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**A Comparison of Solutions Generated in Incubated Dreams
to Solutions Generated in Waking Thought**

by

Clinton J.G. Marquardt, B.A.

**A thesis submitted to the Faculty of Graduate Studies and Research in partial
fulfillment of the requirements for the degree of Master of Arts.**

Department of Psychology

**Carleton University
Ottawa, Ontario
September 30, 1996**

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A Comparison of Solutions Generated in Incubated Dreams
to Solutions Generated in Waking Thought

submitted by Clinton J.G. Marquardt, B.A.

in partial fulfillment of the requirements for the degree of Master of Arts

Chair

Psychology

Thesis Supervisor

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September 30, 1996

Abstract

Previous research has suggested that dreams can be used to solve problems. The present experiment was conducted to test the following: (1) whether problem solving occurs in dreams; (2) the effectiveness of a dream incubation procedure on the frequency of dream problem solving; and (3) to compare the quality of dream-generated solutions to the quality of solutions generated during waking thought. Eighty Carleton University undergraduates (51 women, 29 men; mean age = 21 years, SD = 4.4) volunteered to participate in this study. All participants reported a dream recall frequency of three or more dreams per week. The participants were asked to select a problem of personal relevance with recognizable solutions. For a period of one week, participants were required to describe thoughts about their chosen problems and to complete a brief questionnaire before going to bed each night. The questionnaire assessed the quality of any solutions generated during wakefulness. The experimental group performed a 15 minute dream incubation procedure after completion of the questionnaire and then went to sleep. The control group simply went to sleep after the questionnaire was completed. Both groups recorded their dreams following nighttime awakenings and/or after morning wake-up and completed a questionnaire assessing the quality of any solutions generated during dreaming. The results demonstrate that problem solving occurs in dreams and that the frequency of dreams incorporating the desired content (dreams on topic) can be increased by a dream incubation procedure. Increasing the dreams on topic, leads to qualitatively better dream-generated solutions. However, thought-generated solution quality ratings are higher than dream-generated solution quality ratings. Inspection of the raw scores demonstrates that dreams provide the best qualitative solution 12% of the time. The implications of employing dreams as problem solving tools are discussed.

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Dreams and Problem Solving

Throughout popular history there have been many examples of important creations made by dreamers. Samuel Taylor Coleridge's *Kubla Kahn* poem, Giuseppe Tartini's *Devil's Sonata* violin piece, Friedrich Kekule's benzene ring and Otto Loewi's chemical nerve impulse theory were supposedly discovered through the help of dreams. Although such anecdotes are inspiring they are not well documented. Whether or not dreams can provide solutions to problems requires empirical study. If dreams do aid in problem solving, the utility of the dream-generated solutions should be evaluated. In determining the utility of the dream-generated solutions one must compare them to the quality of waking solutions. Numerous characteristics may be employed to evaluate solution quality. Five important characteristics to consider are (1) the completeness of the solution. If a solution is incomplete one must continue to search for the rest of the solution. (2) Whether or not the solution is employable is also important. If one cannot put the solution into practical use, then further problem solving is necessary. (3) The novelty of a solution must also be considered. If the solution lacks novelty it may simply be an old solution rehashed and may not provide any additional benefit. (4) Personal satisfaction with the solution should also be measured. A solution may appear satisfactory to others yet not be acceptable to the person with the problem. (5) It is also necessary to evaluate the clarity or specificity of the solution. Ambiguous solutions require extra deciphering and inferences, whereas straightforward solutions present specific actions to be taken. These questions constitute the essence of the present study. However, before looking into

whether or not dreams can help to solve problems with better solutions than waking thought, a brief review of the dream problem solving literature is required.

A body of dream research details the use of dreams for practical purposes. Some contributors to this literature have focused on dreams and their problem solving capacity. A problem may be defined in the terms of Duncker (1945, p.1) as a situation in which "a living organism has a goal but does not know how this goal is to be reached." Dreams have been employed to solve such problems. Three types of dreams have been used to study the conscious problem solving phenomenon (1) lucid dreaming, (2) creative dreaming and (3) hypnotic dreaming.

Problem solving also occurs spontaneously in dreams. In spontaneous problem solving the person may be attempting to solve a problem while awake to no avail. Surprisingly, the solution appears to the person later in a dream. The existence of spontaneous dream problem solving has been debated and studied over the years. Dreams may also spontaneously provide some amount of adaptation to stressors presented during waking consciousness.

Conscious Problem Solving In Dreams

Lucid Dreaming

The term *lucid dream* was first introduced by van Eeden in 1913. A dreamer experiencing a lucid dream knows that he or she is dreaming, is self-reflective and has varying levels of control in manipulating events in the dream. Lucid dreams spontaneously occur in about 1.25% of all dreams (Purcell, Mullington, Moffit,

Hoffmann & Pigeau, 1986). Over the years, techniques have been developed to increase the frequency of lucid dreams. These techniques can be divided into two categories, cognitive and behavioural.

The cognitive techniques increase the frequency of lucid dreams by making changes in the thought processes of the dreamer. These changes require the participant to develop the intention to lucid dream and to consciously motivate him or herself to have a lucid dream. Increasing the intention and motivation of the dreamer has been shown to increase the likelihood of a lucid dream (LaBerge, 1980).

In the Purcell et al. (1986) study, only one of the cognitive techniques was able to significantly increase the frequency of lucid dreams. Post-hypnotic suggestion and increased attentional control did not significantly increase lucid dream frequency beyond the baseline frequency. The one effective cognitive technique was Rossi training; participants attended weekly meetings where the theory of Rossi's process dimension was discussed. The Rossi process dimension is a scale of dream self-reflectiveness (Rossi, 1972). With each step in the scale, the dreamer is more self-reflective until at the highest level the dreamer is fully lucid. This training developed the intention to advance self-ratings on the self-reflectiveness scale. Purcell et al. reported that the dream reports of these participants showed an increase in lucid dream frequency to about nine percent.

While Purcell et al. (1986) found their post-hypnotic technique ineffective, LaBerge (1980) found an auto-suggestion technique to be useful. The advantage of the auto-suggestion technique is that the dreamer can perform it immediately prior to

falling asleep in his/her home, as opposed to being in the lab or having to wait an extended period of time between the suggestion and sleep. LaBerge was able to increase his own lucid dream frequency to about 5.4 lucid dreams per month using the auto-suggestion technique. Two factors contribute to the disparate results of Purcell et al. and LaBerge. First, the Purcell et al. hypnotic treatment was performed in the lab and dreams were collected at home with an intervening time period between the treatment and bedtime. Competing thoughts occurring during this interval could have diminished the impact of the hypnotic suggestion; however, the lack of lucid dreams for this group was most likely because the participants were not informed of the purpose of the hypnotic suggestion. Indeed Purcell et al. state that only one participant had inferred the intention of the treatment. LaBerge was able to use the auto-suggestion technique moments before going to bed, thus avoiding competing thoughts; and since he performed the technique on himself, he knew the intention was to have a lucid dream. These advantages resulted in the increased frequency of lucid dreams. Unfortunately, the fact that LaBerge was his own subject limits the generalizability of the findings.

Behavioural techniques may also be used to increase the frequency of lucid dreams. With these techniques a conditioning process brings upon the experience of lucidity. While awake the person learns a stimulus-response pattern that is intended to continue during dreaming. The behavioural techniques are probably the most effective way to increase the frequency of lucid dreams.

The leather bracelet mnemonic technique of Purcell et al. (1986) was one

particularly effective behavioural technique. These researchers had their participants wear a comfortable leather bracelet for a period of three weeks. When the participants noticed the bracelet, they were to follow instructions that required them to question their present state of consciousness, "awake or dreaming?" If the person determined that he/she was awake, the next step was to concentrate on the intention to become lucid that night. Of course, if the dreamer determined that he/she was dreaming then the mnemonic technique served its function, since he/she was now lucid. In this treatment group, participants were also required to attend weekly group meetings to discuss recognition of the dream state and experimentation with dream control. Dreamers increased the frequency of lucid dreams to about 29%.

A second effective mnemonic technique is the Mnemonic Induction of Lucid Dreams (M.I.L.D.) technique of LaBerge (1980). LaBerge states that this technique should be practiced during spontaneous early morning awakenings. Dement and Kleitman (1957) have shown that stage REM of the sleep cycle is associated with increased dream recall frequency and it is also known that REM duration increases in association with time spent asleep (see Anch, Browman, Mitler & Walsh, 1988, p.42). These findings make awakening from a dream very likely during the morning hours. If a dream is recalled at this awakening point it should be mentally rehearsed to avoid amnesia. If a dream is not recalled, the dreamer should (1) try to remember a dream from earlier that night or (2) try to remember a dream from a previous night or (3) imagine a fabricated dream experience and mentally rehearse either one of the three. The subject then engages him/herself in an activity requiring full wakefulness

such as reading for 10-15 minutes. Next the subject attempts to return to sleep. During sleep onset the subject repeats the following phrase to him or herself "Next time I'm dreaming I want to remember I'm dreaming." The subject then visualizes his/her body lying in bed with his or her eyes moving rapidly to indicate REM and a greater chance of dreaming. The subject must also visualize being in the rehearsed dream and realizing that it is a dream. The phrase and the visualization should be repeated until the intention to lucid dream becomes firmly established. LaBerge was able to increase his lucid dream frequency to 21.5 lucid dreams per month. Assuming an elevated level of 60 dreams recalled per month (approximately two per day), this method yielded 36% lucid dreams overall.

Lucid dreaming offers varying levels of control, but as Garfield (1974, p.144-145) discusses, absolute control is a distinct possibility. With this degree of control the dreamer is able to manipulate a problem in any manner they choose. They may desire to preplan the manipulation or allow their dream mind poetic license and observe the outcome. Even without absolute dream control, dreams may be able to help solve problems. A simple dream incorporation of desired content, without control of the outcome, may be all that is needed to start focusing the dream on a current problem. Hearne (1982) had participants attempt to perform preset tasks in their lucid dreams. One group ($n = 70$) of lucid dreamers was asked to attempt to operate a light switch in their dreams. A second group ($n = 35$) was asked to attempt to operate any type of electrical appliance, and a third group ($n = 35$) was simply asked to attempt to close and open their eyes once. Of the 16 participants who

reported lucid dreams in the first group, 13 incorporated some facet of attempting to operate a light switch in their lucid dreams. Nine of the 35 dreamers of the second group experienced lucid dreams and were able to incorporate operating an electrical appliance of some sort. Six of the 35 dreamers of the third group experienced lucid dreams and were able to close and open their eyes in their dreams. These results were based on self-reported dream experiences.

In short, it may be rather easy to introduce the desired subject matter into a lucid dream. Hearne's results must be accepted with caution as the original subject pool was 70 people. It is unclear how many participants did actually report dreams, lucid and non-lucid. It is unclear if the nine and six people in the second and third groups were the same participants who were able to perform the first task. The maximum number of participants who could have reported at least one of the desired tasks is 28 ($13+9+6$). Hearne makes no mention of any attrition. Simply incorporating desired material into a lucid dream may be easy; 28 of the 31 ($16 + 9 + 6$) lucid dreamers were able to incorporate a preset task into their lucid dreams. However, if the participants in the second and third groups were also some of the successful task reporters from group one, then the minimum number of participants who could have reported one or more of the desired tasks is 15 (13 of the $9 + 6$ participants were the same). This result (48%) is not as encouraging as the first scenario (90%).

A review of the literature indicates that lucid dreaming is observed, albeit infrequently. The degree of self-reflectiveness and control available to lucid dreamers

varies from dreamer to dreamer and from experiment to experiment. With the use of a behavioural mnemonic technique it seems possible for the dreamer to use lucid dreaming to solve problems. For the dreamer with little control over the activities in his or her dreams, simply incorporating the problem into the dream content may be all that is possible. Without further practice, this person must be content to allow the dream surrounding the problem to unfold spontaneously. Dreamers with higher degrees of control available to them may be able to consciously examine the problem from all angles and manipulate distinct aspects of it and perhaps even develop novel solutions in their dreams.

Creative Dreaming

The second problem solving mode in the conscious problem solving category has been called, amongst other things, creative dreaming (Garfield, 1974) and dream incubation (Barrett, 1993; Reed, 1976). In contrast to lucid dreaming, creative dreaming does not require a high degree of self-reflectiveness or control. In this mode the dreamer is conscious of the problem while awake and develops the intention to experience a dream that provides some form of a solution. The studies in this area employ assorted methods of incubation and attempt to solve a wide range of problems; hence, the results are quite varied.

The incubated dreams in Reed (1976) were about personal problems and the participants were selected on the basis of previous recall of dreams portraying their personal problems. The first step of the incubation procedure was to have the

participants immerse themselves in the personal dilemma through symbolic drawings and contemplating the problem. The next step was "purification" during which participants refrained from performing a self-elected negative behaviour for 24 hours. The third and last step was essentially a long and detailed counselling session lasting about two hours which ended with a presleep reverie induced by Reed himself. Participants were then allowed to sleep and experience the desired dream. Upon the dreamer's awakening, Reed returned to listen to the dream and to help the dreamer begin to interpret the dream. Reed, supported by participants' testimonials, feels that most of the dreamers benefitted from the experience and that the dreams helped to positively and gradually change the participants' lives.

Three shortcomings existed within this research. First, all participants had previously experienced dreams involving their current problematic issues. It is quite possible that Reed's procedures did not have an effect on the reported dreams, since no increase in the frequency of dreams incorporating the problematic material was demonstrated. Second, dreamers' reports of positive life changes may be attributed to experimental demand characteristics. Third, although many positive benefits from the dreams are mentioned, the lack of quantitative data renders the study anecdotal.

Garfield's (1974) more extensive, yet still anecdotal, discussion of creative dreaming displays a multitude of techniques designed to help people integrate dreams into their lives. Through the practice of these methods the dreamer becomes more self-aware in his/her dreams and can develop the power to use the dreams for whatever purpose he/she chooses, including problem solving. Garfield postulates that

the dreamer must first allow dreams to become important facets of his/her life. The dreamer must then immerse him/herself in the subject matter that is to be dreamed about by experiencing waking activities relevant to the subject. A dream intention must then be formed, outlining the specific dream to be incubated. During the advanced stages, the dreamer must remember the intended dream and then become conscious of the dream state. Although Garfield does not offer any convincing empirical evidence of the effectiveness of her approach, she supplies a number of inspiring anecdotes supporting her claims.

Griffin and Foulkes (1977) profess to have investigated Garfield's (1974) techniques twice (Foulkes & Griffin, 1976; Griffin & Foulkes, 1977). Both experiments are offered as evidence against Garfield's (1974) affirmations. However, these researchers employed only one of Garfield's techniques. The only mention of an attempt to induce specified dreams in their experiments was through suggesting to the dreamer that he/she attempt to dream about the targeted content which may or may not have been personally relevant. Judges were unable to identify the target suggestions in the dream content. Garfield's techniques are meant to be used holistically, as explained in her book, and not as separate methods. Griffin and Foulkes present their data as a demonstration of the difficulty in attaining dream control, not as a disconfirmation of Garfield's work. Even Garfield feels that dream control is not an easy task. She cites research (p.207) which demonstrates that the development of dream control may take up to six months (Wile, 1934). Since Griffin and Foulkes (1977) did not adequately test Garfield's methods and they too found it

difficult to obtain dream control, they are essentially in agreement with Garfield, contrary to their stated position.

Dement (1972) states that the scientific investigation of problem solving in dreams began as early as 1892 when Charles M. Child found that 33.3% of questionnaire respondents had experienced some form of problem solving in their dreams. Dement found a somewhat lower figure. Only 87 problem solving dreams occurred in 1,148 attempts. The investigation methods of this research may have contributed to the low frequency. First, unlike Reed (1976) and Garfield (1974), Dement chose to have dreamers attempt to solve problems that were not personally relevant. Thus, dreamers may have had little motivation to solve the problems. The problems were brain-teasers. For example, problem one was:

"The letters O,T,T,F,F... form the beginning of an infinite sequence. Find a simple rule for determining any or all successive letters. According to your rule what would be the next two letters of the sequence?"

The solution was:

"The next two letters in the sequence are S,S. The letters represent the first letters used in spelling out the numerical sequence, "One, Two, Three, Four, Five, Six, Seven, etc." " (Dement, 1972; p.99)

In addition to limited self-motivation, a relatively brief incubation procedure may have also contributed to the low frequency of problem solving dreams. The participants were allowed only 15 minutes prior to sleep to study the assigned problem. If, upon awakening, the problem had not been solved the participants were instructed to study the problem for another 15 minutes. The time allotted to study the problem before sleep was probably restricted in order to decrease the probability of

solving the problem before sleeping. In comparison to Reed's (1976) and Garfield's (1974) incubation procedures, Dement's procedure (1972) was less involved. The incubation procedure, coupled with the utilization of impersonal problems, may have inhibited any real amount of problem solving in the dreams of these participants. Dement acknowledged these liabilities and realized the differences between his work and the spontaneous problem solving in the dreams of people who have been working on problems of personal relevance for extended periods.

In contrast to Dement (1972), Barrett (1993) instructed participants to choose personally relevant problems with recognizable solutions. The incubation instructions of Dement (1972; see above) were employed to produce the desired dreams. As well as following these instructions, participants were asked to record their problems on paper and to attend a lecture on dreams and problem solving. Participants recorded all dreams for one week or stopped after they experienced a dream which they felt solved their problem. Nearly half of the 76 (49%) participants reported dreams which they felt portrayed some aspect of the chosen problem. Thirty-four percent of all participants felt that their dreams offered some form of a solution to their problem. Forty-eight percent of the participants ($n = 64$) who chose personal problems experienced dreams on topic; 36% of the participants felt that they experienced satisfactory dream-generated solutions to their personal problems. Sixty-three percent of the participants ($n = 8$) who chose objective problems experienced dreams on topic; 38% of the participants felt that they experienced satisfactory dream-generated solutions to their objective problems. While 25% of participants ($n = 4$) who chose

academic problems experienced dreams about their problems, none experienced dream-generated solutions.

The judges' ratings reflected the same trends as the above participant ratings. According to the judges, 51% of all participants experienced dreams on topic and 25% of all participants experienced solution-containing dreams. Fifty percent of the participants who chose personal problems were rated as having experienced dreams on topic; 28% were rated as having experienced solution-containing dreams. Fifty percent of the participants who chose objective problems were rated as having experienced dreams on topic; 38% were rated as having experienced solution-containing dreams. None of the 50% of participants who were rated as having experienced dreams on the topic of academic problems were rated as having experienced solution-containing dreams.

Some researchers believe that dreams may be beneficial tools for problem solving (Barrett, 1993; Garfield 1974; Dave, 1979). Two factors seem to play important roles in the dream problem solving process, the incubation procedure and the type of problem. It is unclear which factor plays a larger role or if both factors are necessary. For instance, Reed (1976) and Garfield (1974) both used extensive incubation procedures and problems of personal relevance with success. In contrast, Dement's (1972) choice of problem was impersonal and the incubation procedure was limited, resulting in little success. The results of this experiment were not very promising. Barrett (1993) used the same incubation procedure as Dement and allowed participants to attempt to solve personally relevant problems. This

experiment was successful. The three out of four successful experiments mentioned above employed personally relevant problems with different incubation procedures. Therefore, it seems that the type of problem is more important than the incubation procedure. However, Schatzman (1983) reports positive results in solving similar problems to Dement, without any controlled incubation procedure. In this experiment, Schatzman simply asked participants to attempt to solve brain-teaser problems in their dreams. No incubation procedure was prescribed, participants were recruited through a magazine article and results were mailed to the researcher. It is conceivable that the dreamers performed some sort of incubation procedure and or somehow made the problem personally relevant, further confusing the issue. The number and biographical data of subjects who participated is unknown and Schatzman's report does not discuss the number of people who may have tried to dream about the target material and failed; hence, the overall results are tentative at best.

Dreams seem to be able to help in the conscious problem solving process. Whether or not dreams improve on the solutions discovered while awake remains to be adequately studied.

Hypnotic Dreaming

In the clinical literature, there are many examples of hypnosis being used to induce specific hypnotic dream content (for example, Eichelman, 1985). The patients are usually instructed to dream about aspects of their therapy. Eichelman (1985)

demonstrated that the stressful recurring dreams of combat veterans could be manipulated during hypnosis in order to change their disturbing content. These diurnal hypnotic dreams were rehearsed frequently and eventually replaced the stressful nocturnal dreams. The small sample sizes employed in the clinical literature effectively limit the generalizability of these claims.

Similar attempts to induce specific hypnotic dreams can be found in the empirical literature. Experimental attempts are lower in number than the clinical studies. However, they are methodologically more sound and their conclusions more generalizable. Two studies in particular have shown that the content of hypnotic dreams can be manipulated. In the first study, Sheehan and Dolby (1979) gave participants the suggestion to dream about hypnosis. In this experiment, more participants in the hypnotic dream treatment group than the task-motivated group experienced dreams incorporating the suggested element.

In the second study, Dave (1979) selected participants who were suffering from academic, vocational, avocational or personal creative impasses. For example, one participant's creative impasse was the inability to satisfactorily complete a poem. Dave instructed his participants to dream about their problems or projects while hypnotized and while asleep at home during the nights which followed. Significantly more people were able to overcome their creative blocks within a one week period in the hypnotic treatment in comparison to the rational-cognitive treatment group which stressed a linguistic and logical approach to creative problem solving.

In spite of the promising results, it is unclear whether the participants

experienced dream-like imagery while hypnotized or nocturnal dreams displaying content related to the solutions, or if in fact the solutions were discovered during wakefulness following the dreams, as Blagrove (1992) suggests. Although less objectively interesting, the participants' impressions must not be overlooked. Sixty-seven percent of the participants attributed the resolutions of their difficulties to the effect of their hypnotic dreams or the compound influence of the hypnotic dream and the induced nocturnal dream.

Nocturnal dreams can be directly influenced through hypnosis. Barber, Walker and Hahn (1973) demonstrated that a hypnotic induction followed by a suggestion to dream nocturnally about the assassination of President Kennedy increased the number of nocturnal dreams about this specific subject matter. Similar results were obtained by O'Brien, Cooley, Ciotti and Henninger (1981). In this study, hypnotically induced nocturnal dreams were used to desensitize nine participants to snakes. All but one of the participants reported experiencing at least one of the suggested dreams that were designed to decrease their phobic responses. Seven of the nine treatment group participants were able to touch a real snake after their dreams in comparison to only four of the nine control group participants who were treated by a desensitization process alone. Interestingly, one of the two participants unable to touch a real snake experienced a negative nocturnal dream involving a snake, while the dream content of the other participant did not contain a snake. This seems to point to the dream component, not the hypnosis component, as having the main effect on the phobic response.

Although these results seem convincing, the treatment effect could have been due to an extraneous variable which does not appear to have been controlled. The hypnotic susceptibility levels were different between the treatment group and the control group. The treatment group was comprised of high hypnotizable, 8 or above on the Stanford Hypnotic Susceptibility Scale (SHSS, Form A), while the susceptibility of the controls was not assessed. These participants were chosen on the sole basis of displaying snake phobic responses. Despite methodological limitation, this experiment shows that the content of hypnotic dreams and nocturnal dreams is directly manageable. Problems, perhaps even non-personally relevant ones, can be incorporated into dream content, thus allowing the dreamer to contemplate the problem and its possible solutions.

The use of hypnosis to influence nocturnal dream content may be seen as a form of dream incubation. There have been no studies attempting to examine the similarities and dissimilarities between the effects on problem solving of hypnotically influenced nocturnal dreaming and the lucid dreaming and creative dreaming approaches addressed above. Since all methods utilize the processes of nocturnal dreaming, the effects would, in all probability, be synonymous. However, there would most likely be differences between these three methods and the hypnotic dream imagery method. The dissimilarities would stem from the qualitative differences of hypnotic dream imagery and nocturnal dreams. These differences may be attributable to hypnotic susceptibility. Barrett (1979) found that people who were highly hypnotizable experienced hypnotic dream imagery that was very similar to their

nocturnal dreams. This may lead to experiencing hypnotic dream-like imagery that is more similar to nocturnal dreams. Researchers have also shown that diurnal hypnotic dreams are more like the waking fantasies occurring in daydreams (Spanos, Nightengale, Radtke & Stam, 1980). If large differences do exist between the nocturnal problem solving approaches (lucid dreaming, creative dreaming and hypnotically influenced nocturnal dreaming) and the diurnal hypnotic dream problem solving approach, they may only exist for low hypnotizable individuals.

The use of diurnal hypnotic dreams and hypnotically influenced nocturnal dreams for problem solving are important venues to consider. They may provide the chance to ponder obstacles and potential solutions.

Spontaneous Problem Solving In Dreams

Serendipity

In consciously employing dreams to facilitate problem solving, the dreamers were prepared in some way to have solution yielding dreams. In spontaneous problem solving the dreamer does not have the conscious intention to dream of a solution. The dreamer awakens in an "Ah ha!" fashion and feels that a solution has miraculously appeared in his or her dream. Famous creations have allegedly come from dreams such as the aforementioned Samuel Taylor Coleridge's *Kubla Kahn* poem, the *Devil's Sonata* violin piece by Giuseppe Tartini, Kekule's molecular structure of benzene and Otto Loewi's theory of the chemical nerve impulse.

Blagrove (1992) has debated the existence of problem solving in all types of

dreams. He argued that all dreams which purportedly demonstrate problem solving may be considered to be simply reflecting processes which have previously occurred while the dreamer was awake. According to Blagrove, dream problem solving theories are unfalsifiable,

"...the dream problem-solving paradigm, which aims to link dreams with waking life in some causal way, may similarly produce interpretations which are unfalsifiable, in that some such link can often be found or invented, hence making it difficult to find evidence that would count against the theory." (1992, p.217).

This is quite true. However, Blagrove's alternative, "...that dreams are like a linguistic translation of waking concerns and *known solutions* [emphasis added]..." (1992, p.205) is equally unfalsifiable in that a link between the waking concern and the dream can also often be found or invented. Blagrove does not discuss how the person remains unaware of the *known solution* until the dream acts as a catalyst, after which the person becomes aware of the solution.

Blagrove also argues that "dreams may well be depicting attempts in the day to master a situation but in so doing they are not actually themselves "attempts to master" (1992, p.211). It is assumed that Blagrove feels that since the dreamer may not be consciously employing the dream to problem solve while it is happening, the dream is not an attempt at problem solving; it is simply a repetition of a previous attempt. Rumination is in itself a method of problem solving; by constantly working with the problem and potential solutions, people are attempting to solve problems. Why would rumination while awake be problem solving, and not while dreaming?

Blagrove also considers the fact that many solutions are worked out while

awake, after the dream, to be an obstacle for dream problem solving theory. He offers an example of Schatzman's (1983) where a solution is found after the participant refers to a previous dream; here dream problem solving is discounted,

"So not only is the solution worked out when awake, it is not clear that the dream provides the stimuli for this solution, the subject seems to just notice a similarity between the method of solution and the dream." (1992, p.217.).

All dream-generated solutions must be consolidated in the awake state. In this sense, the final tuning of the solution occurs while awake, one cannot remain in the dream state and expect to exercise the solution for a problem that exists in waking life. The fact remains that if a person feels that a solution came to them in a dream then it did. People's conception of the world and how they see themselves in it creates their own reality.

Dreams offer an extra resource and, as Blagrove says, "...it is the process of examination, and not the dream, that provides the solutions." (1992, p.218).

Therefore, if the examination of the problem occurs during a dream, then the utility of dreams should not be excluded from the problem solving arena.

The Adaptation Hypothesis

According to the adaptation hypothesis, dreams aid the dreamer in resolving stress inducing issues in his/her life. These issues need not be strictly emotional. However, the hypothesis does assume that dreams work on an affective level. The emotions associated with the stressor (problem) become the problem for the dream to work on. The dream is an attempt to reduce the stressful affect. The dreamer may

or may not be aware of these current concerns, the problem, or the dream's adaptive actions that is, the solution. Therefore, the adaptive process may also be considered spontaneous problem solving. Such a copious amount of literature exists concerning the function of dreams, in particular, the adaptive function of dreams, that a comprehensive discussion of it is outside the scope of the present text. Instead, a brief overview of the adaptive function of dreams will be presented.

Two opposing views of the adaptation hypothesis have surfaced over the years. Proponents of the mastery hypothesis support the notion of dreams acting to integrate new stress inducing problems with solutions of similar previous problems (Breger, 1967; Klein, 1967; Pearlman, 1970). In effect, adaptation is facilitated by recall within the dream of a similar situation followed by the activation of the previously employed solution upon waking.

The opposing view is that of the compensatory/avoidance hypothesis (De Koninck & Koulack, 1975; Koulack, Prevost & De Koninck, 1985). According to this approach the dream provides an opportunity to avoid the current concern. Consequently, the dream content favors the routine and less stressful components of the dreamer's life.

At the moment, the general function of dreams remains an unresolved issue. The adaptation hypothesis of dream function seems plausible, while the mechanisms of this function need clarification.

Approaches to studying problem solving in dreams may be placed in one of two categories according to (1) awareness of the problem and (2) awareness of the

attempts to solve it. In the first category, the person is consciously aware of the problem and his or her intention to find a solution. Lucid dreaming, creative dreaming (and dream incubation) and hypnotic dreaming are the standard procedures used to investigate conscious problem solving in dreams. Serendipitous problem solving and adaptation fall into the second category of spontaneous problem solving. In this category, the dreamer may not be aware of the problem and/or of the efforts made to solve it.

Hypotheses

The present research attempted to replicate and extend the previous findings regarding dreams and problem solving of the conscious type by comparing incubated dream solutions to waking thought solutions. Creative dreaming was employed in this replication and extension. The replication involved testing the findings of Barrett (1993) mentioned earlier.

Hypothesis One

The frequency of dreams on topic and the frequency of dream-generated solutions were expected to reflect the trends of Barrett (1993); statistical differences between the two data sets would not be explored. Specifically, 50% of the participants who underwent a dream incubation procedure were expected to experience at least one dream about their chosen problems. Thirty-four percent of the dream incubation group participants were expected to experience dreams containing solutions to their chosen problems (Barrett, 1993).

Hypothesis Two

The addition of a control group extends the previous research. The control group was used to determine a baseline frequency of problem solving in dreams. More dream solutions were expected to be generated by the experimental group than the control group since the experimental group completed a nightly dream incubation procedure intended to increase the frequency of dreams about a specific problem. This difference was expected to be statistically significant.

Hypothesis Three

Incubated dreams from the experimental group were expected to yield more solutions to objective problems than personal problems, followed by academic problems (Barrett, 1993). Normal, non-incubated dreams tend to naturally incorporate material from waking experiences (see Marquardt, Bonato, Hoffmann, 1996). Therefore, non-incubated dreams from the control group were expected to incorporate the participants' chosen problems and to provide solutions at a lower frequency while still reflecting the same trend of objective problems being solved more frequently than personal problems followed by academic problems.

Hypothesis Four

The judge's ratings were expected to reflect the same trends as the participants' ratings with respect to the frequencies, in hypothesis three, of problems solved (Barrett, 1993).

Hypothesis Five

A thorough comparison of the qualities of incubated dream-generated solutions, non-incubated dream-generated solutions and waking thought generated-solutions increased the current knowledge of dreams and problem solving. No previous research comparing the three has been found. Incubated dream solutions were not expected to differ from the control group's dream solutions on completeness, employability, novelty, personal satisfaction and specificity since incubated dreams and non-incubated dreams are assumed to employ similar intellectual abilities.

Hypothesis Six

The thought-generated solution quality ratings of the incubation group were not expected to differ from the quality ratings of the control group's thought-generated solutions. No thought solution quality differences were expected since the only distinguishing factor between the groups was the experimental manipulation of the dream incubation procedure.

Hypothesis Seven

Incubated dream solutions and non-incubated dream solutions were not expected to differ from their respective thought-generated solutions on completeness, employability and specificity since dreaming is assumed to employ similar intellectual abilities as waking thought. The person does not become a radically different person with dramatically different aptitudes when he/she dreams. For example, if the person

was inept at mathematics while awake he/she will remain so while asleep and dreaming.

Hypothesis Eight

The experience of employing the dream state as a problem solving tool was expected to contribute to solution quality differences in novelty and personal satisfaction. Both groups' dream-generated solutions were expected to receive higher ratings on these measures than for their respective thought-generated solutions.

Hypothesis Nine

The participant-rated difficulty of the problem was expected to negatively correlate with the sum of the solution qualities for thought and dream-generated solutions for both groups. The problem difficulty was also expected to negatively correlate with completeness of the thought and dream-generated solutions, since more difficult problems typically require more work to solve.

Hypothesis Ten

Both group's participants' ratings of how motivated they were to solve their problems were expected to be positively correlated to the summed thought and dream quality scores since the more motivated participants were expected to generate better solutions.

Hypothesis Eleven

Both group's participants' ratings of how much importance they attribute to their dreams were expected to be positively correlated to their summed dream solution quality scores. This hypothesis originated from the assumption that people who consider their dreams to be more important will pay more attention to them and find qualitatively better solutions within their dreams.

Hypothesis Twelve

The quality of solutions for both groups was expected to increase over time as participants pondered their problems and possible solutions over the one week period. Confirmation of this hypothesis would be demonstrated by a positive correlation between the thought-generated solution quality sums and the night on which the solution was recorded (solution night) and between the dream-generated solution quality sums and the day on which the solution was recorded (solution day).

Method

Participants

Eighty Carleton University undergraduate students (51 women, 29 men; mean age = 21 years) were asked to participate in an experiment exploring the relationship of problem solving in waking thoughts to problem solving in dreams. Participants were selected on the basis of a self-reported dream recall frequency of at least three dreams per week. Participants were randomly assigned to either a dream incubation experimental group or to a control group. There were 25 women and 15 men in the dream incubation experimental group (median age = 20 years, range 18 to 37). Twenty-six women and 14 men participated in the control group (median age = 20 years, range of 17 to 46). Participants received compensation for their participation in the form of a partial course credit in Introductory Psychology.

Materials

The data were collected using a Thought and Dream Log questionnaire package designed for the present experiment (see Appendix A). No previous work has been completed with these scales. The reliability and validity of the scales was unknown. Participants recorded their subject number, age, gender and average number of dreams recalled during a one week period in the autobiographical information section of the questionnaire. The remainder of the questionnaire assessed problem solving in daily thoughts and in dreams and is thoroughly described below.

Procedure

Following the procedure used by Barrett (1993), participants in the present study were asked to select and briefly describe a problem of personal relevance that had a recognizable solution(s) and that they wished to examine over the next week. Problems of personal relevance were chosen as they are more likely to be incorporated into dreams (see the above discussion of Barrett, 1993; & Dement, 1972). The problems were then classified as type 1 = personal, type 2 = general objective or type 3 = academic by the participants. A problem difficulty rating, as a percentage of their most difficult personally relevant problem ever encountered, was also elicited. The remainder of the data were collected through a "home study" described below.

All participants were instructed to complete the set of Bedtime Instructions every night and the set of Wake-Up-Time instructions every time they spontaneously awoke during the night and at normal morning wake-up times for a one-week period. The Bedtime Instructions were performed just prior to going to sleep and required participants to record, in the Thought Log, the date (solution night) and time, and whether they recalled thinking about their problem during the past day. If participants recalled thoughts about their problem, they were to briefly describe these thoughts and to indicate whether or not the thoughts provided some form of a solution. If the thoughts resulted in a solution, participants explained the solution and rated it on a series of Likert-type scales evaluating completeness, employability, novelty, personal satisfaction and specificity. The last bedtime task differed for the

experimental group and the control group. The experimental group performed a dream incubation modelled after Dement (1972) and Reed (1976). Participants were instructed to:

"Please spend the next 15 minutes on attempting to solve your problem. During this time, try to concentrate only on your problem and attempting to solve it. Also, during the next 15 minutes, draw a small picture in the Thought Log. Draw a new picture each night. Please remember to use exactly 15 minutes to complete this step. Turn out the light and have sweet dreams."

The control group did not perform the dream incubation procedure. Their last instructions were to: "Turn out the light and have sweet dreams."

The Wake-Up-Time instructions asked participants of the control group and the experimental group to record, in written form in the Dream Log, all recalled dreams as well as the date (solution day) and time. Participants indicated whether or not their dreams provided some form of a solution. If the dreams resulted in a solution, participants explained the solution and rated it on the same series of Likert-type scales used in the Bedtime Instructions.

Upon completing one week of thought and dream recording, the participants returned for a second meeting with the experimenter. All participants were debriefed and control group participants were offered the chance to participate as experimental group participants. None of the 40 control group participants returned as experimental group participants. Motivation and importance scores were gathered from all participants during the debriefing meeting as well. On a Likert-type scale of one (not at all) to five (extremely) participants were asked to rate how motivated they were to solve their problems. On a similar Likert-type scale of one (none) to five

(a great deal) participants were asked to rate how much importance they give to their dreams on a daily basis. Finally, before leaving the meeting all participants were given a copy of a written debriefing describing the experimental objectives and an overview of the expected outcomes.

One judge reviewed the participants' Thought and Dream Logs and provided a blind rating of all variables rated by the participants. Only one judge was employed since (1) Barrett (1993) has already demonstrated that inter-judge reliability ranges from 88% to 100% agreement for judgements of dreams on topic and from 98% to 100% for judgements of solution content within dreams, and (2) resources for this research were limited and did not permit the employment of a second judge.

The final solution and pre-solution data points for each participant were chosen as follows: (1) the solution quality scores for each dream and thought solution were summed; (2) the highest summed dream or waking thought solution quality score per participant was considered the score of the final solution; (3) if the final solution came from a dream, the highest waking thought score occurring before the dream was used as the pre-solution score; (4) if a participant's final solution occurred during a waking thought, then the highest dream solution quality score occurring before the thought was used as the pre-solution score. Any high scores which occurred after the final solution may be attributed to having experienced the final solution already. Therefore, pre-solution scores were examined from before the final solution. By following this procedure, the current study remained comparable to the Barrett (1993) study in that both studies examined one dream-generated solution per participant.

Results

Twenty-eight of the control group participants chose to examine personal problems, five chose general objective problems and seven chose academic problems. In the incubation group, 30 participants chose personal problems, two chose general objective problems and eight chose to examine academic problems. The judge rated 18 of the control group's problems as personal, 13 as general objective, and nine as academic; 20 of the incubation group's problems as personal, 10 as general objective, and 10 as academic. A total of 402 thoughts related to their problems were reported by the participants; 210 reported by controls and 192 by the incubation group. The participants also reported a total of 405 dreams, 200 by the controls and 205 by the incubation group. Thirty-two of the control group's dreams were related to their problems and 81 of the incubation group's dreams were related to their problems. These results are listed in tables one through four.

Even though participants logged their thoughts and dreams for seven days, not everyone experienced a thought or dream related to their problem (see tables 1 to 4). Of the control group participants, all reported at least one thought related to their problems and 47.5% reported at least one dream related to their problems. In the incubation group 95% of the participants reported at least one thought related to their problems and 85% reported at least one dream related to their problems.

Tables one through four also list the frequency of seven different levels of solution scores for solutions obtained from thoughts and dreams separately for each group. For the purpose of this portion of the analysis, solutions were only considered

Control Group: Subjects' Ratings of Thought Outcomes

Problem type	Frequency of problem type <u>n =</u>	Total thoughts on topic	Thoughts on topic <u>% of n</u>
Personal	28	150	100
General objective	5	30	100
Academic	7	30	100
All problem types	40	210	100

Frequency of solution score			
	<u>% of n</u>		
	Sum = 1	Sum = 2 to 5	Sum = 6 to 10
Personal	0	0	7
General objective	0	0	0
Academic	0	0	0
All problem types	0	0	5

Note.

solution score = completeness + employability + novelty
+ personal satisfaction + specificity

Control Group: Subjects' Ratings of Thought Outcomes

Problem type	Frequency of solution score		
	<u>% of n</u>		
	Sum = 11 to 15	Sum = 16 to 20	Sum = 21 to 25
Personal	7	43	43
General objective	0	60	40
Academic	43	28.5	28.5
All problem types	12.5	42.5	40
	Sum = 25		
Personal		4	
General objective		0	
Academic		0	
All problem types		2.5	

Note.

solution score = completeness + employability + novelty

+ personal satisfaction + specificity

Incubation Group: Subjects' Ratings of Thought Outcomes

Problem type	Frequency of problem type <u>n =</u>	Total thoughts on topic	Thoughts on topic <u>% of n</u>
Personal	30	146	96.6
General objective	2	6	100
Academic	8	40	87.5
All problem types	40	192	95

Frequency of solution score			
	<u>% of n</u>		
	Sum = 1	Sum = 2 to 5	Sum = 6 to 10
Personal	0	3	3
General objective	0	0	0
Academic	0	0	0
All problem types	0	2.5	2.5

Note.

solution score = completeness + employability + novelty

+ personal satisfaction + specificity

Table 2 (continued)

Incubation Group: Subjects' Ratings of Thought Outcomes

Problem type	Frequency of solution score		
	% of n		
	Sum = 11 to 15	Sum = 16 to 20	Sum = 21 to 25
Personal	13	37	37
General objective	0	50	50
Academic	12.5	50	12.5
All problem types	12.5	40	32.5
	Sum = 25		
Personal		10	
General objective		0	
Academic		0	
All problem types		7.5	

Note.

solution score = completeness + employability + novelty

+ personal satisfaction + specificity

Control Group: Subjects' Ratings of Dream Outcomes

Problem type	Frequency of problem type <u>n =</u>	Total number of dreams	Total number of dreams on topic	Dreams on topic <u>% of n</u>
Personal	28	139	21	46
General objective	5	26	6	60
Academic	7	35	5	43
All problem types	40	200	32	47.5

Frequency of solution score

% of n

	Sum = 1	Sum = 2 to 5	Sum = 6 to 10
Personal	0	3.5	0
General objective	0	0	0
Academic	0	0	0
All problem types	0	2.5	0

Note.

solution score = completeness + employability + novelty

+ personal satisfaction + specificity

Table 3 (continued)

Control Group: Subjects' Ratings of Dream Outcomes

Problem type	Frequency of solution score		
	<u>% of n</u>		
	Sum = 11 to 15	Sum = 16 to 20	Sum = 21 to 25
Personal	14	0	0
General objective	20	40	0
Academic	14	28.5	0
All problem types	15	17.5	0
	Sum = 25		
Personal		0	
General objective		0	
Academic		0	
All problem types		0	

Note.

solution score = completeness + employability + novelty

+ personal satisfaction + specificity

Incubation Group: Subjects' Ratings of Dream Outcomes

Problem type	Frequency of problem type <u>n =</u>	Total number of dreams	Total number of dreams on topic	Dreams on topic <u>% of n</u>
Personal	30	152	65	87
General objective	2	5	3	50
Academic	8	48	13	87.5
All problem types	40	205	81	85

Frequency of solution score

% of n

	Sum = 1	Sum = 2 to 5	Sum = 6 to 10
Personal	0	0	3
General objective	0	0	0
Academic	0	0	12.5
All problem types	0	0	5

Note.

solution score = completeness + employability + novelty

+ personal satisfaction + specificity

Table 4 (continued)

Incubation Group: Subjects' Ratings of Dream Outcomes

Problem type	Frequency of solution score		
	<u>% of n</u>		
	Sum = 11 to 15	Sum = 16 to 20	Sum = 21 to 25
Personal	13	17	17
General objective	0	50	0
Academic	0	25	25
All problem types	10	20	17.5
	Sum = 25		
Personal		3	
General objective		0	
Academic		0	
All problem types		2.5	

Note.

solution score = completeness + employability + novelty

+ personal satisfaction + specificity

Table 5

Control Group: Judge's Ratings of Thought Outcomes

Problem type	Frequency of problem type		
	<u>n =</u>		
Personal	18		
General objective	13		
Academic	9		
All problem types	40		

Frequency of solution score			
	<u>% of n</u>		
	Sum = 1	Sum = 2 to 5	Sum = 6 to 10
Personal	0	0	28
General objective	0	0	23
Academic	0	0	22.5
All problem types	0	0	25

Note.

solution score = completeness + employability + novelty
+ personal satisfaction + specificity

Table 5 (continued)

Control Group: Subjects' Ratings of Thought Outcomes

Problem type	Frequency of solution score		
	<u>% of n</u>		
	Sum = 11 to 15	Sum = 16 to 20	Sum = 21 to 25
Personal	66.5	5.5	0
General objective	38.5	31	7.5
Academic	55.5	22	0
All problem types	55	17.5	2.5
	Sum = 25		
Personal		0	
General objective		0	
Academic		0	
All problem types		0	

Note.

solution score = completeness + employability + novelty

+ personal satisfaction + specificity

Table 6

Incubation Group: Judge's Ratings of Thought Outcomes

Problem type	Frequency of problem type <u>n=</u>
Personal	20
General objective	10
Academic	10
All problem types	40

Frequency of solution score <u>% of n</u>			
	Sum = 1	Sum = 2 to 5	Sum = 6 to 10
Personal	0	5	20
General objective	0	0	20
Academic	0	0	10
All problem types	0	2.5	17.5

Note.

solution score = completeness + employability + novelty
+ personal satisfaction + specificity

Control Group: Subjects' Ratings of Thought Outcomes

Problem type	Frequency of solution score		
	<u>% of n</u>		
	Sum = 11 to 15	Sum = 16 to 20	Sum = 21 to 25
Personal	55	20	0
General objective	50	30	0
Academic	60	0	0
All problem types	55	17.5	0
	Sum = 25		
Personal		0	
General objective		0	
Academic		0	
All problem types		0	

Note.

solution score = completeness + employability + novelty

+ personal satisfaction + specificity

Table 7

Control Group: Judge's Ratings of Dream Outcomes

Problem type	Frequency of problem type <u>n =</u>	Total number of dreams on topic <u>% of n</u>	Dreams on topic <u>% of n</u>
Personal	18	30	89
General objective	13	24	92
Academic	9	9	78
All problem types	40	63	87.5

Frequency of solution score			
<u>% of n</u>			
	Sum = 1	Sum = 2 to 5	Sum = 6 to 10
Personal	0	0	11
General objective	0	0	15.5
Academic	0	0	0
All problem types	0	0	10

Note.

solution score = completeness + employability + novelty

+ personal satisfaction + specificity

Table 7 (continued)

Control Group: Judge's Ratings of Dream Outcomes

Problem type	Frequency of solution score		
	<u>% of n</u>		
	Sum = 11 to 15	Sum = 16 to 20	Sum = 21 to 25
Personal	11	0	0
General objective	15	0	0
Academic	0	0	0
All problem types	10	0	0
	Sum = 25		
Personal		0	
General objective		0	
Academic		0	
All problem types		0	

Note.

solution score = completeness + employability + novelty
+ personal satisfaction + specificity

Table 8

Incubation Group: Judge's Ratings of Dream Outcomes

Problem type	Frequency of problem type <u>n =</u>	Total number of dreams on topic	Dreams on topic <u>% of n</u>
Personal	20	54	95
General objective	10	17	90
Academic	10	24	100
All problem types	40	95	95

Frequency of solution score			
	<u>% of n</u>		
	Sum = 1	Sum = 2 to 5	Sum = 6 to 10
Personal	0	0	15
General objective	0	0	10
Academic	0	0	20
All problem types	0	0	15

Note.

solution score = completeness + employability + novelty

+ personal satisfaction + specificity

Incubation Group: Judge's Ratings of Dream Outcomes

Problem type	Frequency of solution score		
	<u>% of n</u>		
	Sum = 11 to 15	Sum = 16 to 20	Sum = 21 to 25
Personal	40	0	0
General objective	40	0	0
Academic	20	30	0
All problem types	35	7.5	0
	Sum = 25		
Personal		0	
General objective		0	
Academic		0	
All problem types		0	

Note.

solution score = completeness + employability + novelty
+ personal satisfaction + specificity

satisfactory if the sum of the solution quality ratings was equal or greater than 21.

Forty-three percent of the control group participants felt that their thoughts generated satisfactory solutions to their personal problems, followed by 40% of participants with general objective problems and 28.5% of participants with academic problems.

Within the incubation group, 37% of the participants felt that their thoughts generated satisfactory solutions to their personal problems, 50% felt their thoughts generated satisfactory solutions to their general objective problems followed by 12.5% of the participants with academic problems.

The control group felt that their dreams did not provide any solutions with quality sum ratings equal or greater than 21, vs 17.5% of all dream incubators.

Seventeen percent of the incubation group felt that solutions to their personal problems were provided by their dreams and none of the participants with general objective problems felt that solutions were provided by their dreams, followed by 25% of participants with academic problems.

Tables nine and ten list the descriptive statistics for all data collected from both groups. Six participants omitted their problem difficulty ratings. These missing values were replaced with the mean difficulty scores for their group. This procedure is consonant with the recommendation of Tabachnick and Fidell (1989). The control group mean problem difficulty rating was 69.9% and the incubation group mean problem difficulty rating was 68.6%. The control group means for total thoughts on topic, total dreams on topic and total dreams were 5.25, 0.80 and 5.00 respectively. The incubation group means for the same variables were 4.80, 2.03 and 5.13

respectively. The rank ordered mean thought solution quality scores for the control group were 4.26 for specificity, 4.19 for employability, 3.78 for personal satisfaction, 3.53 for completeness and 2.97 for novelty. The same rank ordered means for the incubation group were 3.75 for employability, 3.60 for specificity, 3.45 for personal satisfaction, 3.30 for completeness and 2.86 for novelty.

The rank ordered mean dream solution quality scores for the control group were 1.23 for specificity, 1.05 for employability, 0.98 for personal satisfaction, 0.98 for novelty and 0.80 for completeness. The rank ordered mean dream solution quality scores for the incubation group were 2.13 for personal satisfaction, 2.03 for employability, 1.95 for completeness, 1.78 for specificity and 1.65 for novelty.

A set of one-group Chi-Square frequency analyses employing the frequencies of solution score sums of 21 or greater for all problem types found in tables 1, 2, 3, and 4 was computed. In this analysis the control group data and/or thought solution frequency data were employed as the expected frequencies and alpha was set at $p = .01$. Since some of the frequency data yielded expected frequencies of zero, a constant of one was added to all frequency values in order to avoid division by zero in computing the Chi-Square statistic. The following significant differences were found: (1) the control group's thought solution frequencies were different from their dream solution frequencies ($\chi^2(2) = 108.57, p < .01$), (2) the control group's thought solution frequencies were different from the incubation group's dream solution frequencies ($\chi^2(2) = 54.8, p < .01$), (3) the incubation group's thought solution frequencies were different from the control group's dream solution

Control Group: Measures of Central Tendency for Subject Scores

Measure	Age	Problem type	Problem difficulty %	Motivation	Importance
Mean	21.26	1.48	69.90	3.81	2.95
Max.	46.00	3.00	100.00	5.00	5.00
Min.	17.00	1.00	30.00	2.00	1.00
Median	20.00	1.00	75.00	4.00	3.00
Std. D. of Sample	4.92	0.78	19.86	0.87	1.09
Var. of Sample	24.20	0.61	394.30	0.77	1.19
		M + I	Total thoughts on topic	Total dreams on topic	Total # of dreams
Mean		6.76	5.25	0.80	5.00
Max.		9.00	12.00	3.00	8.00
Min.		3.00	2.00	0.00	2.00
Median		7.00	5.00	0.00	5.00
Std. D. of Sample		1.52	1.78	0.99	1.36
Var. of Sample		2.31	3.17	0.98	1.85

Control Group: Measures of Central Tendency for Subject Scores

Measure	Thought solution sum	Thought solution night	Dream solution sum	Dream solution day
Mean	18.73	4.13	5.03	1.53
Max.	25.00	7.00	19.00	5.00
Min.	8.00	1.00	0.00	1.00
Median	19.50	4.00	0.00	1.00
Std. D. of Sample	3.86	1.81	7.24	1.13
Var. of Sample	14.92	3.29	52.38	1.28

Thought solution qualities

	Completeness	Employability	Novelty	Personal satisfaction	Specificity
Mean	3.53	4.19	2.97	3.78	4.26
Max.	5.00	5.00	5.00	5.00	5.00
Min.	2.00	1.00	1.00	0.00	0.00
Median	4.00	4.50	3.00	4.00	5.00
Std. D. of Sample	0.98	1.02	1.31	1.27	1.06
Var. of Sample	0.96	1.04	1.72	1.61	1.12

Control Group: Measures of Central Tendency for Subject Scores

Measure	Dream Solution Qualities				
	Completeness	Employability	Novelty	Personal satisfaction	Specificity
Mean	0.80	1.05	0.98	0.98	1.23
Max.	4.00	5.00	5.00	5.00	5.00
Min.	0.00	0.00	0.00	0.00	0.00
Median	0.00	0.00	0.00	0.00	0.00
Std. D. of Sample	1.26	1.60	1.49	1.53	1.86
Var. of Sample	1.60	2.56	2.23	2.33	3.46

Incubation Group: Measures of Central Tendency for Subject Scores

Measure	Age	Problem type	Problem difficulty %	Motivation	Importance
Mean	20.93	1.45	68.57	3.81	3.28
Max.	37.00	3.00	100.00	5.00	5.00
Min.	18.00	1.00	30.00	1.00	1.00
Median	20.00	1.00	70.00	4.00	3.00
Std. D. of Sample	3.87	0.81	17.47	1.01	1.11
Var. of Sample	14.99	0.66	305.31	1.02	1.24
		M + I	Total thoughts on topic	Total dreams on topic	Total # of dreams
Mean		7.09	4.80	2.03	5.13
Max.		10.00	16.00	5.00	15.00
Min.		2.00	0.00	0.00	0.00
Median		7.00	5.00	2.00	5.00
Std. D. of Sample		1.72	2.95	1.46	2.43
Var. of Sample		2.96	8.73	2.13	5.91

Incubation Group: Measures of Central Tendency for Subject Scores

Measure	Thought solution sum	Thought solution night	Dream solution sum	Dream solution day
Mean	16.96	3.28	9.53	2.15
Max.	25.00	7.00	25.00	7.00
Min.	0.00	1.00	0.00	1.00
Median	19.00	2.50	9.00	1.00
Std. D. of Sample	7.01	2.25	9.41	1.87
Var. of Sample	49.16	5.08	88.55	3.52
Thought solution qualities				
	Completeness	Employability	Novelty	Personal satisfaction
Mean	3.30	3.75	2.86	3.45
Max.	5.00	5.00	5.00	5.00
Min.	0.00	0.00	0.00	0.00
Median	4.00	5.00	3.25	4.00
Std. D. of Sample	1.60	1.86	1.84	1.69
Var. of Sample	2.57	3.47	3.37	2.87

Incubation Group: Measures of Central Tendency for Subject Scores

Measure	Dream Solution Qualities				
	Completeness	Employability	Novelty	Personal satisfaction	Specificity
Mean	1.95	2.03	1.65	2.13	1.78
Max.	5.00	5.00	5.00	5.00	5.00
Min.	0.00	0.00	0.00	0.00	0.00
Median	2.00	1.00	1.00	2.00	1.00
Std. D. of Sample	2.01	2.21	1.83	2.13	1.94
Var. of Sample	4.05	4.90	3.36	4.52	3.76

frequencies ($\chi^2(2) = 4025.25$, $p < .01$), (4) the incubation group's thought solution frequencies were different from their dream solution frequencies ($\chi^2(2) = 71.12$, $p < .01$), (5) the incubation group's dream solution frequencies were different from the control group's dream solution frequencies ($\chi^2(2) = 914$, $p < .01$), and (6) the control group's thought solution frequencies were different from the incubation group's thought solution frequencies ($\chi^2(2) = 11.94$, $p < .01$).

Rosenberg (1990, p. 263) and Hays (1988, p. 303) have stated that t-tests can be employed without homogeneity of variance, providing the samples are of equal size. Therefore, six t-tests were performed to further examine the statistically significant differences found in the set of Chi-Square analyses. The t-tests were performed on the data for all problem types with the constant of one added, as in the Chi-Square analyses, and the following means are reported without the constant added. The results were as follows: (1) the mean thought solution frequency (37.17) was significantly greater ($t(2) = 8.41$, $p < .01$) than the mean dream solution frequency (0) for the control group, (2) the control group's mean thought solution frequency (37.17) was not significantly different ($t(2) = -3.14$, $p > .01$) from the incubation group's mean dream solution frequency (14), (3) the incubation group's mean thought solution frequency (33.17) was not significantly different ($t(2) = 3.08$, $p > .01$) from the control group's mean dream solution frequency (0), (4) the mean dream solution frequency (14) was not significantly different ($t(2) = -2.6$, $p > .01$) from the mean thought solution frequency (33.17) for the incubation group, (5) the incubation group and control group mean dream solution frequencies (14 & 0

respectively) were not significantly different ($t(2) = 1.89, p > .01$) and (6) the mean thought solution frequencies for the incubation group (33.17) and the control group (37.17) were not significantly different ($t(2) = -0.36, p > .01$).

Two additional one-group, Chi-Square analyses were indicated by the hypotheses. The solution frequencies between problem types for each group separately were assessed for significant differences. Since the control group did not experience any satisfactory (sum = 21 to 25) dream-generated solutions, a Chi-Square analysis on this data was not performed (see table 3). The second analysis of this set indicated that the distribution of satisfactory dream-generated solution frequencies per problem type was significantly different ($\chi^2(2) = 23.28, p < .01$) from the distribution of expected frequencies for chance factors alone. Inspection of the frequencies revealed that dreams most frequently generated solutions to academic problems (25%), followed by personal problems (17%) and general objective problems (0%) (see table 4).

The judge's ratings did not accurately reflect the control group or the incubation group participant ratings for thought or dream solutions at the current solution quality sum level of 21 or greater (see tables five to eight). The judge felt that only 7.5% of the control group participants with general objective problems experienced thoughts containing solutions and none of the incubation group's problems were solved by their thoughts. The judge also felt that no dream solutions for either group could be rated at the 21 or greater solution quality sum level.

However, the participants' highest solution quality ratings were more in

agreement with the judge's highest solution quality ratings. None of the control group participants felt that the final solution to his/her problem occurred in a dream and the judge felt that only one of the control group participants' final solutions occurred in a dream. This resulted in a 97.5% agreement level. Eight of the incubation group participants felt that the final solution to their problems occurred in dreams. The judge felt that ten of the incubation group's final solutions occurred in dreams. Participants and the judge agreed on three of these final dream solutions. This resulted in a 70% agreement level.

Correlations between participant and judge ratings are listed in table 11. The highest participant-judge correlations were between ratings of problem type and between ratings of problem difficulty. All remaining participant-judge correlations were less than .39. The low participant-judge correlations for solution night and solution day were interpreted as demonstrating that participants felt that the pre-solutions and final solutions to their problems occurred on different nights and days than the judge rated. Correlations between participant and judge ratings of solution qualities would be invalid since the solutions from different dreams and thoughts from each participant would be compared.

Two correlation matrices of all variables for both groups revealed high multicollinearity between employability of the dream solution and (1) completeness of the dream solution ($r = 0.93$), and (2) personal satisfaction with the dream solution ($r = 0.913$); and between personal satisfaction with the dream solution and completeness of the dream solution ($r = 0.94$) for the control group. For the incubation group, high multicollinearity was found between employability of the

Table 11

Correlations Between Subject Ratings and Judge Ratings

	Controls	Incubation
	<i>r</i>	<i>r</i>
Problem Type	0.70	0.66
Problem difficulty	0.40	0.57
Solution night	0.11	0.38
Solution day	0.18	-0.16
Motivation	0.35	0.41
Importance	0.34	0.14
Dreams on topic	0.36	0.30

dream solution and specificity of the dream solution ($r = 0.901$), and between personal satisfaction with the dream solution and specificity of the dream solution ($r = 0.903$). In the subsequent MANOVA comparing the two groups, the offending variables, employability of dream solution and personal satisfaction with dream solution, were not included. Significant correlations ($r(38) > \pm 0.325, p < .01$) for each group separately are listed in tables 12 and 13.

Four MANOVA statistical tests were completed. A more liberal alpha level ($p = .05$) was employed in the multivariate analyses. The first one compared the control group and the incubation group scores for the thought solution qualities of completeness, employability, novelty, personal satisfaction and specificity; the dream solution qualities of completeness, novelty and specificity; and the variables motivation, importance, problem type, problem difficulty, solution night, solution day, number of thoughts on topic, number of dreams on topic and total number of dreams. The significant Wilks' $\lambda(17, 62) = 0.658, p = .035$ signifies that over all variables, the groups were not equal. Significant individual variable differences also occurred between the two groups for the dependent variables of thought solution specificity ($F(1, 78) = 4.755, p = .032$), dream solution completeness ($F(1, 78) = 9.365, p = .003$), and number of dreams on topic ($F(1, 78) = 19.29, p = .000035$). Inspection of the means revealed that the control group's mean thought solution specificity score was higher than the incubation group's; the incubation group's mean dream solution completeness score and the mean number of dreams on topic were higher than the control group's mean scores (see tables 9 & 10).

The second MANOVA also revealed a significant Wilks' Λ (11, 68) = 0.756, $p = .042$. Therefore, over the variables motivation, importance, problem type, problem difficulty, solution night, solution day, number of thoughts on topic, number of dreams on topic, total number of dreams, sum of thought solution qualities and sum of dream solution qualities the two groups differed. Inspection of the means revealed the same difference as in the first MANOVA on the variable of number of dreams on topic. A second significant difference (F (1,78) = 5.747, $p = .019$) was also revealed. The incubation group's mean sum of dream solution qualities was higher than the control group's mean score (see tables 9 & 10).

The third and fourth MANOVA's were designed to test whether the thought-generated solutions differed qualitatively from the dream-generated solutions. The first analysis of this set compared the control group's dream quality scores to their thought quality scores across the variables of completeness, employability, novelty, personal satisfaction and specificity. The significant Wilk's Λ (5,74) = 0.366, $p < .05$, signifies that over all variables the thought and dream solutions are qualitatively different. The individual F-tests, (F (1,78), with all $p < .05$) demonstrated that all mean thought solution scores were higher than the mean dream solution quality scores (see table 9).

The second analysis of this set repeated the process with the data from the incubation group. Once again the Wilk's Λ (5, 74) = 0.766, $p < .05$, was significant. Therefore, over all solution quality scores the thought and dreams solutions were different. The individual F-tests, (F (1, 78), with all $p < .05$), also

revealed that all mean thought solution quality scores were higher than the mean dream solution quality scores (see table 10). The two intercorrelated variables discovered in the correlation matrix, employability of dream solution and personal satisfaction with dream solution, were returned to the analysis since the high multicollinearity arose from intercorrelating the dream solution quality scores. The current analysis compared dream solution quality scores to thought solution quality scores; removal of the dream quality variables would also produce an unequal number of dependent measures being compared. Also the dream solution qualities of one group were not compared to the thought solution qualities of the other group since the second MANOVA demonstrated that the summed thought solution quality scores were not different for the two groups. However, two ANOVA's comparing the groups' summed thought solution quality scores to their summed dream solution quality scores demonstrated significant differences ($F(1, 78)$, with all $p < .05$). For both groups the mean summed thought solution quality scores were higher than the mean summed dream solution quality scores (see tables 9 & 10) supporting the MANOVA results above.

The correlation matrices (see tables 12 & 13) demonstrated that (1) problem difficulty as rated by the participants was not significantly correlated to the thought or dream-generated solution quality sums for either group ($r(38) < \pm 0.325$, $p > .01$), (2) problem difficulty was not significantly correlated to thought or dream-generated solution completeness for either group ($r(38) < \pm 0.325$, $p > .01$), (3) motivation scores were significantly positively correlated to the thought-generated

solution quality sums for the incubation group only ($r(38) = 0.424$, $p < .01$), (4) motivation scores were not significantly correlated to dream-generated solution quality sums for either group ($r(38) < \pm 0.325$, $p > .01$), and (5) importance of dreams scores were not significantly correlated to the dream-generated solution quality sums for either group ($r(38) < \pm 0.325$, $p > .01$).

The correlation matrices (see table 12 & 13) also indicated significant relationships between (1) the control group's dream-generated solution quality sums and the solution day ($r(38) = 0.674$, $p < .01$), (2) the incubation group's dream-generated solution quality sums and the solution day ($r(38) = 0.599$, $p < .01$), and (3) the incubation group's thought-generated solution quality sums and the solution night ($r(38) = 0.492$, $p < .01$). These correlations were further investigated with a set of ANOVA's, with alpha set to $p = .01$.

It should be noted that a Bonferonni correction for type I error (alpha) was not performed. Two hundred and fifty-three correlations were performed per group. With each correlation, an increase in the type I error rate may occur. According to the correction, a per comparison alpha level of $p = .0000395$ would maintain the family-wise alpha level of $p = .01$. A critical r value was not determined for this per comparison alpha level.

The first ANOVA tested the relationship between the solution day and the dream-generated solution quality sum for the control group. The significant $F(4, 35) = 10.316$, $p = .0001$ indicates that the summed dream solution quality scores vary according to the solution day. Post-hoc Scheffé tests of all possible pairings of the

sum of dream solution qualities for each solution day demonstrated that the dream solution scores for day 1 differed from those of day 3 ($F(4,35) = 4.073, p < .01$). Inspection of the means revealed that the summed dream solution quality scores for day 1 (mean = 2.258) were lower than those for day 3 (mean = 17.5).

The second ANOVA assessed the relationship between the solution day and the sum of dream solution qualities for the incubation group. The significant $F(6, 33) = 6.688, p = .0001$, demonstrates that the sum of the dream solution qualities varies according to the solution day. Post-hoc Scheffé tests of all possible pairings of the summed dream solution qualities for each solution day revealed that the dream solution scores for day 1 differed from those of day 2 ($F(6, 33) = 3.5, p < .01$). Inspection of the means revealed that the summed dream solution quality scores for day 1 (mean = 3.955) were lower than the scores for day 2 (mean = 16.444).

The last ANOVA demonstrated that there was a significant relationship between the solution night and the summed thought solution quality score for the incubation group ($F(6, 33) = 3.855, p = .005$). Post-hoc Scheffé tests of all possible pairings of the summed thought solution qualities for each solution night did not reveal any significant differences.

Table 12

Control Group: Significant Correlations

		Age	Problem type	Problem difficulty	Solution night
Problem difficulty			-0.399	1	
Thought solution quality	Completeness				0.388
	Novelty		-0.328		
	Personal satisfaction				
	Specificity				
Thought solution sum					
Dream solution quality	Completeness				
	Employability				
	Novelty				
	Personal satisfaction				
	Specificity				
Dream solution sum					
Motivation				0.454	
Thoughts on topic		0.346			-0.328
Dreams on topic					
Total dreams					

Table 12 (continued)

Control Group: Significant Correlations

		Thought solution quality		
		Completeness	Employability	Novelty
Problem difficulty				
Thought solution quality	Completeness	1		
	Novelty		0.415	1
	Personal satisfaction	0.346	0.47	0.326
	Specificity	0.464	0.418	
Thought solution sum		0.613	0.74	0.605
Dream solution quality	Completeness			
	Employability			
	Novelty			
	Personal satisfaction			
	Specificity			
Dream solution sum				
Motivation				
Thoughts on topic				
Dreams on topic				
Total dreams		-0.333	-0.421	

Table 12 (continued)

Control Group: Significant Correlations

		Thought solution quality		Thought solution sum	Solution day
		Personal satisfaction	Specificity		
Problem difficulty					
Thought solution quality	Completeness				
	Novelty				
	Personal satisfaction	1			
	Specificity	0.492	1		
Thought solution sum		0.786	0.676	1	
Dream solution quality	Completeness				0.684
	Employability				0.664
	Novelty				0.615
	Personal satisfaction				0.631
	Specificity				0.576
Dream solution sum					0.674
Motivation					
Thoughts on topic					
Dreams on topic					0.415
Total dreams				-0.479	

Table 12 (continued)

Control Group: Significant Correlations

		Dream solution quality		
		Completeness	Employability	Novelty
Problem difficulty				
Thought solution quality	Completeness			
	Novelty			
	Personal satisfaction			
	Specificity			
Thought solution sum				
Dream solution quality	Completeness	1		
	Employability	0.93	1	
	Novelty	0.785	0.827	1
	Personal satisfaction	0.94	0.913	0.73
	Specificity	0.804	0.883	0.814
Dream solution sum		0.947	0.974	0.89
Motivation				
Thoughts on topic				
Dreams on topic		0.682	0.733	0.758
Total dreams				

Table 12 (continued)

Control Group: Significant Correlations

		Dream solution quality	
		Personal satisfaction	Specificity
Problem difficulty			
Thought solution quality	Completeness		
	Novelty		
	Personal satisfaction		
	Specificity		
Thought solution sum			
Dream solution quality	Completeness		
	Employability		
	Novelty		
	Personal satisfaction	1	
	Specificity	0.796	1
Dream solution sum		0.933	0.929
Motivation			
Thoughts on topic			
Dreams on topic		0.707	0.65
Total dreams			

Table 12 (continued)

Control Group: Significant Correlations

		Dream solution sum	Importance of dreams
Problem difficulty			
Thought solution quality	Completeness		
	Novelty		
	Personal satisfaction		
	Specificity		
Thought solution sum			
Dream solution quality	Completeness		
	Employability		
	Novelty		
	Personal satisfaction		
Dream solution sum		1	
Motivation			
Thoughts on topic			
Dreams on topic		0.754	0.441
Total dreams			

Table 13

Incubation Group: Significant Correlations

		Solution night	Thought solution quality		
			Completeness	Employability	Novelty
Thought solution quality	Completeness	0.452	1		
	Employability	0.475	0.729	1	
	Novelty	0.431	0.389	0.443	1
	Personal satisfaction	0.397	0.742	0.686	0.519
	Specificity		0.685	0.583	0.453
Thought solution sum		0.492	0.858	0.846	0.696
Dream solution quality	Completeness				
	Employability				
	Novelty				
	Personal satisfaction				
	Specificity				
Dream solution sum					
Motivation		0.372		0.376	
Thoughts on topic		0.478	0.462	0.424	0.333
Dreams on topic					
Total dreams					

Table 13 (continued)

Incubation Group: Significant Correlations

		Thought solution quality		Thought	Solution
		Personal satisfaction	Specificity	solution sum	day
Thought solution quality	Completeness				
	Employability				
	Novelty				
	Personal satisfaction	1			
	Specificity	0.662	1		
Thought solution sum		0.879	0.816	1	
Dream solution quality	Completeness				0.593
	Employability				0.487
	Novelty				0.5
	Personal satisfaction				0.625
	Specificity				0.578
Dream solution sum					0.599
Motivation			0.433	0.424	
Thoughts on topic		0.387		0.471	
Dreams on topic					0.486
Total dreams					

Table 13 (continued)

Incubation Group: Significant Correlations

		Dream solution quality		
		Completeness	Employability	Novelty
Thought solution quality	Completeness			
	Employability			
	Novelty			
	Personal satisfaction			
	Specificity			
Thought solution sum				
Dream solution quality	Completeness	1		
	Employability	0.824	1	
	Novelty	0.767	0.78	1
	Personal satisfaction	0.858	0.866	0.801
	Specificity	0.855	0.901	0.713
Dream solution sum		0.927	0.944	0.87
Motivation				
Thoughts on topic				
Dreams on topic		0.612	0.643	0.665
Total dreams				

Table 13 (continued)

Incubation Group: Significant Correlations

		Dream solution quality		Dream
		Personal satisfaction	Specificity	solution sum
Thought solution quality	Completeness			
	Employability			
	Novelty			
	Personal satisfaction			
	Specificity			
Thought solution sum				
Dream solution quality	Completeness			
	Employability			
	Novelty			
	Personal satisfaction	1		
	Specificity	0.903	1	
Dream solution sum		0.955	0.944	1
Motivation				
Thoughts on topic		0.367		
Dreams on topic		0.627	0.56	0.669
Total dreams				

Table 13 (continued)

Incubation Group: Significant Correlations

		Motivation	Thoughts on topic
Thought solution quality	Completeness		
	Employability		
	Novelty		
	Personal satisfaction		
	Specificity		
Thought solution sum			
Dream solution quality	Completeness		
	Employability		
	Novelty		
	Personal satisfaction		
	Specificity		
Dream solution sum			
Motivation		1	
Thoughts on topic		0.374	1
Dreams on topic			
Total dreams			0.475

Discussion

The results of this experiment clearly demonstrate that dreams can provide solutions to problems. *Hypothesis one* was confirmed: 85% of the incubation group participants reported dreams on topic and 52.5% of the dream-incubators also experienced dreams containing solutions of some type (solution sum = one to 25) to their problems. These frequencies are higher than previously documented frequencies. Barrett (1993) reported that the incubation procedure resulted in 49% of the participants experiencing dreams on topic and 34% experiencing dream-generated solutions.

Eighty-seven percent of the personal problem dream-incubators reported dreams on topic in contrast to Barrett's 48%; 50% of the general objective problem dream-incubators reported dreams on topic compared to Barrett's 63%; 87.5 % of the academic problem dream-incubators reported dreams on topic in contrast to Barrett's 25%. Forty-six percent of the control group participants who chose personal problems experienced dreams on topic, 60% of the participants who chose general objective problems experienced dreams on topic and 43% of the participants who chose academic problems experienced dreams on topic.

The participants in the current study also experienced a higher frequency of dream-generated solutions (see tables 3 & 4). Recall that 52.5% of the dream incubation group participants experienced dream-generated solution. The results of the controls reflected Barrett's (1993) findings; 35% of the controls experienced dream-generated solutions with quality sums of one to 25 versus 34% of the dream-

incubators in Barrett's study. However, if only the satisfactory dream-generated solutions, with quality sums of 21 or greater, are considered then only 17.5% of all dream-incubators experienced dream-generated solutions and none of the control group participants experienced satisfactory dream-generated solutions. The current study found that 17% of personal problem dream-incubators experienced satisfactory dream-generated solutions in comparison to 36% in Barrett; none of the general objective problem dream-incubators experienced dream-generated solutions in contrast to 38% in Barrett; and 25% of the academic problem dream-incubators in comparison to none in Barrett.

Dissimilarities between the incubation procedures may have contributed to the disparate results. Barrett's lecture on dreams and problem solving was replaced with drawing a small picture representing the personally relevant problem. Although one would think that a lecture discussing some of the discoveries made in dreams would stimulate people to dream about their desired topic more so than drawing a simple picture, it is possible that the lecture was just one of many about dreaming. It is unclear if Barrett used participants enrolled in a course on dreams or if they were introductory psychology students. If the lecture was just one of many, then enthusiasm in completing the experiment may have been low. In the current experiment, enthusiasm differences could not have contributed to the effect of the incubation procedure, since there were no significant differences between the groups on the subjective measures of motivation to solve the problem and importance of dreams.

The number of dreams on topic may have been directly influenced by the task of drawing a picture that represented the problem, as was the case for a twenty-one year-old female incubation group participant with a personal problem. Her problem was trying to find ways to improve her personal appearance. One evening she drew the initials of a restaurant, that served greasy food, inside a circle with an X crossed through it. The resulting dream was about the restaurant. One could speculate that increasing the complexity and time involved in drawing the picture may increase the dreams on topic and consequently increase the frequency of problem solving in dreams.

Hypothesis two was only partially supported by the results of this study. Although the Chi-Square results demonstrate that the distributions of the frequencies of dream-generated solutions per problem type were different between the groups, the means of the frequencies of satisfactory (solution quality sums = 21 to 25) dream-generated solutions were not significantly different. This result was no doubt, influenced by small sample sizes. In the incubation group, only two participants chose general objective problems and only one of which experienced a dream on topic. In the control group, five participants chose general objective problems and three of these experienced dreams on topic. Had more participants chosen general objective problems, there would have been more dreams on topic. Since dreams on topic are correlated with dream solution sums there would also have been more solved general objective problems. Also the small number of cases ($n = 3$ problem types) in the Chi-Square analysis influenced the significance of the result. Future research

should concentrate on evaluating the number of solution containing dreams per participant instead of per problem type.

Barrett (1993) revealed a solution frequency trend demonstrating that dream-generated solutions occur most frequently for objective problems, 38% of the participants experienced them, followed by personal problems (36%) and 0% for academic problems. This trend was not replicated by the current study and therefore, *hypothesis three* was not confirmed. The frequency of satisfactory (sum = 21 to 25) dream-generated solutions per problem type in the current study displayed an opposite trend. Twenty-five percent of the participants with academic problems experienced satisfactory dream-generated solutions and 17% of the participants with personal problems experienced satisfactory dream-generated solutions followed by none of the participants with general objective problems. This significant trend was not reflected in the control group's satisfactory solution frequency data, disconfirming the second part of hypothesis three.

Participants in the current study may have employed different criteria to make the judgements of problem type than the criteria employed in Barrett (1993). Barrett did not state any formal definitions of the problem types. The current study based examples of problem types on the examples provided by Barrett. The methods coupled with the fact that the judge was not perfectly accurate on judgements of problem type (see table 11) leads to the possibility that confusing problem types created the disparities between the solution frequency trends. Standardized definitions of problem type should be employed in future research.

Hypothesis four was not supported by the data. The judge did not feel that any satisfactory dream-generated solutions occurred for either group. In Barrett (1993), the judges seemed to be able to recognize participant-rated dreams on topic and the participant-rated solution containing dreams with relative ease. In the current study, the judge's ratings did not accurately identify the same thoughts or dreams on topic as the participants; nor was the judge able to accurately recognize the same pre-solutions or final solutions as the participants (see table 11 correlations for solution night and solution day).

The favored problem type of both groups was personal problems. Both groups also chose more academic problems than general objective ones. The judge's problem type ratings in the current study reflected the frequencies found in Barrett (1993) more so than the participant ratings of problem type in the current study. The judge rated the majority of both groups' problems as personal, followed by general objective and then academic. It appears that the judge felt that more of the participant-rated personal problems could be better categorized as general objective ones.

A closer inspection of the judges' roles suggests that the differences in the judges' tasks may have contributed to these participant-judge disparities. In Barrett (1993) judges had to choose which dreams were on the specified topics and decide which ones of these provided solutions. In the present study the judge was required to (1) identify which dreams were on topic, (2) decide which of these dreams provided solutions and (3) provide solution quality ratings. Only the dream receiving

the highest summed solution quality score was included in the analysis. In the current study one subject could have submitted more than one solution-containing dream. In the Barrett study participants stopped recording their dreams after they felt a solution had been generated and thus could only submit one solution containing dream. The extra demands of choosing the correct solution containing dream and rating the solution qualities similarly to the participants no doubt decreased the participant-judge correlations in the current study.

However, the strongest influence on participant-judge correlations was probably the subjective nature of dream interpretation. Many participants identified solutions in their dream that the judge did not perceive. In retrospect, the solutions were appropriate. For example, one twenty-one year-old female incubation group participant decided to examine the general objective problem of trying to keep her kitten, Sidney, off the stove and counter. She reports the following dream.

"The first dream I can remember was quite horrifying. My apartment was burning down and I was the only one home. I was about to climb out my window, it was night, I suddenly remembered Sidney. I was calling for him. Next I was walking down the hall trying to shelter myself from the flames, calling to Sid. I could hear him. I saw him sitting on the stove, the only thing not on fire. I grabbed him and went to go back to my room, I was half way down the hall and from then I can't remember any more."

The judge could not identify a solution in this dream. On the other hand, the participant felt that the solution was to "just let him go on the stove and counter, because otherwise, in the dream, Sid would have more than likely died!" The solution was, in effect, to do nothing. Employing strict guidelines for what constitutes a solution may increase the accuracy of judges' ratings as well as influence

the solution frequencies discussed in hypothesis three.

The comparison of solution qualities between the control and incubation groups' dream-generated solutions revealed significant differences. The incubation group's mean dream solution completeness and summed dream solution scores were higher than the control groups scores. These results disagree with *hypothesis five*, no differences were expected. This finding, coupled with the results of the second MANOVA and the correlations in table 13, demonstrates that although the incubation procedure did not increase the frequency of problem solving in dreams (see discussion of hypothesis 3) it did increase the dreams on topic which led to an increase in the quality of the dream-generated solutions.

Interestingly, the thoughts on topic were positively correlated to the thought-generated solution quality sums (not significantly for the control group) to a lesser extent than the dreams on topic were correlated to the dream-generated solution quality sums. Therefore, it appears that increasing the amount one dreams about one's problem is more beneficial than increasing the amount one thinks about one's problem.

Hypothesis six required the thought-generated solutions to be compared between groups on the five qualitative scales. Since the control group's mean thought solution specificity score was significantly higher than the incubation group's mean score, this hypothesis was not supported by the data. The origin of this difference is unclear. It is unlikely that the difference was due to group characteristics since the thought-generated solution frequencies and the thought-generated solution sums were

not significantly different. It seems that the incubation procedure somehow lowered the incubation group's thought-generated solution specificity scores.

The third and fourth MANOVA's tested *hypotheses seven* and *eight*. The significant differences between the thought and dream-generated solutions within each group are in opposition with hypotheses seven and eight. All mean thought-generated solution qualities were higher than the mean dream-generated solution qualities in both groups. Investigating the trends of the rank-ordered mean quality scores may prove more fruitful in subsequent research. In the current research, the incubation group's mean personal satisfaction score for thought-generated solutions was ranked third and then jumped to first for the dream-generated solutions. There seemed to be less change in the rank ordering for the control group thought and dream solution qualities. The dream incubation procedure may not result in individual dream solution qualities that are higher than thought-generated solution qualities but it seems to help the dreamer generate qualitatively different solutions from waking thought.

The correlations listed in tables 12 and 13 failed to support *hypothesis nine*. There were no significant relationships between the problem difficulty and the thought or dream solution quality sums or between problem difficulty and completeness of the solution (thought or dream-generated) for both groups. These results seem to imply that more difficult problems are not more difficult to solve. There was, however, a significant negative relationship between the problem type and the problem difficulty for the control group and a non-significant negative relationship ($r = -0.27$) for the same variables for the incubation group. The negative correlations mean that personal

problems were rated the most difficult, followed by general objective problems and academic problems.

Examination of the correlations between participants' ratings of motivation to solve their problems and the summed thought and dream-generated solution scores revealed only one significant relationship. The incubation group's motivation scores were related to their summed thought solution scores. Therefore, the more motivated they were to solve their problems, the better their thought solutions. Since only one of the four hypothesized relationships reached significance *hypothesis ten* was only partially supported.

While examining the variables involved in hypotheses nine and ten, a few unexpected differences between the significant correlations of each group were also found. The control group ratings of problem difficulty were positively correlated with their motivation to solve their problems. Since they also felt that their more difficult problems were their personal ones, inferentially, one can assume that they were more motivated to solve their personal problems. This relationship did not exist for the incubation group.

The control group's summed thought-generated solution quality scores were negatively related to the total number of dreams they experienced. This relationship implies that the less people dream about their problems, the better their thought solutions, for non-dream incubators. Perhaps examining non-incubated dreams for problem solving content interferes with waking problem solving. In effect, people would be searching for a needle in a haystack of dreams.

The participant ratings of dream importance were not correlated to their summed dream solution scores as expected, failing to support *hypothesis eleven*. This finding indicates that it does not matter how one perceives his/her dreams, qualitatively similar solutions will be generated by all dreamers. One may wish to speculate that an inherent function of dreaming is to solve problems and that it is a natural cognitive process. This is contrary to Blagrove's (1992) position. Blagrove seems to imply that if one believes that dreams solve problems and one examines his/her dreams, solutions will be found.

The correlational relationships between the summed thought solution quality ratings and the night on which they were recorded and the summed dream solution quality and the day on which they were recorded partially support *hypothesis twelve*. A thorough investigation of the significant three out of four possible correlations revealed three interesting patterns. (1) The dream solutions become qualitatively better with time. (2) Dream incubators tend to increase the quality of dream solutions more rapidly than non-dream incubators; it only takes them two days instead of three. (3) Thought solutions also become qualitatively better with time, although no significant solution quality increases occur in a one week period. This pattern applies only to dream incubators. Therefore, the optimal method of producing the greatest increases in solution quality is to practice dream incubation for two days.

One of the implications of this research is that although dreams do not always generate solutions that are better than thought-generated solutions, they do so frequently enough to be recognized. As stated in the results, the judge felt that a

dream solution was the best solution for one of the control group participants and 10 of the incubation group participants. Since the judge felt that all of the participants solved their problems to some degree in either a thought or a dream, then 11 out of the 80 solutions were dream-generated solutions; stated differently, dreams solved problems better than waking thoughts 13.75% of the time. None of the control group participants felt that their dreams provided the final solution to their problems and only eight of the dream-incubators felt that their dreams generated the final solution to their problems. Seventy-eight of the participants felt that they had solved their problems to some degree through a thought or a dream, eight of these final solutions were dream-generated solutions. In other words, the participants felt that dreams solved their problems better than waking thoughts 10.25% of the time. The two results combined yield an estimate of the dream's ability to solve problems to a better degree than waking thoughts 12% of the time. No literature exists which documents this dream problem solving advantage.

A second implication of this research is on strategies for problem solving. Discounting dreams as a method of problem solving would be an illogical mistake. The best approach to problem solving would be to employ all available resources. Dreams should be considered a practical complement to the problem solving of waking thought.

A third implication of the results of this experiment is an influence on the theories of the origin of dreaming. The bottom-up theories dictate that the brainstem and reticular formation activity of the brain leads to stimulation of cortical activity

which becomes synthesized into a dream (Hobson, 1988). The dream is nothing more than an epi-phenomenon. The current research demonstrates that solutions, which are sometimes better than waking thought solutions, can be generated by dreams. This means that thoughts and dreams at least share similar cognitive processes.

Twelve hypotheses were tested in the present research. Only hypothesis one was fully supported. The dream incubation group experienced dreams on topic and dream-generated solutions with frequencies similar to previous research (Barrett, 1993). Hypotheses two, ten and twelve were only partially supported and hypotheses three through nine (inclusive) and eleven were not confirmed. Despite these results, important information was gained. In summary, this experiment demonstrates (1) that people feel that dreams can solve problems, (2) a dream incubation procedure can increase the frequency of dreams on topic which leads to qualitatively better and more complete dream-generated solutions, and (3) that the dream-generated solutions are often better than thought-generated solutions.

References

- Anch, A., Browman, C., Mitler, M. & Walsh, J. (1988). Sleep: A scientific perspective (p. 42). Englewood Cliffs: Prentice Hall.
- Barber, T., Walker, P. & Hahn, K. (1973). Effects of hypnotic induction and suggestions on nocturnal dreaming and thinking. Journal of Abnormal Psychology, 82(3), 414-427.
- Barrett, D. (1979). The hypnotic dream: Its relation to nocturnal dreams and waking fantasies. Journal of Abnormal Psychology, 88(5), 584-591.
- Barrett, D. (1993). The "committee of sleep": A study of dream incubation for problem solving. Dreaming, 3(2), 115-122.
- Blagrove, M. (1992) Dreams as the reflection of our waking concerns and abilities: A critique of the problem-solving paradigm in dream research. Dreaming, 2(4), 205-220.
- Breger, I. (1967). Function of Dreams. Journal of Abnormal Psychology, 72(5), 1-28.
- Dave, R. (1979). Effects of hypnotically induced dreams on creative problem solving. Journal of Abnormal Psychology, 88(3), 293-302.
- De Koninck, J. & Koulack, D. (1975). Dream content and adaptation to a stressful situation. Journal of Abnormal Psychology, 84, 250-260.
- Dement, W. (1972). Some must watch while some must sleep. San Francisco: W.H. Freeman and Company.
- Dement, W. & Kleitman, N. (1957). The relation of eye movements during sleep to dream activity: An objective method of the study of dreaming. Journal of Experimental Psychology, 53, 339-346.
- Duncker, K. (1945). On problem solving. Psychological Monographs, 58, 1-113.
- Eichelman, B. (1985). Hypnotic change in combat dreams of two veterans with posttraumatic stress disorder. American Journal of Psychiatry, 142, 112-114.
- Foulkes, D. & Griffin, M. (1976). An experimental study of "creative dreaming". Sleep Research, 5, 129.
- Garfield, P. (1974). Creative dreaming. New York: Ballantine Books.

- Griffin, M. & Foulkes, D. (1977). Deliberate presleep control of dream content: An experimental study. Perceptual and Motor Skills, 45, 660-662.
- Hays, W. (1988). Statistics (4th ed., p. 303). Orlando: Holt, Rinehart & Winston, Inc.
- Hearne, K. (1982). Effects of performing certain set tasks in the lucid-dream state. Perceptual and Motor Skill, 54, 259-262.
- Hobson, J. (1988). The dreaming brain. New York: Basic Books.
- Klein, G. (1967). Preemptory ideation. In R. Jessor and S. Feshbach (Eds.), Cognition, personality and clinical psychology (pp. 1-61). San Francisco: Jossey-Bass.
- Koulack, D., Prevost, F., & De Koninck, J. (1985). Sleep, dreaming and adaptation to a stressful intellectual activity. Sleep, 8, 244-253.
- LaBerge, S. (1980). Lucid dreaming as a learnable skill: A case study. Perceptual and Motor Skills, 51, 1039-1042.
- Marquardt, C., Bonato, R. & Hoffmann, R. (1996). An empirical investigation into the dream-lag and day-residue effects. Dreaming, 6(1), 57-65.
- O'Brien, R., Cooley, L., Ciotti, J. Henninger, K. (1981). Augmentation of systematic desensitization of snake phobia through posthypnotic dream suggestion. The American Journal of Clinical Hypnosis, 23(3), 231-238.
- Pearlman, C. (1970). The adaptive function of dreaming. In E. Hartmann (Ed.), Sleep and dreaming (pp. 329-333). Boston: Little, Brown.
- Purcell, S., Mullington, J., Moffit, A., Hoffmann, R. & Pigeau, R. (1986). Dream self-reflectiveness as a learned cognitive skill. Sleep, 9(3), 423-437.
- Reed, H. (1976). Dream incubation: A reconstruction of a ritual in contemporary form. Journal of Humanistic Psychology, 16(4), 53-70.
- Rosenberg, K (1990). Statistics for behavioral sciences (p. 263). Dubuque, IA: Wm. C. Brown.
- Rossi, El. (1972). Dreams and the growth of personality. New York: Pergamon Press.

- Schatzman, M. (1983). Sleeping on problems really can solve them. New Scientist (11 August 1983), 416-417.
- Sheehan, P. & Dolby, R. (1979). Motivated involvement in hypnosis: The illustration of clinical rapport through hypnotic dreams. Journal of Abnormal Psychology, 88(5), 573-583.
- Spanos, N., Nightengale, M., Radtke, H. & Stam, H. (1980). The stuff hypnotic "dreams" are made of. Journal of Mental Imagery, 4, 99-110.
- Tabachnick, B., & Fidell, L. (1989). Using multivariate statistics (2nd ed.). New York: Harper & Row.
- Van Eeden, F. (1913). A study of dreams. Proceedings of the Society for Psychical Research (London), 26(pt.47), 431-461.
- Wile, I. (1934). Auto-suggested dreams as a factor in therapy. American Journal of Orthopsychiatry, 4, 449-463.

Appendices

Appendix A. Thought and Dream Log

SUBJECT NUMBER:

SEX:

AGE:

Average number of dreams recalled during a one week period:

DEBRIEFING MEETING:

Motivation score:

Importance score:

-
1. Fill in the information needed above.
 2. Select a problem of personal relevance with recognizable solution(s). Briefly describe this problem on the back of this page.
 3. Circle the type of problem you have chosen:
 1. Personal
 2. General Objective
 3. Academic
 4. If the most difficult personally relevant problem you have ever encountered has a difficulty value of 100% what percentage would you assign to your current problem?
 5. Perform the bedtime instructions every night for the next week.
 6. Perform the wake-up-time instructions every time you wake up during the night and when you wake up in the morning for the next week.
 7. Please return your completed Thought and Dream Log to the experimenter on the date specified at the first meeting.

8. If you have any questions please call Clint at 745-4965.

Please note that if reporting or thinking about a personally relevant problem results in undue distress you may wish to consider stopping your participation in this study. The following telephone numbers are listed for your reference.

Carleton University Peer Counselling Centre 788-2600 ext. 3581

Distress Centre 238-3311

Rape Crisis Centre 729-8889

Sexual Assault Support Centre 234-2266

Thought Log

Bedtime Instructions

Please answer the following questions in the Thought Log (7 following blank pages) just before going to bed each night. Please use both sides of the paper and feel free to attach more paper if needed.

Questions:

1. What are today's date and time?
2. Did you think about your problem today? "Yes" or "No"
3. If you answered "yes" above please continue, otherwise go to step 8.
4. Briefly describe your first thought about your problem.
5. Did this thought present some form of a solution to your problem? If "Yes" please explain.
6. If you feel the thought presented a solution to your problem, rate the solution on the following dimensions by writing the corresponding numbers after the thought. If you do not feel that your thought helped you with your problem go to step 7.

Completeness: Is this a whole solution or do you need other ideas?

Incomplete 1 2 3 4 5 Complete

Employability: Practically speaking, can you use the solution?

Unusable 1 2 3 4 5 Usable

Novelty: How new is this solution to you?

Old 1 2 3 4 5 New

Personal Satisfaction: Do you like the solution?

Unsatisfactory 1 2 3 4 5 Satisfactory

Specificity: Is the solution clear or did you have to "read into" it?

Vague 1 2 3 4 5 Specific

7. If you thought about your problem more than once today, number each separate thought consecutively. Repeat steps 4, 5 and 6 for each thought.
8. Experimental Group: Please spend the next 15 minutes on attempting to solve your problem. During this time, try to concentrate only on your problem and attempting to solve it. Also, during the next 15 minutes, draw a small picture in the Thought Log that somehow represents your problem. Draw a new picture each night. Please remember to use exactly 15 minutes to complete this step.
8. Control Group: Turn out the light and have sweet dreams.
9. Experimental Group: Turn out the light and have sweet dreams.

Dream Log

Wake-Up-Time Instructions

Please answer the following questions in the Dream Log (7 following blank pages) as soon after waking up as possible. Remember to complete the Dream Log each time you wake up whether it be in the middle of the night or in the morning. Please use both sides of the paper and feel free to attach more paper if needed.

Questions:

1. What are today's date and time?
2. Please record the first dream you can remember. When writing down your dream please include as much detail as possible, consider nothing irrelevant. Also, do not edit the dream to make it more coherent or presentable, we are interested in the dream as it actually occurred.
3. Did this dream present some form of a solution to your problem? If "Yes" please explain.
4. If you feel the dream presented a solution to your problem, rate the solution on the following dimensions by writing the corresponding numbers after the dream. If you do not feel that your dream helped you with your problem go to step 5.

Completeness: Is this a whole solution or do need you other ideas?

Incomplete 1 2 3 4 5 Complete

Employability: Practically speaking, can you use the solution?

Unusable 1 2 3 4 5 Usable

Novelty: How new is this solution to you?

Old 1 2 3 4 5 New

Personal Satisfaction: Do you like the solution?

Unsatisfactory 1 2 3 4 5 Satisfactory

Specificity: Is the solution clear or did you have to "read into" it?

Vague 1 2 3 4 5 Specific

5. If you had more than one dream, number each one consecutively. Repeat steps 2, 3 and 4 for each dream.
6. Have a good day.

Appendix B. Informed Consent Form

An informed consent form provides a description of what the participation in a research project entails. Its purpose is to provide the participant with a clear idea of what is expected of them and that their rights as an individual will be respected.

If you have any questions or comments about this research, please contact Clinton Marquardt (Principal Investigator) at 745-4965 or 834-0307 or Dr. W.D. Jones (Faculty Sponsor) at 788-2600 ext. 2648. If you have any ethical concerns about this research contact Dr. L. Paquet at 788-2600 ext. 2692 (Department of Psychology Ethics Committee Chairperson).

The purpose of this experiment is to explore the relationship between problem solving that occurs during waking consciousness and problem solving that occurs during dreams. Your role as a subject in the study is to briefly describe a personally relevant problem with a recognizable solution(s) that you wish to explore. You will also be required to maintain a Thought Log and Dream Log for a period of one week. The Thought Log will be completed prior to going to bed each night. The Dream Log will be completed upon each awakening during the night and in the morning. You will record your thoughts and dreams, as well as answer questions pertaining to both, in the logs according to the instructions contained within the logs.

I am aware that my participation in this study is voluntary. If for any reason, at any time, I wish to leave the study, I may do so without having to give an explanation and with no penalty whatsoever.

Furthermore, I am aware that the data gathered in this study are confidential and anonymous with respect to my personal identity.

I have read the above form, and, with the understanding that I can withdraw at any time, and for whatever reason, I consent to participate in this study of dreams and their relationship to problem solving.

Participant's signature:

Date:

Investigator's signature:

Experiment #: 95-051

Appendix C. Debriefing

A Comparison of Solutions Generated in Incubated Dreams to Solutions Generated in Waking Thoughts

Dream researchers have been examining the problem solving phenomena in dreams for years. The approaches to studying problem solving in dreams can be placed in one of two categories as dictated by the criteria of awareness of the problem and awareness of the attempts to solve it. In the first category the person is consciously aware of the problem and the intention to find a solution. Lucid dreaming, creative dreaming (and dream incubation) and hypnotic dreaming are the standard procedures used to investigate conscious problem solving in dreams. Serendipitous problem solving and adaptation fall in the second and unconscious problem solving category. In this category the dreamer is not necessarily aware of the problem or the efforts made to solve it.

The present research attempted to replicate and extend the previous findings regarding dreams and problem solving of the conscious type by comparing dream solutions and waking solutions. The creative dreaming and dream incubation model was employed in this replication and extension. Half (50%) of the personally relevant problems were expected to be solved through dream incubation. More dream solutions were expected to be generated by the experimental group than the control group. Incubated dreams were expected to yield more solutions to objective problems than personal problems. Non-incubated dreams were expected to reflect the same trend, with less frequency. Judge's ratings were expected to reflect the same trends as the subjects' ratings with respect to problems solved. A thorough comparison of incubated dream solutions and solutions uncovered during wakefulness extended the current knowledge of dreams and problem solving. Incubated dream solutions were not expected to differ from either groups' waking solutions on measures of Completeness, Employability and Specificity since dreaming is assumed to employ similar intellectual abilities as waking thought. However, the experience of employing the dream state as a problem solving tool was expected to contribute to differences in measures of Novelty and Personal Satisfaction for incubated dream solutions and both groups' waking solutions. The qualitative ratings of non-incubated dreams were expected to be similar to the qualitative ratings of the waking thoughts of both groups.

This experiment employed a control group and an experimental group. The data collected from these two groups will be compared. If you were asked to draw a picture before going to bed, you were in the experimental group. If you were not asked to draw a picture then you were in the control group. If you would like to repeat the experiment as an experimental group participant please speak to the principle investigator. You will be asked to perform a brief dream incubation procedure before going to bed. The procedure may help you to dream about your problem and perhaps generate a solution to your problem.

We would like to thank you for contributing to this study. The time and effort you put in was greatly appreciated. Thank you!

If you have any questions or comments about this research, please contact Clinton Marquardt (Principal Investigator) at 745-4965 or 834-0307 or Dr. W.D. Jones (Faculty Sponsor) at 788-2600 ext. 2648. If you have any ethical concerns about this research contact Dr. L. Paquet at 788-2600 ext. 2692 (Department of Psychology Ethics Committee Chairperson).

Appendix D. Announcement for Recruiting

Psychology 49.100

Dream Experiment

Experiment #: 95-051

Principal Investigator: Clinton Marquardt

Phone: 745-4965 or 834-0307

Supervisor: Dr. W.D. Jones

Phone: 788-2600 ext. 2648

Eighty subjects are required for a dream experiment. The experiment involves briefly describing a personally relevant problem with recognizable solution(s) that you wish to explore. You will also be asked to record, in written format, specific thoughts and dreams recalled for a period of one week and to complete a questionnaire package. You must usually recall at least three dreams per week to be eligible for participation.

Please write your initials and telephone number and indicate the meeting set that is most convenient for you on the sign-up sheet. There are two meetings per set, you must attend both. Simply show up at the time and place of the meeting set you choose. The meetings will be held as listed, if the schedule changes you will be notified. Please do not forget the times and places of the meeting set you choose. The meetings should take no longer than half an hour.

Subjects will receive 2 credits for this experiment. You must keep a record of the experimenter's name, title of the experiment and location and time. It is your responsibility to know where and when the experiment is held.

Meeting Set 1: December XX, at 0XXXhrs room XX of the XXX building and December X+7 days and 0XXXhrs. room XX of the XXX building.

Sign-up Sheet

Initials	Student Number	Phone	49.100 Section	Meeting Set	Best time to call

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