so the question still remain as to whether NREM sleep is also associated with emotion regulation.

Summary and Conclusion

Even though this current study could not confirm the hypotheses and therefore could not make definitive conclusions regarding whether individuals who recall more dreams and have greater emotionality present with the dream, have greater emotional regulation. It is nevertheless still a beneficial study, as the research in the field is still very limited. This study provides a novel way to investigate emotion regulation and dreaming simply by examining the emotionality present in the recalled dream reports of individuals who recall more dreams (HFRs) in comparison to those who recall less dreams (LFRs). In terms of clinical significance, investigating the emotion regulatory function of dreaming can aid the identification of various sleep disorders, such as Narcolepsy and REM behaviour disorder, as

well in the assessment and treatment plan of mood disorders such as Depression (Cipolli et al., 2008; Kramer, 1991; Schredl, 2009).

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APPENDICES

Appendix A

Participant Recruitment Email

Dear Students,

INFORMATION: UCT SLEEP STUDY All UCT students who want to participate in this PAID study, please read:

I am running a PhD study at the Department of Psychology at UCT. The study looks at memory and emotions in relation to sleep and dreaming. This study has been approved by the Humanities Faculty Research Ethics Committee.

The study will consist of three phases: the first phase entails filling out the online questionnaire, if you are deemed eligible, and willing to continue with the study, you will advance to the second phase. At the second phase you will briefly meet with the researcher to fill out additional questionnaires. Following this, and if you are still eligible and willing, you will be invited to participate in the sleep study.

The sleep study will take place over two non-consecutive nights scheduled at your convenience. Before you go to bed you will complete some questionnaires, as well as three memory tasks. The memory tasks will be repeated the following morning. You will not be woken up during the night.

Who can participate?

I am looking for males and females between the ages of 20 and 40 years, who are not on any chronic medication like anti-depressants, anti-psychotics, sleeping pills or any other psychotropic medication.

What are the benefits?

1) You will learn more about your sleeping patterns.

2) You will also receive **R300 payment** upon completion of both sleep testing nights.

Please follow the link below to fill out the consent form and advance to the first phase of the study:

https://www.surveymonkey.com/r/VXBPVGH

Please note that all personal information will be kept strictly confidential and it will not be used for purposes outside of this research study.

Please email sleep.dreamstudy@gmail.com if you have any questions.

Regards,

Mariza (Head Researcher)

Appendix B

Online Survey Consent Form

Sleep Studies at UCT

Online consent form

This is a survey used for initial screening for sleep studies being carried out at the University of Cape Town (UCT). This online survey should take less than 15 minutes and will assess you on various aspects of your sleep routine and other qualities that affect sleep.

Taking part in this survey is completely voluntary, and you may withdraw at any time without incurring any penalties. The information you provide will be kept strictly confidential. This means that your digital data will be kept in secure computer files, and will only be shared with the researchers of these studies. Any information that is released to the public will not include your name or any personal details that may be used to identify you.

Please take this survey in a single session, and without consulting outside sources of information. This survey is intended to collect responses in a specific manner, and outside sources of information or activities between answering the questions may impact on the results. In order to control this to some degree, the survey must be completed in less than 20 minutes for the results to be considered.

If your responses indicate that you are eligible for the next phase, you may be contacted to meet with a researcher to participate in a second, short screening interview. This screening will determine if you are eligible for the sleep study, for which you will receive payment upon completion.

By continuing with this survey, you agree to supply personal information that is correct to the best of your knowledge.

If you do not agree, please close the page on your web-browser and do not continue.

If you have any questions, please contact sleep.dreamstudy@gmail.com

Appendix C

Online Survey

Demographic and Medical Information

2. Full name

3. Student number

4. Course code (If applicable)

5. Please provide contact details: (We need to be able to contact you in order to organise sessions)

6. Highest level of education

7. Sex

Male

Female

Other

8. Age (years)

9. What is your country of origin?

10. What is your primary language?

11. Are you currently on ANY medication? Please list ALL medications.

12. Have you ever had a head injury?

13. Did you lose consciousness?

14. Please list all past and current medical conditions

15. Have you ever been diagnosed with a psychiatric condition?

16. If yes, please list the condition(s)

17. Have you ever been diagnosed with a sleep disorder? 18. Which disorder, please explain

19. If there are any other details about your medical history, that you have not mentioned yet, please add them here:

20. Do you use any substances or drugs, for instance marijuana, cocaine, or MDMA?

21. If yes, please list the substance(s) and how frequently you use them per month

Dream Details

22. If a dream is defined as a long and bizarre story, an image that vanishes rapidly, or a feeling of having dreamt, on average, how many mornings per week over the last couple of months did you wake up with a dream in mind?

23. In general, how interested are you in your dreams, e.g. thinking about them, trying to understand them, discuss them with other people, or write about them?

24. What is your definition of a dream?

25. If you have to give your best guess, how many times do you wake up during the night?

Alcohol Use Questionnaire

The following questions relate to your alcohol use over the last 6 months. If you do not consume alcohol you still need to fill out the questionnaire.

26. Do you feel you are a normal drinker? ("normal" – drink as much or less than most other people)?

27. Have you ever awakened the morning after some drinking the night before and found that you could not remember a part of the evening?

28. Does any near relative or close friend ever worry or complain about your drinking?

29. Can you stop drinking without difficulty after one or two drinks?

30. Do you ever feel guilty about your drinking?

31. Have you ever attended a meeting of Alcoholics Anonymous (AA)?

32. Have you ever gotten into physical fights when drinking?

33. Has drinking ever created problems between you and a near relative or close friend?

34. Has any family member or close friend gone to anyone for help about your drinking?

35. Have you ever lost friends because of your drinking?

36. Have you ever gotten into trouble at work because of drinking?

37. Have you ever lost a job because of drinking?

38. Have you ever neglected your obligations, your family, or your work for two or more days in a row because you were drinking?

39. Do you drink before noon fairly often?

40. Have you ever been told you have liver trouble such as cirrhosis?

41. After heavy drinking have you ever had delirium tremens (D.T.'s), severe shaking, visual or auditory (hearing) hallucinations?

42. Have you ever gone to anyone for help about your drinking?

43. Have you ever been hospitalized because of drinking?

44. Has your drinking ever resulted in your being hospitalized in a psychiatric ward?

45. Have you ever gone to any doctor, social worker, clergyman or mental health clinic for help with any emotional problem in which drinking was part of the problem?

46. Have you been arrested more than once for driving under the influence of alcohol?

47. Have you ever been arrested, even for a few hours, because of other behaviour while drinking?

PSQI

INSTRUCTIONS The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

48. During the past month, what time have you usually gone to bed at night?

49. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?

50. During the past month, what time have you usually gotten up in the morning?

51. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)

For each of the remaining questions, check the one best response. Please answer ALL questions.

During the Past month, how often have you had trouble sleeping because you . . .

52. Cannot get to sleep within 30 minutes.

Not during the past month

Less than once a week

Once or twice a week

Three or more times a week

53. Wake up in the middle of the night or early morning

Not during the past month

Less than once a week

Once or twice a week

Three or more times a week

54. Have to get up to use the bathroom

Not during the past month

Less than once a week

Once or twice a week

Three or more times a week

55. Cannot breathe comfortably

Not during the past month

Less than once a week

Once or twice a week

Three or more times a week

56. Cough or snore loudly

Not during the past month

Less than once a week

Once or twice a week

Three or more times a week

57. Feel too cold

Not during the past month

Less than once a week

Once or twice a week

Three or more times a week

58. Feel too hot

Not during the past month

Less than once a week

Once or twice a week

Three or more times a week

59. Had bad dreams

Not during the past month

Less than once a week

Once or twice a week

Three or more times a week

60. Have pain

Not during the past month

Less than once a week

Once or twice a week

Three or more times a week

61. Other reason(s), please describe

62. How often during the past month have you had trouble sleeping because of the possible reason(s) asked about in the preceding question?

Not during the past month

Less than once a week

Once or twice a week

Three or more times a week

63. During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?

Not during the past month

Less than once a week

Once or twice a week

Three or more times a week

64. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

Not during the past month

Less than once a week

Once or twice a week

Three or more times a week

65. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

Not during the past month

Less than once a week

Once or twice a week

Three or more times a week

66. During the past month, how would you rate your sleep quality overall?

Very good

Fairly good

Fairly bad

Very bad

67. Do you have a bed partner or roommate?

No bed partner or roommate

Partner/roommate in other room

Partner in same room, but not same bed

Partner in same bed

BDI-II

Instructions: This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, then pick out the one statement in each group that best describes the way you have been feeling during the past two weeks, including today. Select the statement you have picked. If several statements in the group seem to apply equally well, select the highest number for that group. Be sure that you do not choose more than one statement for any group, including Item 16 (Changes in Sleeping Pattern) or Item 18 (Changes in Appetite).

68. Sadness.

0 I do not feel sad.

1 I feel sad much of the time.

2 I am sad all of the time.

3 I am so sad or unhappy that I can't stand it.

69. Pessimism.

0 I am not discouraged about my future.

1 I feel more discouraged about my future than I used to be.

2 I do not expect things to work out for me.

3 I feel my future is hopeless and will only get worse.

70. Past Failure.

0 I do not feel like a failure.

1 I have failed more than I should have.

2 As I look back, I see a lot of failures.

3 I feel I am a total failure as a person.

71. Loss of Pleasure.

0 I get as much pleasure as I ever did from the things I enjoy.

1 I don't enjoy things as much as I used to.

2 I get very little pleasure from the things I used to enjoy.

3 I can't get any pleasure from the things I used to enjoy.

72. Guilty Feelings.

0 I don't feel particularly guilty.

1 I feel guilty over many things I have done or should have done.

2 I feel quite guilty most of the time

3 I feel guilty all of the time

73. Punishment feelings.

0 I don't feel I am being punished.

1 I feel I may be punished.

2 I expect to be punished.

3 I feel I am being punished.

74. Self-Dislike.

0 I feel the same about myself as ever.

1 I have lost confidence in myself.

2 I am disappointed in myself.

3 I dislike myself.

75. Self-Criticalness.

0 I don't criticize or blame myself more than usual.

1 I am more critical of myself than I used to be.

2 I criticize myself for all of my faults.

3 I blame myself for everything bad that happens.

76. Suicidal Thoughts or Wishes.

0 I don't have any thoughts of killing myself.

1 I have thoughts of killing myself, but would not carry them out.

2 I would like to kill myself.

3 I would kill myself if I had the chance.

77. Crying. 0 I don't cry any more than I used to.

1 I cry more than I used to.

2 I cry over every little thing.

78. Agitation

0 I am no more restless or wound up than usual.

1 I feel more restless or wound up than usual.

2 I am so restless or agitated that it's hard to stay still.

3 I am so restless or agitated that I have to keep moving or doing something.

79. Loss of Interest.

0 I have not lost interest in other people or activities.

1 I am less interested in other people or things than before.

2 I have lost most of my interest in other people or things.

3 It's hard to get interested in anything.

80. Indecisiveness.

0 I make decisions about as well as ever.

1 I find it more difficult to make decisions than usual.

2 I have much greater difficulty in making decisions than I used to.

3 I have trouble making any decisions.

81. Worthlessness.

0 I do not feel I am worthless.

1 I don't consider myself as worthwhile and useful as I used to.

2 I feel more worthless as compared to other people

3 I feel utterly worthless

82. Loss of Energy.

0 I have as much energy as ever.

1 I have less energy than I used to have.

2 I don't have enough energy to do very much.

3 I don't have enough energy to do anything.

83. Changes in Sleeping Pattern

0 I have not experienced any change in my sleeping pattern.

1a I sleep somewhat more than usual.

1b I sleep somewhat less than usual.

2a I sleep a lot more than usual.

2b I sleep a lot less than usual.

3a I sleep most of the day.

3b I wake up 1-2 hours early and can't get back to sleep.

84. Irritability

0 I am no more irritable than usual.

1 I am more irritable than usual.

2 I am much more irritable than usual.

3 I am irritable all the time.

85. Changes in Appetite

0 I have not experienced any change in my appetite.

1a My appetite is somewhat less than usual.

1b My appetite is somewhat greater than usual.

2a My appetite is much less than before.

2b My appetite is much greater than usual.

3a I have no appetite at all.

3b I crave food all the time.

86. Concentration Difficulty.

0 I can concentrate as well as ever.

1 I can't concentrate as well as usual.

2 It's hard to keep my mind on anything for very long.

3 I find I can't concentrate on anything.

87. Tiredness or Fatigue.

0 I am no more tired or fatigued than usual.

1 I get more tired or fatigued more easily than usual.

2 I am too tired or fatigued to do a lot of the things I used to do.

3 I am too tired or fatigued to do most of the things I used to do.

88. Loss of Interest in Sex.

0 I have not noticed any recent change in my interest in sex.

1 I am less interested in sex than I used to be.

2 I am much less interested in sex now.

3 I have lost interest in sex completely.

Appendix D

Most Recent Recall Form

Age _____

Gender _____ **MOST RECENT DREAM**

Date Today _____

We would like you to write down the last dream you remember having, whether it was last night, last month, or last year. But first please tell us the date this dream occurred: _____. Then tell us what time of day you think you recalled it: _____. Then tell us where you were when you recalled it: _____.

Please describe the dream exactly and as fully as you remember it. Your report should contain, whenever possible: a description of the setting of the dream, whether it was familiar to you or not; a description of the people, their age, sex, and relationship to you; and any animals that appeared in the dream. If possible, describe your feelings during the dream and whether it was pleasant or unpleasant. Be sure to tell exactly what happened during the dream to you and the other characters. Continue your report on the other side and on additional sheets if necessary.

Appendix E

Information Sheet

PARTICIPATION IN UNIVERSITY OF CAPE TOWN RESEARCH STUDY INFORMATION SHEET

Name of Participant: _____

Name of principal researcher: Mariza van Wyk

Department/research group address: Psychology Department, Faculty of Humanities, University of Cape Town

Contact number: 0835658190 (Mariza van Wyk)

Email: mariza.v.w@gmail.com

Dear Participant

You are invited to take part in a research study conducted by the Psychology Department at the University of Cape Town. This study is interested in looking at the relationship between dreaming, memory and emotion regulation. Please note that you participation is completely voluntary and that you may withdraw from the study at any time without any negative consequences for yourself. Any information collected will only be used for research purposes.

What's involved?

Sleep study

For the sleep study, you will be asked to come to the UCT Sleep Sciences laboratory on two non-consecutive nights (this will be scheduled at your convenience). In preparation for this, you will be asked to not sleep at all during the day on the days that you will be coming to the sleep lab. You will also be asked to not drink any caffeine containing drinks (e.g. coffee) or alcohol on the days that you come to the sleep lab. Furthermore, we would like for you to avoid sugary foods and excessive exercise on the day. For the first night we will ask you to come to the sleep lab approximately an hour before your usual bedtime, and approximately 2 hours before your usual bedtime on the second night. Please eat at home before arriving as supper will not be provided for you.

At the sleep lab, you will be given your own private room to sleep in. There are bathroom facilities in the sleep laboratory and you will be given an opportunity to change into your sleeping clothes (please bring these with you). A researcher will then hook you up to a polysomnograph machine. This is a machine that records various aspects of sleep. It consists of a box (which will be placed on your bedside table) that has leads attached to it. Some of these leads are attached to an electrode that will be attached to you with a medically

approved paste. The leads will be placed on your scalp, and on certain places on your face in order to measure brain and muscle activity, as well as eye movements. The electrodes will be removed the following morning by dissolving the paste in water for easy removal.

The remaining leads will be attached to medically approved sticker electrodes. The sticker electrodes will be placed on certain places on your face and also on your chest area. These electrodes will measure muscle activity, eye movements and your heart rate.

Once the leads have been attached, you will be asked to lie down in the bed. The technician will turn the machine on and test whether everything is working correctly. We will then turn off the lights and ask you to sleep as you would normally at home. You will be left alone in your own room, but the researcher will be just outside the room monitoring your brainwaves on a computer. While we will be able to hear you if you call out something, you will also be given access to an intercom if you need anything during the night. If you need to go to the bathroom during the night, we will simply unplug the machine and then plug in back in when you return.

Memory Testing

On the second night that you come to the sleep laboratory, we will ask you to complete three memory tasks. Two of the tasks are done verbally, and the third is a computer-based task called an emotional memory task. In this task you will be shown a series of positive, neutral and negative images. Please note that some people might find some of the negative images offensive. If you think this might be a problem for you, please inform the researcher, you are under no obligation to participate in the study. Completing these tasks will take approximately 30 minutes. You will complete similar tasks the following morning.

What information will we be using?

All the information that we collect from you during the two screening phases, during memory testing, as well as the data from the sleep testing nights will only be used for research purposes. It will be used as part of the principal researcher's PhD thesis and will also be used in future research publications. Complete confidentially will be maintained at all times, i.e. your information will be used, but your name will not appear on anything and all identifying information will be left out. Personal information will be kept completely private and stored on password-protected computers and locked filing cabinets.

Are there any risks?

There are no major risks associated with this study. However, through the years in very rare instances people have had a reversible skin reaction to some of the equipment. Please let us know in advance if you have sensitive skin or any medical condition that you

think could be affected by the study procedure. The researcher will be there for every step of the study, and should you feel uncomfortable at any time you may ask the researcher any questions and you may withdraw from the study at any time without any negative consequences for yourself.

Are there any benefits?

There are no direct benefits for participating in this study as this study is for research purposes only. However, if any sleep disorder is detected in the sleep laboratory, this information will be given to your doctor.

Is there any payment?

As you will be giving up a lot of your time, you will be paid for the nights that you spend in the sleep laboratory. For each night in the sleep laboratory, you will receive R150. Thus, if you complete the full two nights in the sleep laboratory, you will be paid R300 upon completion of the second night.

Appendix F

PARTICIPATION IN UNIVERSITY OF CAPE TOWN RESEARCH STUDY CONSENT FORM

Name of principal researcher: Mariza van Wyk

Department/research group address: Psychology Department, Faculty of Humanities, University of Cape Town

Contact number: 0835658190 (Mariza van Wyk)

Email: mariza.v.w@gmail.com

I, _____, confirm that I have read and agree to all the information in the information sheet provided for me and that I agree to take part in this study. I hereby also confirm that I have supplied the researcher with all relevant medical information, or any information that would be important for the purposes of this study.

I hereby give permission for the researcher to use the information collected in the screening phases and the sleep study for research purposes. I acknowledge that all this information will used for research purposes, will be kept for future research purposes, may be used in future research publications, and will only be used if my name and all identifying information is omitted.

I agree to a monetary compensation of R150 for every night that I spend in the sleep laboratory that will be paid to me upon completion of the second night.

I am aware that my participation is completely voluntary and that I may withdraw from this study at any stage without any negative consequences for myself.

Name of Participant: _____

Signature of Participant: _____

Date: _____

Name of Researcher: _____

Signature of Researcher: _____

Date: _____

Appendix G

Ethical Approval Documents

DEPARTMENT OF PSYCHOLOGY

REPORT OF THESIS COMMITTEE

Student Name: Mariza van Wyk

Student #:

Degree: PhD

Title (as proposed): The role of dreaming in memory processes and emotion regulation during sleep

Supervisor: Prof Mark Solms

Co-supervisor:

Committee members: DR F. BOONZAIER
DR L. SCHRIEFF
DR S. MALCOLM-SMITH
DR P. NJAMBORO

WE:

1. Approve the proposal, and recommend that the student continue with the research.

(2.) Approve the proposal, and recommend that the student may continue with the research. However, we recommend that change(s), as noted below, be incorporated in the research, to the satisfaction of the supervisor.

3. Approve the proposal in terms of its ethical implications. If necessary, explanatory notes appear below.

4. Find the proposal unsatisfactory, for the reason(s) listed below. The student is hereby requested to re-present the proposal to a departmental thesis committee by _____.

NOTES:

- Rethink framing of the study re: questions
- Make hypotheses more explicit
- State explicitly that a lack of proficiency in English would be an exclusion criterion
- Consent forms to be translated into home language of participants (state this in your proposal).

UNIVERSITY OF CAPE TOWN

DC: HUM /

FACULTY OF HUMANITIES

PROPOSAL APPROVAL FORM

DOCTORATE (A research proposal must accompany this form)	RESEARCH MASTERS (A research proposal must accompany this form)	C/W MASTERS

SECTION A: (To be completed by candidate)
Please complete this form and return it to the Faculty Office once you have obtained the signatures of the supervisor(s) and Head of Department.

Surname	van Wyk				**First Name(s)**	Mariza
Title	**Mr.**	**Ms.**	**Mrs.**	**Miss**	**Student No**	VWYMAR015
Address	6 Hillside road, Tamboerskloof, Cape Town					
Telephone(Home					**Work/Cell**	0835658190

Note: Your UCT Email address is the default email address for all official communication – make sure that you access it regularly.

Department	Psychology
Title of Dissertation:	The Role of Dreaming in Memory Processes and Emotion Regulation during Sleep

Qualifications held			
Degree/Diploma	**Major(s) &) Subjects**	**Month/Year awarded**	**University**
BA Humanities	Psychology, Afrikaans	2009, December	Stellenbosch University
Psychology Honours	Neuropsychology	2010, December	UCT
MA in Psychological Research	Neuropsychology	2013, June	UCT

Signature of candidate: Mark **Date:** 24/04/14

SECTION B:

	Name	Signature	Date
Supervisor	Prof M. Solms		25/4/2014
Co-supervisor (if applicable)			
HOD	Prof. M. Solms		25/4/2014
Deputy-Dean: Research			
Ethics approval obtained where applicable	on behalf of Departmental Ethics Committee		24/4/2014