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**Auditory Subliminals:**

**Effects on the Emotional Tone of a Writing Task and on the Subjects' Mood**

**by David Mibashan**

**Thesis submitted to the  
School of Graduate Studies and Research  
of the University of Ottawa  
in partial fulfillment of the requirements  
for the degree of Doctor of Philosophy in  
Clinical Psychology**

 David Mibashan, Ottawa, Canada, 1990



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UNIVERSITÉ D'OTTAWA  
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## Curriculum Studiorum

David Mibashan was born in 1957 in Buenos Aires, Argentina. He received his Bachelor of Arts degree in Psychology from the Hebrew University of Jerusalem in 1982, and his Master of Arts degree in Psychology from the University of Regina in 1983. The title of his M.A. thesis is Reflections of Feelings and the Enhancement of Adolescents' Self-Disclosure.

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## ABSTRACT

The effect of an auditory subliminal message upon the performance of a writing task and upon the mood of the participants was investigated in this study. One hundred and twenty eight subjects (randomly assigned to eight conditions, each one comprising 16 subjects) were asked to create a children's story. One condition was exposed to a happy subliminal message (the word happy repeated every five seconds, 14 dB below ambient noise), one condition to a sad subliminal message, and another condition to a subliminal white noise tape. These three conditions received the message while writing the story. Three additional conditions (incubation) were exposed to the same tapes for twenty minutes before writing the story. In addition, there were two contrast conditions in which subjects were requested to write a happy (sad) children's story without being exposed to a subliminal message. The main dependent measures were: self-ratings of the subjects' mood on the axis of pleasure; judges' ratings of the happiness/sadness of the stories; and happy, sad, happy-related, sad-related, and total word counts.

With regards to the task, the results indicated no effects for the no incubation conditions; a significant difference between the happy and sad conditions among the incubation conditions; and a significant difference between the two upon request conditions. With regards to the mood of the participants, there was a decrease in pleasure for the sad no incubation condition and a similar decrease for the happy

incubation condition.

The main conclusions drawn from the present experiment are: mood and task are affected in an independent fashion by the subliminal messages; the affective tone of the stories did not in turn affect the mood of the subjects in the subliminal conditions; the request to write a happy or a sad story did not give rise to mood change as observed with other supraliminal mood-induction techniques; and it appears that subliminal effects are different from supraliminal effects.



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## INTRODUCTION

Subliminal perception refers to the ability of an individual to respond to a stimulus of which s/he is completely unaware. The notion that humans are able to extract information, analyze it, and utilize it without any consciousness of doing so diverges from the commonsensical belief that in order to respond to a stimulus, a phenomenal representation (i.e., consciousness) of that stimulus is required. While controlled experiments on subliminal perception began in the second half of the past century, there is written evidence of subliminal perception that goes back to the fifth century B.C. A definition of subliminal stimulation and an analysis of the main issues surrounding the topic is provided next.

### **Definition of subliminal perception**

Subliminal perception designates stimulus-response processes in which the stimulus is below the level of awareness (Rees, 1971). Subliminal (from Latin, below the threshold) is a quality of the stimulus. While it does not leave a trace of its presence in consciousness, its influence on the responses of the individual can be recorded.

Several studies in neurology and neuropsychology have found evidence for the

processing of information without this information achieving phenomenal representation (consciousness). For example, Marcel (1983b) conducted a study with two hemianopic patients (cortically blind in one hemisphere due to tissue damage). Results showed that when objects were presented to their blind fields and the patients reported no sight at all, their wrists, fingers, and arms prepared to reach for the objects, accounting for shape, orientation, size, location, and distance. The patients were blind to the objects and could not detect them or comment on them, however they could localize them through eye movements. The sensory qualities of the stimuli had been analyzed with no awareness of so doing.

Weiskrantz, Warrington, Sanders, and Marshall (1974) tested a hemianopic patient who could reluctantly (he always denied 'seeing' anything) and accurately 'guess' the orientation of lines, and could also discriminate between stimuli presented to his blind field. "[the patient] also fails to recognize familiar objects, but he also is unaware that he can detect. In behavioural terms he can both 'detect' and 'identify', at least under our conditions of testing, but he admits to no awareness of either capacity" (p. 723, italics in original). Information that has no possibility of entering awareness (due to lesion), can, however, be perceived by the subject.

Dixon (1971, pp. 12-13, italics in original) stated that six categories of events could qualify as instances of subliminal perception:

(1) The subject responds to stimulation the energy or duration of which falls below that at which he ever reported awareness of the stimulus in some previous threshold determination.

(2) He responds to a stimulus of which he pleads total unawareness.

(3) He reports that he is being stimulated, but denies any awareness (i.e., knowledge) of what the stimulus was.

(4) The subject reports awareness of the stimulus, i.e., he could describe it if asked, but denies any awareness of the fact that he responded to it.

(5) He reports awareness of the stimulus, and of making a response, but professes complete ignorance of any contingency between the two.

(6) In this, the final case, the subject is aware of responding to a stimulus, but unaware of that aspect of the stimulus which governs his response.

Dixon only accepts the first three cases as fulfilling the conditions for subliminality. The essential condition is that the subject cannot, under any



circumstances, be made aware of the stimulus. Situations such as lack of attention or distraction are not, therefore, instances of subliminal perception.

There are different ways of presenting a subliminal stimulus (i.e., below the threshold). They entail the presentation of the stimulus for a very short period of time, or at a very low intensity. The concept of threshold, the differential effects of the same stimuli presented sub- or supraliminally, and the comprehension of the meaning of the subliminal stimulus are discussed next.

### **Thresholds for perception**

A threshold refers to an energy level of the stimulus (or to a noise/signal ratio) below which the stimulus cannot be perceived by the subject at a better than chance level. As an example, a person undergoing an optometrist's check-up reaches a point where s/he can no longer discriminate a B from an E in 50% of the trials.

Swingle (in preparation) described five different thresholds: content discrimination, stimulus discrimination, stimulus detection, behavioural, and physiological thresholds. Before they are detailed, the methods for determining the thresholds require an explanation. Merikle (1984) described two measures of awareness threshold, objective and subjective. In 'guessing' experiments (subjects making discriminations under the impression that they are guessing because the stimuli are too faint), an objective measure is based on chance level error rate. Subjective measures are based on the subject's report. That is, when a subject claims that s/he can no longer see or hear a stimulus, that point becomes the subjective threshold. The objective threshold refers to

the point at which the subject cannot see the stimulus and his/her responses are at or below a chance level discrimination. Although Merikle claimed in 1984 that an objective measure of awareness was more accurate than a subjective one, he changed his position in 1986 by claiming that subjective measures were indeed better indicators of the distinction between conscious and unconscious processes than objective measures (Cheesman & Merikle, 1986).

The thresholds described by Swingle can be determined at the objective or at the subjective level. An objective level is generally lower than a subjectively determined one and is a better indicator of a threshold, because the individual's subjective judgement is not required. The first threshold described by Swingle is the content discrimination threshold. Above this point a subject can accurately (defined as significantly above the chance level) describe the content of a stimulus. For instance, a subject can describe the scene depicted in a painting shown to him/her.

Lower in the energy scale lies the stimulus discrimination threshold. Between this point and the content discrimination threshold, subjects can discriminate between stimuli (for instance in the example of the eye check-up subjects are able to state that two different letters have been presented) although they cannot distinguish the two different stimuli (saying what the two letters are).

The third threshold is the stimulus detection threshold. Above this point subjects are able to state that a stimulus was presented to them but they fail to distinguish what it is. Below this point subjects are not aware that a stimulus has been presented to

them.

The next threshold is the behavioural one. Above this point and below the stimulus detection threshold is where the subject is not able to detect the presence of a stimulus. This is the area where behavioural responses to the stimuli are shown. It is therefore, the region where subliminal effects are found. A stimulus, of which the subject cannot be aware, impacts on the person's responses. Below the behavioural threshold, stimuli do not evoke behavioural responses.

The fifth and last threshold is the physiological one. Below this point, stimuli do not evoke neural responses.

#### **Subliminal and supraliminal effects**

Dixon considered that three criteria indicated the presence of subliminal perception (1971, p. 18, italics in original):

(1) The eliciting of contingent responses by stimulation below the absolute awareness threshold, where this threshold is itself defined as the lowest level of stimulus energy at which the subject ever reports hearing (or seeing) anything of the stimulus.

(2) The retrospective reporting by the subject that he neither saw nor heard anything of the stimulus.

(3) The occurrence of contingent responses, without reported awareness of the stimulus that differ qualitatively from those elicited by the same stimulus when presented above the awareness threshold.

This last point raises a very interesting issue. Brody (1987) claims that the effects of conscious and unconscious processes are essentially parallel and that there are no qualitative differences in the influence of conscious and unconscious stimuli. This view is opposed by Marcel, Merikle, Kihlstrom, and Spence and Holland, each for very different reasons.

Marcel (1983a, 1983b) contends that the information available to consciousness is not the same and it is not in the same form as that available to the unconscious processes. It is for this reason that a stimulus which does not enter consciousness will have a qualitatively different impact than one which does reach awareness, because the processing of different information will lead to dissimilar results.

Merikle and Cheesman (Merikle and Cheesman, 1986; Cheesman and Merikle, 1986) support the idea that a qualitative difference between the effects of the same stimulus presented sub- or supraliminally is the key element that demonstrates the existence of perception without awareness. The different responses elicited are proof that different processes (i.e., perception and subliminal perception) took place.

According to Kihlstrom sub- and supraliminal stimuli elicit different responses because (1987, p. 1448)

...preconscious processing obviates the possibility of conscious countercontrol of these effects. Priming occurs automatically regardless of whether the prime is accessible to conscious awareness, but the automatic effects of consciously perceptible stimuli may be obviated by whatever processing strategies are deliberately deployed to analyze and respond to them.

Spence (1961) and Spence and Holland (1962), following a similar line of thought, postulate that consciousness can actually be restricting. Due to expectations and social factors involved in consciousness, semantic associates of conscious percepts are more restricted than those of unconscious percepts. Material not available to consciousness is processed differently (more extensively) than conscious material.

### **Comprehension of the meaning of a subliminal stimulus**

In one of his experiments with hemianopic patients, Marcel (1983b) showed that the interpretation of a polysemous word (bank) was influenced by the presentation of a disambiguating word (either river or money) to the blind field of the subjects. The experiment showed that the patients could not only perceive stimuli presented to their

blind areas, but that they could also process the meaning of such stimuli.

Groeger (1986b) conducted several experiments to investigate whether the auditory presentation of a cue word at below discrimination and at below detection levels influenced a sentence completion task. In one experiment the words 'smug' and 'cosy' were given as alternatives to complete the sentence "She looked ... in her fur coat". The word 'snug', which is structurally related to the word 'smug' and semantically related to the word 'cosy', was presented at either below discrimination or below detection thresholds. Subjects in the below discrimination condition chose the word 'smug' significantly more often, and conversely, subjects in the below detection condition chose the word 'cosy' more often. Groeger concluded that the below discrimination presentation prompted a structural analysis, while the below detection presentation prompted a semantic analysis of the subliminal stimuli.

In a derivation of the previous experiment, Groeger (1986b) presented the word 'snug' subliminally as before (below discrimination and below detection conditions), while the pair of alternative completions of the sentence was changed to 'smug' and 'snug'. The word 'snug' was chosen significantly more often at the below detection level, indicating not only that there was semantic processing of the subliminal word but that semantic information was not utilized at the below discrimination level.

In a different experiment (Groeger, 1986a), subjects were asked to complete a sentence (e.g., "The planning authority accepted the plan for ... reforestation"), and were given three alternatives: a correct one, 'natural', and two incorrect words, 'pace' and 'storage'. The first incorrect word is structurally related to a subliminally presented

auditory cue ('space') while the second incorrect alternative is semantically similar to the cue word. The results showed that when subjects made a mistake and did not choose the correct word, the structurally similar alternative was chosen more often in the below discrimination condition, while the semantically similar word was chosen more often in the below detection condition. From these experiments it can be seen that semantic processing takes place when the stimuli are presented below the detection threshold.

## REVIEW OF THE LITERATURE

### Early history of subliminal perception

The first suggestion of perception without awareness is attributed to Democritus (470-400 B.C.) in his passage 'much is perceptible which is not perceived by us...' (Beare, 1906; p. 206). There are however some doubts about the authenticity of the quote due to the fact that it was read and interpreted at least five hundred years after Democritus' time. Plato (428-348 B.C.) and Aristotle (384-322 B.C.) later wrote about imperceptible increments, a process that takes place in an unnoticeable way. The return to a homeostatic state (such as the relief of pain, for instance) falls into this category. While the onset of the painful experience is usually quite distinct, its disappearance occurs without a perceptible difference of feelings.

A further step in the history of perception without awareness occurred during the second half of the seventeenth century. Leibniz (1646-1716) stated that 'we always have an infinity of minute perceptions without being aware of them. We are never without perceptions, but necessarily we are often without awareness, namely when none of our perceptions stand out.' (Leibniz, 1981/1698, pp. 161-162). These ideas of Leibniz (together with his description of les petites perceptions, akin to the earlier ideas of Plato and Aristotle) mark the first definition of perception without awareness as it was to be



understood and debated in more modern times. In moving on to the last century, it is in 1863 that Suslowa (Miller, 1939) reported that aesthesiometer sensitivity could be lowered not only with supraliminal electrical stimulation, but also with a subliminal current. Peirce and Jastrow (Collier, 1940) found a similar effect. Subjects made judgements of weights that were less than one JND apart in the belief that they were guessing. Their 'guesses' were consistently above the chance expectation.

In 1898, Boris Sidis performed several experiments, first using himself as a subject and then utilizing other people. In these experiments, cards bearing letters, figures, or names were held at a distance which was too far to allow the subjects to distinguish them. With surprising consistency, participants were able to accurately 'guess' the content printed on the cards. Several experiments followed, all based on the 'guessing' model. In 1908, Stroh, Shaw, and Washburn replicated Sidis' experiment and they obtained similar results. In addition to the visual part of the experiment, they also included a condition where letters were whispered. This is probably the first experiment in auditory perception without awareness.

From the beginning of the century until 1957, research on subliminal stimulation concentrated on the discrimination of the stimulus, optical illusions and learning and conditioning. The main question under investigation regarding the discrimination studies concerns the extent to which a subject can discriminate a figure while believing that s/he is just guessing (i.e., his/her confidence on the response is nil). In this vein, Williams (1938) tried to disentangle the subliminal element in experiments concerning extra-sensory perception (ESP). He found that subjects could distinguish between three

geometrical figures without being aware of receiving any stimuli. Collier (1940) found similar results. These experiments supported the effects of subliminal stimulation and discounted the existence of ESP.

A different line of research, started by Dunlap in 1900, utilized the Muller-Lyer illusion. The drawing was presented in such a way that it resembled two parallel lines of the same length, because these were clearly discernible. The angular lines, however, were subliminal shadows. If there was no influence of the subliminal stimuli, the two parallel lines should have been seen as equal in length. This was not the case. Although the effect was slight, the illusion was present. A final line of research involved learning and conditioning. Thorndike and Rock, Jr. (1934) showed that 'a satisfying aftereffect could strengthen the connection which it followed and to which it belonged in cases where the learner did not know what the connection was' (p. 1). In their experiments on word association, subjects were rewarded for making speech-writing connections (e.g., responding 'now' to the cue word 'begin') and penalized for making meaning connections (e.g., responding 'start' to the cue word 'begin'). Thorndike and Rock, Jr. concluded that subjects could apply a certain rule without knowing it, and without knowing that they were applying it. The learning therefore was considered to be outside the realm of awareness.

A different approach to threshold, which questioned the existence of subliminal perception, was provided by Signal Detection Theory (SDT; Tanner & Swets) in 1954. SDT rejected the idea of a limen even at a specific time for a specific individual. SDT divided the process of responding to a stimulus into two stages: sensing and deciding

on the response. Sensing, according to SDT, does not depend on a lumen, and subliminal stimulation could be understood as signals impinging on the individual but without sufficient energy to evoke a 'signal present' acknowledgement. Awareness, therefore, is not the issue; the strength of the signal is. As these signals have a summation effect, they might be given a signal present value afterwards, thus disclaiming subliminal perception.

Dixon has shown, however, that SDT does allow for the existence of subliminal perception as in the case of subception (where autonomic thresholds for meaningful stimuli are lower than those for verbal report). This is seen when the subject indicates a false negative response (stating 'signal absent' when there was a signal, albeit faint) but his/her actions show that s/he has been affected by the stimulus.

Nineteen fifty-seven marks an important year in the history of subliminal perception. Adams (1957) published a thorough review of the research on behaviour without awareness. Zuckerman (1960) noted that of the 57 articles reviewed by Adams, the majority did not involve the use of subliminals to influence a task or the mood of the participants. Forty-eight studies belonged to the stimulus discrimination category (in their different facets, e.g., ESP, whispering, Muller-Lyer illusion), and seven belonged to the operant conditioning category (e.g., Thorndike & Rock, 1934). Since then subliminals were used less in discrimination studies and began to be employed more as independent variables, where the aim was to measure the impact of subliminal messages on the dependent measures.

It was also in 1957 that a large controversy was precipitated by a commercial firm claiming that the messages 'Eat popcorn' and 'Drink Coca-Cola' presented subliminally to a movie theatre audience significantly increased the sales of these two products. Although there was never a written report on the findings, the uproar was so large that the United States Congress became involved (McConnell, Cutler, & McNeil, 1958). In 1975, George and Jennings replicated the experiment with the aim of increasing the sales of Hershey's chocolate and the results were negative. As a consequence of these studies the public at large became aware of the existence of subliminals.

The present study concentrates on the effects of a subliminal message upon the mood of the subjects and upon the performance of a writing task. The next section reviews the literature on the interaction between mood and task, on studies of subliminal effects on mood and behaviour, and on the methodological issues relevant to the effective presentation of an auditory subliminal message.

#### **Interaction between mood and task**

Mood, as defined by Clark and Isen (1982) is a feeling state characterized by a ready access to a significant amount of positive (or negative) material in memory and also characterized by thinking positive (or negative) thoughts. Feeling states are to be distinguished from emotions in that they are not attention-getting, nor do they interrupt ongoing behaviour through an abrupt change in activity. A mood, or feeling state, gently

redirects ongoing thoughts and behaviours to affect the thoughts or behaviour which will occur next, within the existing context.

Clark and Isen suggest that moods are prolonged because they lead to similar behaviours and thoughts. Moods are not directed towards any particular subject and are not related to any specific set of behaviours. The conduct influenced by such moods is determined by what in the environment receives the person's attention.

Emotions, on the other hand, are usually more intense and involve arousal together with a cognitive component utilized to interpret the emotion. Emotions are more closely tied to specifiable behaviour and they usually change the interaction between organism and environment quite abruptly.

In summary, moods are pervasive, do not interrupt ongoing behaviour, are transitory and frequent, and are not directed towards a specific behaviour.

**Mood induction procedures.** Several supraliminal methods have been employed to induce a positive or a negative mood in order to study their effect upon behaviour and thought. The methods described here were all shown to affect the self-rated mood in the expected direction:

Self-referent mood statements. This is the most widely used method and it was developed by Velten (1968). Subjects are required to read aloud 60 positive, neutral or negative self-referent statements (according to the induction employed) such as "For the rest of the day, I bet things will go really well" (positive); "I feel rather sluggish now"

(negative); "The typography and the paper were of highest quality" (neutral).

Autobiographical Recollections Method. Brewer, Doughtie, and Lubin (1980) developed a technique that requires subjects to recall past personal sad events. Subjects are asked to recall three events in their lives that made them feel lonely, rejected or hurt. The entire procedure lasts 11 minutes and it is effective in lowering the mood ratings. Imagery is used to relive the experiences recalled more intensely.

Taped story. Williams (1980) used a sad and a neutral taped story and asked subjects to listen to it. The sad story asked the subject to imagine a friend falling ill and dying of lymphoma. The tape concentrates on the subject's own feelings of helplessness and loneliness. The neutral tape asks the subject to imagine that s/he is preparing a collage and concentrates on the shapes and on the materials.

Success/failure feedback. Isen, Clark, Shalke, and Karp (1978) exposed subjects to preprogrammed wins or losses on a video game. Subjects played under the impression that winning or losing depended on their skills while indeed their success rate was determined by the experimenters.

Film presentation. Isen and Gorgoglione (1983) presented five minute segments of film. A comedy, and a man running away from something unknown were used for the positive and the negative conditions respectively.

Gift offering. Isen and Daubman (1984) offered free gifts to subjects in order to induce a positive mood. In related experiments gifts were offered to shoppers at a shopping mall. These people were subsequently asked to participate in a seemingly unrelated study. The gifts were effective in improving the mood of the participants.

Mood induction procedures showed an impact on psychomotor activity, problem solving, social behaviour, judgement making, memory, and behavioural effects in general. A brief review of the major findings is provided next.

Velten (1968), Hale and Strickland (1976) and Matheny and Blue (1977) showed that subjects wrote a series of numbers faster when experiencing a positive mood. Isen, Daubman and Nowicki (1987) conducted an experiment where subjects were requested to solve a creative problem (Duncker's candle task). The prior induction of a positive mood made the resolution of the problem more likely.

Regarding social behaviour, Clark and Isen (1982) showed that subjects who had been given a free gift were more ready to help a stranger in distress in a seemingly unrelated situation. Strickland, Hale and Anderson (1975) showed that when subjects were in a positive mood and were asked to choose their preferences from a list of activities their choices reflected more social and active behaviour than those chosen by people in a negative mood.

Clark and Isen (1982) showed that subjects who had an induced positive mood made more positive judgements when rating neutral faces. With regards to memory,

Isen (1985) showed that while a positive mood facilitated the recall of positive memories, a negative mood did not facilitate the recall of negative instances. She explained these results in terms of a coping mechanism of trying "to chase the blues away". With respect to performance, Goodwin and Williams (1982) have found that a negative mood provoked more pauses in speech and a lowered task performance.

In summary, the literature on mood induction indicates that a task (e.g., watching a movie, playing with a computer) can induce a mood, and in return this mood can influence a task (e.g., performance on a writing task, memory, social behaviour, aesthetic judgement). There is, therefore, a bidirectionality of effects between mood and task.

While the connection between these two elements (mood and task) has been shown at a supraliminal level, few studies have concentrated on the subliminal induction of mood, as is the case in the present study which studies the influence of subliminals on mood and on the performance of a task. Furthermore, no studies have investigated the effects of the affective properties of mood (happy/sad) upon the affective properties of the task performed by the subject, as the present study investigates, whereby the affective tone of the stories written by the subjects will be evaluated.

### **Subliminal effects to the mood and the behaviour of subjects**

**Emotional judgement of neutral faces.** This line of research investigated whether a



subliminal message of an emotional nature would influence the judgement of a percept. Smith, Spence and Klein (1959) visually presented the words 'happy' or 'angry' subliminally (starting at a 4 msec exposure) while a subject was looking at a supraliminally exposed image of a neutral face. Subjects were asked to describe the expression of the face. The results showed that when the happy stimulus was present the face was rated as significantly happier than when the angry stimulus was presented.

Wiener and Schiller (1960) and Wiener and Kleespies (1968) have postulated that the supraliminal perception of some of the structural elements of the subliminal stimulus might account for the phenomenon of subliminal perception. This explanation is referred to as the partial-cue hypothesis. Contradicting the hypothesis, however, Groeger (1984) has shown that a below detection stimulus does not only elicit a response without the person's awareness, but that the response is semantically, and not structurally, related to the subliminal prompt. If a part of the stimulus was seen, and the subject was not aware of it, the fact that the connection to the response was a semantic one indicates an unconscious processing of the material, opposing the partial-cue hypothesis expectation that just a structurally similar response would be elicited.

Henley (1975) conducted a similar experiment to that of Smith et al. Twenty subjects were shown slides of a neutral face supraliminally while at the same time they received an auditory subliminal message. The message was either the word 'happy' or the word 'sad' presented below threshold to one ear while supraliminal tones were

presented to the second ear. Subjects were asked to describe the changes that they perceived in the faces presented. All the slides were identical. There were two interesting findings in this study. In the first place, Henley did not find an effect for the subliminal stimuli. That is to say that the ratings of the face were not different under the happy or the sad message. The second finding was the following: at the beginning of the experiment, subjects were exposed to a series of eight identical slides while receiving the happy or sad message. After this first series, a second one ensued, with the same eight slides but with no subliminal message present. Unexpectedly, the responses to this second series reflected (at a significant level) the order of the happy and sad subliminal stimuli presented before. That is, during the first series the subliminal stimuli were presented in the following order: H, S, S, H, S, H, H, S. In the second series, the slides 1, 4, 6 and 7 were rated as significantly happier than slides 2, 3, 5 and 8. This finding indicates that subthreshold stimuli are stored in the order in which they were presented and they also reappear in that same order. This unexpected capability for storing subliminal stimuli was corroborated by Swingle in 1979.

Somekh and Wilding (1973), also replicated the experiments of Smith et al. with similar results. They also showed that unconscious discriminations can be finer than consciously obtained ones. As an example of this, they carried out an experiment in which the words 'happy' and 'sad' were subliminally presented (visually) while subjects rated the pleasantness of a supraliminal visual stimulus. The subliminal stimuli were presented to the nondominant eye below the detection threshold. The words were effective in influencing the judgement of the neutral face. However, when the words

'harpy' and 'sap' were presented subliminally instead, the effect was not found. Even more interesting was the finding that at supraliminal levels, the words 'harpy' and 'sap' were mistakenly understood as 'happy' and 'sad'.

The experiments described in this section show that the meaning of the messages was processed and that the words 'happy' and 'sad' were effective when employed in a subliminal message. These studies did not measure the mood of the subjects, raising an interesting issue regarding the influence of the messages. Did they change the percept (the neutral face) or did they put the subjects in a different mood which lead to a different judgement? The studies reviewed do not allow for a solution to this issue.

**Mood Induction.** Several researchers have investigated whether a subliminal stimulus of an emotional nature could increase the anxiety level of the subjects. A search for the factor that triggers a panic or an anxiety attack in some individuals led to the hypothesis that clues to which the person is unaware might be responsible for increasing their anxiety level.

Tyrer, Lewis, and Lee (1978) employed visual subliminals in two experiments in an attempt to elevate the anxiety of the subjects. In the first experiment, 24 subjects were paired according to their scores on the Trait Anxiety Index of the State-Trait Anxiety Inventory (STAI). One group was subliminally exposed to 20 anxiety-inducing words (e.g., coffin, cruel, hatred) below the detection threshold, while the second group

was exposed to the same words but at a supraliminal level. Both the State Anxiety Index of the STAI and an anxiety factor score (measured on a Semantic Differential Scale) showed a significant increase in anxiety for both groups. Additional paper and pencil scales measuring bodily symptoms associated with anxiety (e.g., sweating, palpitations) did not distinguish between the groups nor did they indicate a pre/post difference. While this experiment might indicate that subliminal stimulation is as effective as supraliminal stimulation to elicit anxiety, the lack of control groups (exposed sub- and supraliminally to neutral words) impedes the ruling out of alternative explanations, for example, that it was the experimental set up that provoked the increase in anxiety. An experiment conducted by Kemp-Wheeler and Hill (1987) corrected this shortcoming. This experiment will be described immediately after the second Tyrer et al. study is reviewed.

The second experiment conducted by Tyrer et al. involved the subliminal presentation of an emotive film (a speeded up sequence of a car driving through a bustling city) or a neutral one (a swan floating on a lake). The level of illumination of the film was decreased by employing dark filters in front of the projector and by increasing background illumination in the projection room. The anxiety factor, measured by the Semantic Differential Scale, was increased by the emotive film and decreased by the neutral film. This experiment showed that subliminal stimulation can induce anxiety.

Kemp-Wheeler and Hill (1987) conducted a study in which 28 subjects were divided into two groups matched according to the trait scale of the STAI. One group

was subliminally presented with 20 emotional words shown tachistoscopically (e.g., suicide, rape, grief) and the other group was subliminally presented with 20 neutral words (e.g., pass, utilities, wrist). The stimulus words were presented below the detection threshold of the subjects. The dependent measures were heart rate (HR), respiration rate (RR), state anxiety on the STAI, Semantic Differential Scale of anxiety, and five analogue scales to measure aspects of perceived somatic anxiety (sweating, shaking, palpitations, difficulty in breathing and muscular tension). The anxiety factor and three of the five perceived aspects of somatic anxiety showed an increase in anxiety for the emotional group as opposed to the control one. HR and RR increased in both groups, and the authors speculated that the posture the subjects had to maintain during the subliminal presentation and the fact that many of them were holding their breath in order to pay more attention to the tachistoscope provoked the increase in these measures. The experiment conducted by Kemp-Wheeler and Hill showed that emotional words presented subliminally do increase anxiety.

Investigating also the mood induction phenomenon, Borgeat, Elie, Chaloult, and Chabot (1985) were interested in verifying if words hidden in rock'n'roll music could have a negative influence on adolescents and if a relaxed passivity facilitated receptivity of the subliminal message. To that end they checked whether physical responses could be influenced by the meaning of subliminal auditory stimuli. To better quantify the responses, Borgeat et al. concentrated on psychophysiological measures such as skin conductance responses, frontal muscular activities and heart rate, each of which was

monitored while the subjects were auditorily exposed to emotional and neutral words masked by white noise. The words, presented in French, were similar in sound but differed in their meaning. The emotional words (with their English translation in brackets) were: violer, putain, pénis (rape, whore, penis), and the neutral ones were: voiler, patins, tennis (veil, skates, tennis). The subjects were each exposed to two conditions: an alert and a relaxed one. During the alert condition they were instructed to listen to possible words or sounds that might appear imbedded in the masking white noise, and to signal their detection and identification of the words. The dB level of the subliminal words was increased from 0 up to identification level in increments of 5 dB.

The results showed that the messages did elicit psychophysiological responses, that these were related to the meaning of the stimulus, that passive listening was more susceptible to subliminal influence (as postulated by Fiss in 1966 and by Dixon in 1971), and unexpectedly it was found that neutral words elicited stronger responses than the emotional ones. Borgeat et al. explain this phenomenon as a situation similar to perceptual defense, that is, the individual identifies the emotional words and responds by raising the threshold to them. This phenomenon indicates that the subjects were able to distinguish between emotional and neutral words and were able to react differentially to them even when they were not aware of the content of the message.

Robles, Smith, Carver and Wellens (1987) utilized the anxiety portion of the Multiple Affect Adjective Checklist (MAACL) and the state anxiety scale of the STAI to study changes in the anxiety level following the visual presentation of positive, neutral and negative subliminal stimuli. They found that threatening images elicited more anxiety

than neutral images, and these in turn elicited more anxiety than humorous ones. Robles et al. reported that their experiment was the first one in which the dependent variable was not an evaluative judgement about some external stimulus (like the judgement of neutral faces while being exposed to an emotional subliminal message) but rather the subject's self-reported mood.

**Perceptual defense and subception.** Perceptual defense is the phenomenon whereby recognition thresholds are contingent upon the emotional characteristics of that which is recognized. It has been shown that the response latency for the correct report of an emotional or anxiety provoking subliminal stimulus differs from those for neutral stimuli (Dixon, 1971).

The significance of this phenomenon is that in order to postpone conscious recognition of a word there has to be an earlier (unconscious) process of distinction between emotional and neutral words. This prior discrimination leads to a signal of the threat value of the message.

Dixon and Henley (1980) summarized the preconscious processing taking place in perceptual defense in the following manner: "structural followed by semantic analysis of the stimulus material, leading to activation of pre-existing emotive representations in long-term memory (LTM), which in turn evokes an autonomic response, which initiates a feedback (or more strictly a 'feed forward') control on the awareness and recognition thresholds." (p. 40).

Lazarus and McCleary (1951) investigated whether individuals were able to identify the significance of two words before reporting recognition of them. They hypothesized that indeed an individual was able to distinguish between a threatening word (e.g., death) and a nonthreatening one (e.g., boat) at an autonomic level. They coined the term subception to explain the effect whereby "tachistoscopically exposed nonsense syllables which had been associated with painful electric shocks stimulated larger GSR's than nonshocked syllables even when the exposure speeds were too rapid for the subject to identify them correctly....[Subception is] a process of autonomic discrimination in the absence of the ability to report conscious recognition..." (Lazarus, 1956, p. 343).

To test whether subjects could discriminate autonomically (i.e., changes in the GSR between syllables), Lazarus and McCleary (1951) conducted an experiment in which nonsense syllables were associated with either a shock or a nonshock situation. When the syllables were presented subliminally, at a later stage, the subjects were not able to distinguish them. The shock syllables, however, elicited larger GSR readings. The choice of nonsense syllables, conditioned shock, and physiological measures was made in order to avoid procedural difficulties inherent in more subjective measures, and to distinguish the physiological responses from the verbal ones. The results clearly indicated that subjects were able to make discriminations even when unable to report conscious recognition (a fact also demonstrated by Corteen & Wood, 1972; Henley & Dixon, 1974; and Borgeat & Goulet, 1983).

Lazarus and McCleary's experiment initiated a long standing debate. Perceptual



experience is, by definition, conscious according to Eriksen (1960) and to Fuhrer and Eriksen (1960). Verbal report is an adequate indicator of consciousness although in some instances verbal report might be insufficient to communicate it. Eriksen (1956) discarded the phenomenon of subception as an artifact. Eriksen contended that there is always a (conscious) perceptual process following the stimulus and that GSR and verbal response are but two different manifestations of this process. As this perceptual process is a previous stage to those of GSR and verbal response, a correlation between these last two elements does not indicate the existence of the subception effect, but it indicates that the perceptual process (a phenomenal representation) took place. In the case of Lazarus and McCleary's experiment, Eriksen explained that GSR was a faster indicator of perception, and this might be due to the fact that having a continuous response range for the GSR and a discrete one for the words can mask a discrimination because the subject cannot verbalize it (the response) due to the lack of appropriate response categories.

Eriksen stated that "To accept Lazarus and McCleary's conclusion that discrimination was shown by the GSR in the absence of conscious awareness, we must be prepared to assume that a language consisting solely of 10 nonsense syllables is sufficient to describe the entire realm of subjective awareness." (Eriksen, 1956, p. 79). In response to Eriksen, Lazarus (1956) replied that "The subception effect suggests not that autonomic discrimination is better than verbal perception, but that it can be prior or responsive to aspects of the stimulus which are not verbally articulated." (Lazarus, 1956, p. 345).

Eriksen's position entails a contradiction. This contradiction is that, according to him, if subliminal stimuli elicit any responses at all, that proves that the stimuli were perceived consciously. Bowers (1984) explained the issue as follows:

...it seems clear that there is a contradiction at the heart of his argument [Eriksen's]. He seems to argue that any verbal or nonverbal discrimination is, in effect, evidence of conscious perceptual experience. However, such a position means that subliminal perception is a logical impossibility, since any evidence for discriminative responsiveness is de facto evidence for conscious (i.e., supraliminal) perception. But if subliminal perception is logically impossible, then its existence is not an empirical issue, despite all of Eriksen's attempts to resolve the issue empirically. In other words, Eriksen's explicit commitment to the empirical resolution of whether subliminal perception exists is at loggerheads with his implicit commitment to the notion that any discriminative response to a stimulus reflects conscious perception. (p. 232, italics in original.)

The areas of perceptual defense and of subception show that individuals are able to distinguish subliminal stimuli and react accordingly. Furthermore, depending upon the threat value of the message, the organism might even raise the threshold for entrance into awareness of the threatening stimuli.

**Preferences and cognitions.** Kunst-Wilson and Zajonc (1980) employed visual subliminals

to test whether cognition was a prerequisite to affective discrimination (judging on a like-dislike scale). It was commonly held that repeated exposure to a stimulus lead to an increase in liking for the stimulus. Kunst-Wilson and Zajonc maintained that affective discrimination was not dependent on recalling the stimuli. In order to test their hypothesis they subliminally exposed subjects to a geometrical figure (an octagon). Subjects were then supraliminally shown two octagons, one being the stimulus figure shown previously. When the subjects were requested to recognize the stimulus among the two possibilities, the results were at about the chance level. When subjects were asked which one they liked better, however, they chose the stimulus figure more often than the other octagon.

Zajonc (1980) and Zajonc and Markus (1982) concluded that affect and cognition are partially independent from each other and that consciousness of an object is not necessary for the person to indicate a preference.

Bornstein, Leone and Galley (1987) conducted three experiments to test the preference effect. In the first experiment, a replication of the Kunst-Wilson and Zajonc (1980) study, their subjects were exposed to images of irregular polygons at subliminal exposure times (4 msec) and at supraliminal exposure times (48 msec). The subjects were then shown two cards bearing polygons and were asked to indicate which one they preferred. One card depicted the polygon previously shown to them, while the other card was an unfamiliar polygon. A different group of subjects was also shown two cards (same as before) and asked to recognize the stimulus card among the two. The

results showed that at subliminal exposure times subjects could not recognize the stimulus card. Their preferences, however, clearly rested with the familiar card. This experiment shows that affect and cognition might be employing two processes and that recognition is not a prior step to that of preference.

The second experiment conducted by Bornstein et al. was similar to the first one but the stimuli were photographs of faces instead of polygons. Once again, people preferred familiar (i.e., faces they had been exposed to before) faces to new ones. The third experiment entailed an in vivo replication of the previous study. Subjects were shown, in a subliminal fashion, a photograph of a person and then they engaged in an interaction with the person depicted in the picture and with another individual (both confederates of the experimenter). The results showed that when the subjects were put into a position where they had to agree with one of the two confederates, they sided with the familiar person.

A characteristic of Bornstein et al. research of special importance is the setting of the threshold. In all studies Bornstein asked an additional group of subjects to make judgements regarding the presence or the absence of the stimulus for 60 subliminally presented slides, half of which were stimulus slides and half of which were blanks. If the stimuli could not be detected then the accuracy of the judgements should not differ significantly from chance (50%). This was indeed the case. Bornstein's research showed that a 4 msec stimulus which could not be detected by the subject had an impact on his/her behaviour.

Merikle (1982) and Cheesman and Merikle (1986) claim that there is no basis for

assuming that visual subliminal stimuli are effective. The studies described by them involve a technique different from the one employed by Bornstein, and it is not relevant to the present experiment. In synthesis, the subliminal method utilized by Merikle and by Cheesman involves the masking of a stimulus by the presentation of another one, and therefore stopping the first stimulus from reaching consciousness. The exposure times of the 'subliminal' stimuli, however, would render them supraliminal were it not for the mask. While their experiments show that subliminal perception has not been demonstrated employing the masking technique (and the topic is far from exhausted), that discussion is not relevant to studies employing visual stimuli which are not masked by another stimulus (e.g., Bornstein's) or to studies of auditory subliminal perception.

**Subliminal Psychodynamic Activation.** Bornstein's manipulation checks were based on a study by Silverman (1966) who conducted many experiments showing subliminal influences on the mood and performance of subjects. Silverman hypothesized that by employing subliminals he could investigate the Freudian unconscious. The term unconscious as used in psychoanalysis differs from the one mentioned elsewhere in this review. Psychoanalytic theory distinguishes between preconscious processes, which occur outside of the subject's awareness but can be easily made conscious (by increasing the stimulus intensity or by attracting the subject's attention), and between unconscious processes, which are not accessible to awareness at the time of their occurrence due to interfering psychological processes (repression). Psychoanalytic

theory asserts that the rules for the processing of unconscious material (primary processes) differ from the rules for the processing of preconscious or conscious material (secondary processes).

It is precisely because of the differences in processing of conscious and unconscious material that Silverman viewed subliminal stimulation as a useful research tool for primary (unconscious) processes.

There are in psychoanalysis two kinds of theoretical propositions. Genetic theorists approach current behaviour in terms of earlier events and experiences and the formation of the unconscious processes and structures; while the dynamic approach studies how behaviour is influenced by the present interactions of the individual with his/her surroundings. These surroundings are not similar to behavioural tenets but are comprised of the unconscious wishes, anxieties, and fantasies that motivate behaviour. Silverman claims that these elements can be reached through subliminal stimulation which bypasses awareness and is therefore analyzed by the individual with the help of the inner-oriented primary process, rather than the reality-oriented secondary process. Silverman set out to test psychoanalytic hypotheses which linked deep-seated conflicts with their manifestations as symptoms (e.g., oral aggressive tendencies towards mother for schizophrenics, anal fixations for stutterers). The issue of concern here is that the evoking of certain unconscious elements, such as wishes, anxieties, and fantasies, carried out through the use of subliminals, will lead to an increase or a decrease in psychopathology. Silverman worked with both clinical and nonclinical populations.

Silverman's studies showed subliminal influences on mood, behaviour and

thought processes. Four reviews of Silverman's work (Mendelsohn & Silverman, 1982; Silverman, 1985a; Silverman & Weinberger, 1985; Silverman, Kwawer, Wolitzky, & Coron, 1973) documented the following effects: several clinical groups (schizophrenics, depressives and stutterers) increased their symptomatology after exposure to subliminal stimuli which were designed to stir up their particular unconscious conflicts. Following psychoanalytic lines of thought, schizophrenics were exposed to aggressive or sexual messages, depressives to messages of oral-aggressive content, and stutterers to anal stimuli. The experiments showed an increase in disordered thinking and in nonverbal pathology for the schizophrenics. Symptoms intensified in depressives and stutterers as a result of the procedure.

Another area investigated was whether a task could be influenced. Accuracy in a dart throwing competition for a nonclinical population was enhanced or impaired with the subliminal messages **Beating dad is OK** or **Beating dad is wrong**. These messages, according to Silverman, Ross, Adler and Lustig (1978) are related to Oedipal conflicts, that is, the wish to be better than the father, while at the same time the fear to do so.

A different area of research investigated by Silverman is that of the merging stimulus. Silverman hypothesized that humans have powerful wishes, typically unconscious, for a state of oneness with another person (Silverman & Weinberger, 1985). This symbiosis has its origin, according to psychoanalytic theory, in childhood, when the child experiences the "good mother of early childhood".

In clinical populations the subliminal presentation of the merging message

**Mommy and I** are one reduced pathology in 'differentiated patients' (those with a somewhat developed sense of self). Silverman and his colleagues claimed that the presentation of this same stimulus to nonclinical groups in different settings significantly improved the participants' adherence and betterment in an alcoholism program (Schurtman, Palmatier, & Martin, 1982), learning of math classes (Ariam & Siller, 1982), weight reduction programs (Silverman, Martin, Ungaro, & Mendelsohn, 1978), and in smoking cessation programs, assertiveness training courses, and others (Silverman & Silverman, 1964; Parker, 1982; Silverman, Lachmann, & Milich, 1984; Bryant-Tuckett & Silverman, 1984).

Silverman's line of research has encountered several criticisms on its way. Although several replications of his findings have succeeded (Silverman, 1980), several attempts have failed (Silverman, 1985b). The choice of different dependent measures for his own studies and the fact that there were several projective scales employed as dependent measures, made replication of the studies difficult as Balay and Shevrin (1988) pointed out. They also mentioned that some of the control messages (e.g., **People are talking**) might not be neutral for some subjects and might influence the results.

Balay and Shevrin also criticized the universality of the merging stimulus. Shevrin has isolated words that are unique to each patient's psychopathology. These words seem to activate brain processes related to the external symptoms and inner conflicts of the patient. While it is logical that specific words will have a specific meaning for an individual, the universality of the merging message seems to be supported by a large



body of experiments (see the reviews mentioned earlier). The issue of the universality of the merging message, however, is irrelevant to the experiment described here, as it deals with the Freudian unconscious, which is not explored in this dissertation.

Silverman's studies raise several methodological aspects which complicate replications and cast doubt over some of his findings. His research project, however, seems to indicate that subliminals are effective in changing mood, behaviour, and thought processes. Two interesting findings are: first, that subliminal stimuli have different effects than the same stimuli presented supraliminally; secondly, in regards to the experiments aimed at increasing pathology, it seems that the messages affect the person and not the percept. Stutterers, for example, do not utter anal words or describe the stimulus as a consequence of the subliminal message. The effect is a more profound one, which in turn leads to the stuttering.

**Boundary studies.** Fisher (1975) investigated the impact of auditory subliminal messages on the perceived body boundary. The body boundary refers to the tendency of a person to defend him/herself against intrusions and it is measured with the aid of the Barrier index scored in the Holtzman inkblot series. He hypothesized that men would be more upset than women when feeling that foreign material had gained entrance to them in a fashion which they could not control.

Fisher found that subjects were influenced by the presentation of subliminal messages of different content (aggression, depression, reassurance, vulnerability). Men were affected by all the messages, while none of them had an effect on women. The

presentation of the same stimuli supraliminally (Fisher and Greenberg, 1972) had only produced a decrease of the body boundary scale for males. This effect only applied to the aggressive message while the other messages were ineffectual. Fisher's studies lend support to the theory that men and women will react differently to intruding stimuli and to the theory that the same message will have different effects according to the mode of presentation, sub- or supraliminal.

In 1976, Fisher replicated his earlier studies and showed that making his subjects aware that they were being exposed to a subliminal message did not diminish the effect of the tapes. He also found that the request that subjects pay attention to a blinking light and try to find a pattern to that blinking acted as a competing stimulus that cancelled the effect of the subliminal messages. In summary, Fisher showed that subliminal messages presented below the detection threshold were effective in modifying people's thoughts and behaviour. Fisher's method of presenting subliminal messages is simple and has several advantages. The method will be described shortly.

**Recovery of subliminal images in dreams.** The Poetzl phenomenon (Erdelyi, 1972) is the ability to recover in dreams aspects of a picture shown for a very brief period of time. The recovered aspects could not be described immediately after the exposure. For example, subjects exposed to a picture of the temple ruins at Thebes for 1/100 of a second were asked to report their dreams, draw their images, and search for similarities between the dream and the original picture. Not only was there a significant recovery of elements from the picture in the dream, but also, the elements recovered were those

which had not been consciously described immediately following the exposure to the image.

**Subliminal effects on a writing task.** In two pilot studies conducted by the present author, subjects were asked to write a children's story while being exposed to a happy or a sad auditory subliminal message. The results indicated that the stories reflected the tone of the message, that is, stories in the happy condition were happy and conversely, stories in the sad condition were sad. Furthermore, the mood of the subjects experienced a reversal. Subjects that wrote a happy story ended the task with a sadder mood than the initial one; subjects in the sad condition finished the task with a more elated mood than their initial one. This reversal effect, first identified in our pilot studies, has not been previously reported in the literature. We shall use this thesis, therefore, as an occasion to check on the robustness of this effect. If indeed the phenomenon is found, we shall discuss it, including its possible causes, in the final chapter.

Interestingly, the stories written by the subjects in the sad conditions were longer (measured by the number of words) than the happy condition stories. It was also found that the sad tape was as effective as the happy tape in eliciting subliminal effects. These last two findings are important in light of Isen's (1985) finding that sad messages presented supraliminally were not as effective as happy messages, a fact that they attributed to the use of coping mechanisms to avoid the sad material. Goodwin and Williams (1982) and Velten (1968) had demonstrated that a sad mood-induction

produced less writing than a happy mood-induction. There is an indication, therefore, that the subliminal presentation of a sad message might provoke different effects than those induced by a sad supraliminal message.

The two pilot studies showed that the messages influenced the tone of the stories, making them happier or sadder. The mood of the participants was also influenced.

#### **Presentation of the subliminal stimuli – Methodological considerations**

It is important in this study to present the stimuli not only below the discrimination threshold but also below the detection threshold. In this latter case subjects cannot detect the presence of a subliminal message even when told that there is one (Hutchinson, 1988). Merikle (1984) described two different ways of determining a threshold, a subjective way and an objective one. A subjective threshold is defined at the point where a subject claims that s/he can no longer identify or detect a stimulus. An objective threshold is defined as that point where not only the subjects claim no awareness but also their detection of the subliminal stimulus is not above a chance level (50% of correct responses). An objective threshold is more stringent and more accurate than a subjective one.

In 1988, Hutchinson investigated a method of presenting auditory subliminal messages below the detection threshold. In that study he first determined the

discrimination and the detection thresholds for the subjects. Employing a method-of-limits, the subjects had to report any stimulus that they could identify. The stimuli were letters of the alphabet presented auditorily. If the subjects heard something but could not identify it, they were asked to tap on the table to signal detection. Because it had been found that feedback about the correctness of the answers could lower the discrimination thresholds (Zwislocki, Maire, Feldman, & Rubin, 1958), Hutchinson provided feedback to the subjects.

Once the discrimination and detection thresholds had been established (at the detection threshold subjects could no longer state the presence or absence of a stimulus above a chance level), the experimenter proceeded to present stimuli to the subjects at intensities ranging from 5 to 40 dB below the detection threshold. Subjects were asked to guess what letter was presented while at the same time indicating the confidence with which they were giving their responses.

The results showed that more than half of the subjects guessed correctly the letters presented below their detection threshold well above the chance level. The subjects were claiming "no confidence" on their judgements. A retest yielded similar results. These findings indicated that at intensities lower than that at which the subjects could no longer state the presence or the absence of a signal, they were able to 'guess' the letters presented subliminally. There were no correct responses at 5 dB below the detection threshold, nor at the 35 dB level and below (Hutchinson suggests that this is probably the physiological threshold, below which stimuli have no effects). The range where there were more correct responses was at the 15 to 25 dB levels.

Hutchinson's experiment showed that below an objectively determined detection threshold (utilizing feedback and forced-choice response to increase accuracy) there is an area where subliminal stimuli have a behavioural impact on the subject (in this case, 'guessing' letters). This is precisely, the subliminal effect, i.e., the eliciting of responses influenced by a stimulus outside the awareness of the individual. The range more susceptible to this influence is not just below the threshold, but well below it.

Fisher (1975, 1976) devised a method of presenting a message below the ambient noise level. The loudness of the tape measured at the speaker is just above the ambient noise. The farther away the person is situated from the speaker the volume of the message will be lower at the reception point. Employing several intensities it can be calculated at what loudness the message is arriving at the subject. By manipulating the distance between the subject and the speaker, a below ambient noise rendering of the stimulus can be obtained reliably.

Four studies conducted by Swingle (in preparation) showed that at intensities of 15 dB below ambient noise no subject could detect the presence or absence of the stimulus in a forced choice situation.

Fisher's method is simple to implement and it has two important characteristics. First, it insures that the message is subliminal and second, it is easy for the experimenter to check that the message is actually playing.

### **Rationale of the present study**

The present study evolved from an interest of the author in the fields of subliminals and creative writing. While the interaction of effects between mood and tone has been studied independently of the field of subliminal perception (Clark & Isen, 1982; Velten, 1968; Hale & Strickland, 1976; Isen et al., 1987) and the effects of subliminal messages have been seen on the performance of a task (Somekh & Wilding, 1973; Bornstein et al., 1987, Silverman et al., 1978) and on the mood (anxiety) of the subject (Tyrer et al., 1978; Borgeat et al., 1985; Kemp-Wheeler & Hill, 1987; Robles et al., 1987) none or few subliminal studies have concentrated on:

- (1) the subject's self-reported mood on a pleasure axis
- (2) the interaction mood-task
- (3) the affective properties of the task performed

A majority of researchers believe that the sub- or supraliminal presentation of the same stimulus will evoke different responses (Marcel, 1983b; Merikle & Cheesman, 1986; Kihlstrom, 1987; Spence & Holland, 1962) and there is ample experimental confirmation of this phenomenon (Fisher & Greenberg, 1972; Fisher, 1975). It is relevant, therefore, to conduct an experiment investigating the influence of a subliminal

message upon the mood of the participants, the affective tone of the task they perform and the interaction between the mood and the task. Unlike experiments employing the guessing model, where subjects attempt to discriminate between stimuli, the present study investigates the effects of a happy/sad subliminal auditory message that is presented for an extended time.

In the present study (described in detail in the next chapter) participants will be asked to create a children's story while (or after) being exposed to a subliminal message (the words 'happy' or 'sad', or white noise at a subliminal level). The tone of their stories (happy/sad) and their final mood will be the main dependent measures.

In the pilot studies the tone of the stories was affected by the subliminal messages. The following examples, taken from those studies, show the beginning of two stories. The first one belongs to the happy condition: "It was a warm and sunny day in July when Bob aged seven decided to take his dog Sarge to the park to play. Sarge was a big strong German shepherd who loved to play in the park with Bob". The following excerpt belongs to a story in the sad condition: "It was Sten's birthday. He was six years old. 'What an awfully long time to be alive,' was his first thought when he woke up. It was a rather strange thought for a child to have on one of the most important days of his life. But Sten was a rather strange boy, so it suited him". The pilot studies also showed an interesting phenomenon: subjects wrote a children's story concordant to the direction of the message but their final mood showed a reversal. Typically, a subject in the happy condition wrote a happy story and his/her mood at the end of the task was sadder than at the beginning. The same phenomenon applied to



the sad message.

The choice of a children's story (an outer-related task), will allow subjects to express their feelings without having to involve personal experiences. Another consideration in choosing this task is that as the literature demonstrates, children's stories cover the whole span between happiness and sadness (as, for instance, "Hans in luck" and "The poor boy in the grave", written by the Grimm brothers).

Dixon (1971, 1981) explains that the exposure to a subliminal message is comparable to the exposure to other stimuli to which the subjects are unaware, stimuli coming from within the subject like for instance, self-talk. Dixon asserts that due to the limited capacity of consciousness, preconscious processes are taking place continuously, and these processes influence individuals' actions. Some of the stimuli being processed preconsciously have their source within the organism and some come from the outside.

In order for a subliminal message to become effective, Dixon explains that there has to be an appropriate situation for the expression of the content of the message. For instance, in the present experiment, it is expected that in the conditions where subjects write a story while exposed to a happy/sad message, the message will influence the writing of the stories leading to happy/sad creations. In the conditions where subjects will perform an emotionally neutral task while exposed to the message, it is expected that the mood of the subjects will be affected in the direction of the

message since the task cannot be modified directly by the message.

Dixon (1981) contends that subjects can be aware of their behaviour even though they might not know what influenced it. It is, therefore, hypothesized, that in the present experiment subjects will be aware of the tone of the stories they have produced.

Following Dixon's line of thought it is quite possible to find that task and mood might be affected independently of one another, that is, the mood might change while the task will not show any influences of the subliminal. The conditions where the neutral task is conducted first will allow us to clarify the mood-task interaction by observing how an affected mood will influence the writing of the story.

Groeger (1986a) has found that in a forced choice situation words presented subliminally can find their way into a text. A word count of the stimulus words will be conducted in the present experiment in order to test the possibility of intrusion of stimulus words into the text. Based on findings of Henley (1975) and Swingle (1979) that a subliminal might persist and influence subsequent tasks, the conditions in which subjects perform the neutral task will allow us to test this hypothesis by observing whether the task can be influenced when performed after the exposure to the subliminal messages.

Two contrast conditions are included in which subjects will not be exposed to

subliminal stimuli to examine the effects of requesting subjects to write a happy/sad story upon their mood and upon their output.

With regards to the influence of the subliminal message upon the mood of the participants, no studies have been conducted which employ a happy/sad message and then measure the subjects' happiness/sadness. Furthermore, an issue derived from the pilot studies is the reversal effect. If the mood influences the tone of the story, will this tone in turn affect the final mood of the person?

This experiment also presents a methodological issue, i.e., the presentation of an auditory subliminal message without the subjects noticing it. To this end, Fisher's method (1975, 1976) will be implemented. A fixed energy objectively determined below detection threshold message will be presented. The implementation of this technique entails the presentation of the message 15 dB below the ambient noise and therefore the message is subliminal (below detection threshold), that is, the subject is not aware of the presence of a message.

In summary, the present study investigates the effects of a subliminal message upon the mood of the subjects; upon the task (is the task influenced independently of mood and if so through which process, intrusion or directly?); interaction mood-task (does the mood mediate the changes to the task?, does the task influence the final mood?); and the effects of an incubation period for the subliminal messages. Additional

issues include: length of the stories; intrusion of words; and comparison of the effects of the happy and the sad tapes.

The hypotheses of this study are (see Method chapter for a full description):

The tone of the stories will be influenced in the direction of the message

The subjects are aware of the tone of the stories they have written

The mood of the subjects will reflect that of the message when no writing task is performed and will be its opposite when a writing task is performed (reversal effect)

In addition, the following issues will be examined

The effects of an incubation period

The number of words in the stories

The intrusion of happy and sad words

## **METHOD**

### **Subjects**

One hundred and twenty eight female students at the University of Ottawa participated as subjects in the present study. Students were approached in Psychology classes and in the corridors of the University and asked to volunteer for a creativity study lasting no longer than 45 minutes. Interested students were given an appointment. No payment was offered. During the course of the data collection nine subjects were dropped due to the following reasons: seven because they did not follow the instructions (read a book instead of sorting the pictures; started writing the story without waiting five minutes as instructed), one because she finished earlier and left the experimental room, and one because she mentioned the possible existence of subliminal images in the pictures (there were none). Nine additional subjects were run in order to fill all the experimental cells.

### **Apparatus**

A Sony-o-matic tape recorder was connected to a Realistic MPA-20 amplifier. This equipment, situated in the control room was wired to a pair of Realistic 40-1247A speakers located in the sound-proof experimental room. The speakers were fixed to the

wall facing the subjects at a distance of 1.05 meters from their heads. A microphone, GSC E7300A was utilized to inform the subjects that the initial five minutes had lapsed. A closed-circuit television camera, Mini Scan 5050, focused on the subject's face, was unobtrusively placed in the experimental room to verify that the distance to the speakers remained constant. This room also contained a desk and a chair. Three sheets of blank paper were on the table, and a pen was available in case the subjects needed it.

Three twenty minute professional quality audio tapes were employed. The tapes were recorded by a male and the words (one per tape) were repeated every five seconds (the white noise sound was equivalent in length to a spoken word and was also presented subliminally). The three tapes had the same output volume. The following table shows the words used together with their word frequency (Standard Frequency Index; Carroll, Davies, & Richman, 1971). Vokey and Read (1985) studied the effects that ambiguous auditory signals with no discernible meaning had upon individuals. They used backward presentation of speech and found that these utterances might be either recognized by the subjects or they might have a certain meaning (a wrong one) ascribed to them. In the present experiment, white noise was utilized to avoid the possibility of backward words or nonsense syllables being interpreted by the subjects.

Table 1

**Standard Frequency Index (SFI) of the words utilized in the tapes**

<b>Tape</b>	<b>Message</b>	<b>SFI</b>
1	Happy	61.4
2	Sad	57.2
3	White noise	

The tapes were played 6.5 dB above the ambient noise (see Table 2) when measured at the speaker. They were at a below detection level at the subject's chair (the message is approximately 14 dB below ambient noise, calculated by extrapolation). As expressed before, evidence that stimuli presented below detection in this fashion are out of awareness of the subject and also effective (they do influence the subject) was provided by Hutchinson (1988) and by Fisher (1975, 1976). The method utilized to present the messages subliminally (Fisher's) has two advantages. The subject is not aware of the presence of a stimulus and the experimenter is able to make sure that the message is present (a sometimes impossible task with embedded messages). Table 2 indicates the dB readings in the experimental room.

**Table 2**  
**dB readings in the experimental room**

<b>Source</b>	<b>dB</b>
Ambient noise	29-32
Rumbling of tape at speaker	34.5
Spoken words at speaker	35.5
Words at S (extrapolated)	18

### **Procedure**

**Experimental conditions.** There were eight experimental conditions, each one comprised of 16 subjects. Only female subjects were used in order to simplify the design and given that Swingle (in preparation) has found that a subliminal male voice has a larger impact on females than males. Table 3 displays the different conditions and their characteristics. In the first three conditions, subjects were required to write a story while receiving the subliminal message; in conditions four to six, subjects conducted an intervening task (sorting magazine pictures into masculine and feminine; see Appendix A) as a means of having to spend twenty minutes of exposure to the subliminal message) prior to writing a story, and then proceeded to write it. The three tapes were utilized in the following fashion: conditions one and four received the happy message; two and five the sad one; and three and six the white noise tape. These last two



conditions were the control groups. Conditions seven and eight served as contrast groups. Subjects in both these conditions were not exposed to a subliminal tape. They were requested to write a happy and a sad children's story respectively. These are the so called "upon request" conditions.

Conditions 4-6 were designed with two objectives in mind: the first one, to check if an incubation period enhanced or diminished the influence of the subliminal messages; the second one, to check the influence of the messages on the mood alone, when no writing task had been performed. Conditions 7-8 were designed to see if people are able to write a story of a requested tone, and how the writing of such a story influenced their mood.

**Table 3**

**Experimental conditions**

<b>Cond</b>	<b>Tape</b>	<b>Picture</b>	<b>Writing</b>	<b>Comments</b>
1	Happy	No	Yes	
2	Sad	No	Yes	
3	W.Noise	No	Yes	Control
4	Happy	Yes	Yes	
5	Sad	Yes	Yes	
6	W.Noise	Yes	Yes	Control
7	None	No	Yes	Contrast
8	None	No	Yes	Contrast

**Treatment.** Upon arrival to the laboratory Ss were taken to the experimental room. The assignment of subjects to the different conditions was random, having been previously decided by the drawing of numbers from one to eight, in sixteen repetitions. Ss were instructed to self-address an envelope if they were interested in receiving a summary of the results of the study. They were asked demographic questions (first language, year of studies in University and age), were asked to sign the informed consent form, and were administered the first mood questionnaire (see Appendix B for copies of the questionnaires administered to the subjects; the direction of the scoring is shown in the first questionnaire). The instructions were then read to the subjects (see Appendix C), according to the condition to which they belonged. The E then left the experimental room and proceeded to the control room. One of the three experimenters was not blind to the conditions to which the subjects belonged. Approximately 30% of the randomly distributed subjects dealt with this experimenter. Contact between experimenter and subjects lasted less than two minutes. The other two experimenters were blind to the conditions within the groups 1-3 and 4-6. Due to the procedure of this experiment they knew if a picture task was administered or not.

The E started the tape and a stopwatch at the same time. Subjects in conditions 1-3 and 7-8 were asked to think about the story for five minutes before beginning to write. After that time had passed, the E informed the subjects through the intercom that they could start writing. Subjects were given 15 minutes in which to write at which time the E entered the room and informed the Ss that the writing time had elapsed. The Ss

were asked to fill in the second mood questionnaire and also Quest3. In conditions four to six Ss were asked, at the beginning of the experiment, to think about the sorting criteria for five minutes and were then told through the intercom to start the task. After twenty minutes had elapsed, Ss were asked to fill in the second mood questionnaire and were read the instructions to write the story. After fifteen more minutes had elapsed they were given the third mood questionnaire and also Quest3. Subjects in all conditions were asked if they had any questions and after answering those, they were thanked and reminded that the results would be mailed to them.

The whole procedure took 30 minutes for the writing only conditions and 45 minutes for the picture sorting plus writing conditions. Confidentiality was assured and all data were labelled with each subject's number. Any comments made by the subjects were also recorded.

### **Instruments and scoring**

The instruments section will discuss the questionnaires administered to the subjects, while the scoring section will discuss the scoring scales used by the blind judges as well as their training.

**Instruments.** There were two versions of the mood questionnaire (see Appendix B). Each consisted of the same six pairs of adjectives, but in different order, and in the opposite scoring direction. Half of the subjects were given Quest1 first and the other half Quest2 first. Subjects in conditions 1-3, and 7-8 were administered two mood

questionnaires (Quest1 and Quest2, or Quest2 and Quest1), one at the beginning of the experiment and one after writing the story, while subjects in conditions 4-6 were given three mood questionnaires, one at the beginning of the experiment, one after sorting the pictures, and one after writing the story. Thus, for half of the subjects these conditions were administered: Quest1-Quest2-Quest1, and for the other half Quest2-Quest1-Quest2. The order of administration had been selected prior to the commencement of the experiment.

The modified semantic differential method employed in these questionnaires allows subjects, according to Osgood, Suci and Tannenbaum (1967), to express their feelings and sensations (in this case about themselves) making use of a standardized sample of alternative verbal responses. The scale indicates both sense and intensity. The line separating each pair of adjectives is 99 mm long, thus facilitating the encoding of the data. The pairs utilized were taken from Mehrabian and Russell (1974) who found that there are three main dimensions to emotions: Pleasure, Arousal, and Dominance. The two highest loading pairs in each of these three dimensions were selected. The selected items also load very low on the other two factors. Table 4 indicates the rotated factor matrix for the six items.

Table 4

Rotated factor matrix for the pairs of adjectives utilized in the mood questionnaires (from Mehrabian and Russell, 1974)

<u>Item</u>	<u>Pleasure</u>	<u>Arousal</u>	<u>Dominance</u>
Happy-unhappy	.89	-.01	.07
Pleased-annoyed	.89	-.03	.03
Stimulated-relaxed	-.16	.82	.07
Excited-calm	-.20	.80	.03
Controlling-controlled	.16	.05	.72
Powerful-overpowered	.21	-.10	.71

The other questionnaire administered to the subjects, Quest3, required the subjects to rate the happiness/sadness of their own story, asked them if they finished writing and if not, asked how much more time they would require, and also requested them to rate the quality of their story. In addition there was an open question about their thoughts concerning the aim of the study, and any special details they had detected. The questionnaire also asked them for any comments they might have had. Some of the comments will be brought up in the Discussion chapter.

**Scoring.** Three sets of data were collected with the help of scorers (see Appendix D for copies of the scoring sheets). The scorers were blind to the aim of the experiment, and to the quantity and distinctions between the conditions. One set of data (C) was not

utilized and is discussed in Appendix D.

The first set of data employed, (A) contains six questions. Two blind raters conducted the scoring. The first item is a bipolar happiness-sadness scale, and is the most relevant variable for this study. The scorers were instructed to rate the tone of the story (happy/sad) disregarding grammar, style, and spelling. They were instructed to concentrate on what was written and not to imagine the end if the story was unfinished. They were also told to keep in mind that happy stories very often carry sad elements and vice versa. They were told to disregard last minute (or last sentence) attempts at changing the tone of the story.

The subsequent five questions in set (A) were secondary because of their exploratory nature. They are not relevant to the main hypotheses and their results are provided in Appendix E. The second and third questions in this set relate to issues picked up during a reading of the stories. It seemed as if several stories had a dreamlike quality (in the negative sense, i.e., somebody trying to avoid a situation, to escape from it, but not being able to) and the judges were instructed to indicate if the story was one in which the characters tried unsuccessfully to avoid certain situations that kept repeating themselves. The third question deals with the presence of extraordinary events, like the intrusion of totally unwarranted elements or happenings (e.g., being sucked by the earth in the middle of a very pleasant and innocuous story). Raters were asked to indicate the sense of these extraordinary events, either positive (improving the general tone of the story) or negative (making the story more dreadful).

Questions 4 and 5 related to the control the author had over the story (some stories appeared to be going in a direction contrary to the author's final intention, and thus several sad or very sad events would take place in a relatively mild and happy story; in such a case, the control the writer had was considered to be low). Some stories did not seem to be aimed at children (either the theme or the treatment of the theme were not appropriate for 8-10 year old children as requested in the instructions) and thus question 5 was devised. Some stories were perceived as having a desperate attempt at the end at changing the overall tone of the story, and with this in mind, question 6 was included. There was an extra space for comments.

Two motivated volunteer undergraduate psychology students (one male and one female) were the blind scorers for this scale. The training involved an explanation of the different questions, scoring of approximately fifteen stories (taken from previous pilot studies), and meetings to clarify any concerns. Once the rating was completed, it was clear that the scales for dreamlike elements and extraordinary events were being confused. A clearer explanation was given and several stories were reread, discussed, and rescored for these two scales. The scorers were reminded to work fast and use their first impressions. It should be kept in mind that scales 2-6 are exploratory and that the weight of the evidence in this study will fall on question 1.

An additional aspect of the scoring (the second set of data utilized, set B) was the counting of words. The aim of these data is to verify if the subliminal messages

affect the stories by changing their tone or just by the intrusion of the words presented in the message, a phenomenon described by Groeger (1986a) and by Swingle (1979). Seven volunteers were asked to read ten stories each and to come up with a list of happy- and sad-related words. These lists were discussed together and the list depicted in Appendix F was conceived. The two counters (two blind female undergraduate psychology students) were asked to count the number of appearances of the words happy and sad, to count for the appearance of related words (i.e., words that include the roots of the words depicted in the list), and to count the total number of words. Random checks of the counting were conducted and no mistakes were found.

### **Measures and Hypotheses**

The main dependent measures of this study are as follows:

Mood of the subject measured on the axis of pleasure.

Subjects' own rating of their output in terms of happiness/sadness.

Judges' ratings of the happiness/sadness of the stories.

Number of times the word happy, the word sad, and related words appear in the story,



as well as the total number of words.

There are four major hypotheses in this study as well as some minor ones. Two of the major hypotheses relate to the tone of the story:

(1) The emotional tone of the story will be influenced in the direction of the subliminal; that is, a happy message will induce a happy story, and conversely, a sad message will induce a sad story.

(2) Subjects will be aware of the happiness/sadness of their stories.

These hypotheses will be tested in the following manner:

(1) The tone of the story of the six subliminal conditions (those exposed to the three tapes, with and without incubation) will be analyzed. A two-way analysis of variance (ANOVA) of the tone of the story (as rated by the judges) by tape (happy, sad, white noise) and by picture task (absent, present) will be performed.

(2) A Pearson correlation between the judges' and the subjects' ratings of the happiness/sadness of the stories will be performed.

With respect to the influence of the subliminal messages on the mood, it is expected that the mood (pleasure axis) will be influenced. Subjects exposed to a happy message are expected to report a happier mood and conversely, subjects exposed to a sad message are expected to report a sadder mood after the exposure. This tendency, however is expected to be reversed if the subjects are writing the story while receiving the subliminal message (that is, a subject will receive a happy/sad message, write a happy/sad story, and have the opposite mood at the end, i.e., sad/happy). The following two hypotheses are therefore formulated:

(3) Subliminals will affect the mood in the direction of the message when no writing task is performed (i.e., a person exposed to a happy message will have a happier mood after exposure to the subliminal, and a sadder mood if exposed to a sad message).

(4) The mood ratings, however, will be opposite those of the subliminal message after writing the story. That is, a person exposed to the happy tape will write a happy story and have a sadder final mood, and conversely a subject exposed to the sad tape, will write a sad story and have a happier final mood.

These hypotheses will be tested in the following fashion:

(3) An analysis of covariance on the conditions that had an incubation period prior to the writing task (4-6) will be conducted: the pleasure rating after the exposure to the subliminal message will be taken as the dependent variable, the independent variable will be the condition, and the covariate will be the initial mood rating.

(4) To analyze the mood change that took place during the performance of the writing task, conditions 1-3, and 4-6 will be analyzed separately. In addition, two analyses will be conducted with conditions 4-6, one utilizing the initial mood rating as the covariate, and the other one utilizing the after-subliminal (but pre-writing) rating as the covariate.

Therefore, the post-writing mood rating in conditions 1-3 will be analyzed by condition with the initial mood rating as a covariate. Conditions 4-6 will have the same analysis performed twice, as explained above.

In addition to these four major hypotheses, the following issues will be investigated: the impact on the mood and on the tone of writing a story upon request (conditions 7 and 8), the impact of the messages on the arousal and dominance mood axes (Appendix E), and the intrusion of words (happy, sad, and related ones) into the story. In addition, the effect of the order of administration of the mood questionnaires will be studied.

## RESULTS

This chapter is organized in the following manner: the analysis of the demographic data and the reliability of the raters is presented first, followed by the analysis of the four hypotheses. Additional materials include the analysis of conditions 7 and 8, the appearance of happy and sad words in the stories, and the effect of the order of administration of the mood questionnaires. In all instances, significance refers to a  $p$  value lower than .05. The significance level will be reported for all instances of  $F$  equal to or larger than 1.

### Demographic data and raters' reliability

The subjects were asked three questions at the beginning of the experiment: their year of studies in University, their first language, and their age.

#### **Year of studies**

The following table shows the distribution of the subjects according to their year of studies.

**Table 5****Distribution of subjects according to their year of studies**

<u>Year</u>	<u>Frequency</u>
PreUniversity	2
First	68
Second	17
Third	27
Fourth	12
Fifth	<u>2</u>
Total	128

A one-way analysis of variance (ANOVA), tone by year, showed that there was no influence of the year of studies upon the tone of the story (happiness/sadness) ( $F[5,12]=1.026$ ;  $p>.41$ ). The year of studies did not show an influence upon the initial mood of the subject. The results of the analyses of variance were as follows, for the pleasure axis  $F[5,122]=.733$  (ns); for the arousal axis  $F[5,122]=.106$  (ns); and for the dominance axis  $F[5,122]=.943$  (ns).

**Language**

Of the 128 subjects that participated in the study 84 stated that English was their first language, 40 named French and four subjects indicated other languages (Chinese and

Spanish). All subjects were perfectly fluent in English. Chi-square goodness of fit tests showed that both main languages were equally distributed across conditions (for the subjects who mentioned English as their first language  $X^2 [7, N=84]=1.71$ , ns; and for the ones who mentioned French,  $X^2 [7, N=40]=2.80$ , ns).

A two-way ANOVA, tone by condition and language indicated no effect for language ( $F[1,108]=3.034$ ;  $p>.09$ ) or for the interaction language by condition ( $F[7,108]=.508$ ). Regarding the mood, three two-way analyses of variance (mood by condition by language) for pleasure, arousal and dominance, showed no impact of the mother tongue upon the initial mood. The statistics were as follows: for pleasure,  $F[1,108]=.001$  (ns); for arousal,  $F[1,108]=.028$  (ns); and for dominance,  $F[1,108]=.473$  (ns). The interactions between the mood and condition were also not significant. For pleasure,  $F[7,108]=1.636$ ;  $p>.14$ ; for arousal,  $F[7,108]=.890$ ; and for dominance,  $F[7,108]=1.053$ ;  $p>.40$ .

### Age

With respect to the age of the subjects, the average age was 21.69, with a standard deviation of 5.38 years; the range was between 16 and 48 years of age. Table 6 shows the means and standard deviations of age according to condition.

**Table 6**  
**Means and standard deviations of age according to condition**

<b>Cond</b>	<b>Mean</b>	<b>SD</b>
1	21.19	4.135
2	20.25	2.206
3	19.81	1.905
4	20.87	4.674
5	20.75	3.357
6	21.06	3.974
7	23.44	7.737
8	26.18	8.833

An ANOVA of age by condition showed a significant effect ( $F[7,120]=2.675$ ;  $p<.05$ ) for condition. A closer look at the data indicated that in conditions 7 and 8 subjects tended to be older than in the other conditions. This is due to the fact that when two subjects arrived at the lab at the same time (in very few occasions), the older one was assigned to the conditions where hearing was not important and where the experiment took less time. This was an inadvertent mistake. In order to check if the age differences had an effect on the main variables of this study, analyses of variance were conducted on the tone of the story and on the three axes of mood, utilizing age as a covariate. In all instances the covariate was not significant: for the tone,  $F[1,119]=1.480$  ( $p>.23$ ); for pleasure,  $F[1,119]=.815$ ; for arousal,  $F[1,119]=.257$ ; and for dominance,

$E[1,119]=.120$ .

### **Reliability**

The scoring of the tone of the story was conducted by two raters (set A, Appendix D).

There were six items in the scoring sheet (see Appendix D). The reliability between the two raters is shown in Table 7.

**Table 7**

#### **Reliability coefficients for the two raters**

<b><u>Scale</u></b>	<b><u>Alpha</u></b>
Tone (happy/sad)	.79
Dream	.81
Extra	.82
Control	.29
Child	.69
Twist	.74

The analysis of the tone of the story (hypothesis 1) is provided next. The analyses of the other, secondary, variables (with the exception of Control which is discarded due to its low reliability) are provided in Appendix E.



### Hypothesis 1

The first hypothesis stated that the tone of the story would be influenced in the direction of the subliminal message, i.e., a happy message would lead to a happy story, and a sad message to a sad story. Two independent variables were used: tape (happy, sad, white noise) and picture task (absent or present, the latter case being the incubation conditions). Table 8 provides the means and standard deviations of the raw tone ratings (utilizing a 6 point scale; the lower the value, the happier the story) for the conditions in which there was exposure to a subliminal message (the first six conditions shown in Table 3).

**Table 8**

**Means and standard deviations of the tone ratings for the subliminal conditions**

<u>Cond</u>	<u>Tape</u>	<u>Picture</u>	<u>Mean</u>	<u>SD</u>
1	Happy	No	3.47	1.784
2	Sad	No	3.25	1.871
3	W. Noise	No	3.41	1.463
4	Happy	Yes	2.41	1.281
5	Sad	Yes	3.84	1.690
6	W. Noise	Yes	3.56	1.741

A two-way analysis of variance, tone rating by tape and picture, showed

nonsignificant effects for tape,  $F[2,90]=1.32$ ;  $p>.28$ ; for picture,  $F[1,90]=.096$ ; ns; and for the interaction tape by picture,  $F[2,90]=2.16$ ;  $p>.13$ . The power of this test (the a priori probability of rejecting the null hypothesis), calculated on a one-way ANOVA, was .35. In order to obtain adequate power a larger number of subjects would be required.

#### **Post hoc analysis**

An examination of the raw data by the two judges showed that while the reliability was adequate and the raters tended to score the stories in the same direction, one of the two raters had a tendency to use the entire range of the scale while the second rater tended to use more the middle scores. To investigate whether there was a difference between the two raters a t-test was conducted. The results were significant ( $t[127]=2.11$ ;  $p$  [2-tail] $<.05$ ). Two post-hoc analyses were then conducted, one employing dichotomous and one employing standardized data. By dichotomizing the raw scores each story is given either a happy or a sad rating. In this fashion, a dichotomous scale was derived from the raw scores for the two raters (scores 1-3 became 0, and 4-6 became 100) and these scores were averaged. Table 9 provides the means and standard deviations for the dichotomized scores.

Table 9

Means and standard deviations of the dichotomized tone ratings for the subliminal conditions

<u>Cond</u>	<u>Mean</u>	<u>SD</u>
1	50.00	48.305
2	40.63	45.529
3	50.00	44.721
4	15.63	35.208
5	71.88	44.605
6	40.63	45.529

A two-way analysis of variance, tone rating by tape and picture, showed no significant effects for tape ( $F[2,90]=2.26$ ;  $p>.12$ ) nor picture ( $F[1,90]=.214$ ; ns). There was a significant tape by picture interaction ( $F[2,90]=4.50$ ;  $p<.02$ ). Simple main effects tests (utilizing the Dunn-Bonferroni procedure to maintain the error rate for the collection of the five tests at or less than .15) showed that the only significant simple main effect was at the picture present level for the three different tapes (i.e., conditions 4, 5 and 6);  $F[2,90]=6.51$ ;  $F$  Crit (.03; 2,90)=3.71.

Scheffé's statistic was utilized to test all the possible simple effects between conditions 4, 5 and 6. The difference between conditions 4 and 5 was the only significant one,  $F[2,90]=12.97$ ;  $F$  Crit (.03; 2,90)=7.42.

In the second place, the judges' raw ratings were standardized. The average and standard deviation for rater 1 for all subjects were 3.32 and 1.577, and for rater 2, 3.56 and 2.003. The alpha reliability coefficient for the standardized ratings was .86. Table 10 provides the means and standard deviations for the standardized scores.

**Table 10**

**Means and standard deviations of the standardized tone ratings for the subliminal conditions**

<b>Cond</b>	<b>Mean</b>	<b>SD</b>
1	.018	.994
2	-.100	1.056
3	-.026	.805
4	-.571	.711
5	.210	.935
6	.069	.968

A two-way analysis of variance of the standardized scores by tape and picture showed nonsignificant effects for tape ( $F[2,90]=1.26$ ;  $p>.29$ ), for picture ( $F[1,90]=.11$ ; ns), and for the interaction tape by picture ( $F[2,90]=2.08$ ;  $p>.13$ ).

In summary, there was no support for hypothesis 1 utilizing raw or standardized data. When dichotomized ratings were utilized, however, there was support for the hypothesis. The interaction between tape and picture was significant, and simple main

effects tests showed that the tapes did have an influence on the incubation conditions only. The direction of the happy and the sad incubation conditions was that of the tape (happier for the happy tape, and sadder for the sad tape; the control condition was in between the happy and the sad conditions) and they were significantly different from each other. A comparable result was observed with the raw data when a one-way ANOVA of the tone ratings by conditions 4 to 6 was conducted. The analysis indicated a significant difference for condition,  $F[2,45]=3.70$ ;  $p<.05$ . Newman-Keuls tests showed that condition 4 differed significantly from conditions 5 and 6, which did not differ from each other.

### **Hypothesis 2**

Hypothesis 2 stated that subjects would be aware of the tone of the stories they wrote. The correlation between the judges' and the subjects' own ratings of the happiness/sadness of the stories was .494;  $p<.001$ . Table 11 provides the correlations broken down by condition, together with their significance values. For this calculation the subjects' ratings have been inverted and therefore a positive correlation indicates that the subjects' and the judges' ratings agree with respect to their direction.

Table 11

Judges' and subjects' ratings of the tone of the stories and their correlation broken down by condition

Cond	Judges		Subjects		Correlation	p<
	Mean	SD	Mean	SD		
1	3.47	1.784	35.63	30.03	.47	.05
2	3.25	1.871	39.13	32.58	.47	.05
3	3.41	1.463	31.75	16.85	.53	.05
4	2.41	1.281	32.75	22.08	.42	ns
5	3.84	1.690	34.63	21.81	.71	.01
6	3.56	1.741	37.38	27.07	-.03	ns
7	2.71	1.643	25.19	14.74	.32	ns
8	4.88	.885	73.38	10.87	.61	.01

Given that there were 16 subjects in each condition, a comparison of the differences between the correlations employing Fisher's  $z_r$  transformation would only show a significant difference between conditions 5 and 6, and one significant comparison among several possible computations cannot be considered an effect but more likely a statistical artifact.

As a post hoc analysis to investigate whether in each condition the ratings between subjects and judges were different, t-tests were conducted between the ratings for each condition. The ratings were normalized prior to performing the tests. The only significant results were for conditions 5 ( $t[15]=2.21$ ;  $p[2\text{-tail}]<.05$ ) and 8 ( $t[15]=-4.31$ ;  $p[2\text{-tail}]<.01$ ). For condition 5 the average rating of the judges was .24 and the standard deviation 1.006 and the average rating of the subjects was -.16, standard deviation .828. For condition 8 the average rating of the judges was .85, standard deviation .527 and for the subjects, the average was 1.31 and the standard deviation .413. In condition 5 the subjects' ratings were happier than the judges' ratings and the opposite was true for condition 8 where the subjects' ratings were sadder than the judges' ratings.

### **Hypotheses 3 and 4**

The data to be analyzed for the testing of these two hypotheses were obtained from the mood questionnaires administered to the subjects. As explained before, subjects in conditions 1-3 filled out two questionnaires (at the beginning and after writing the story), and subjects in conditions 4-6 were administered three mood questionnaires (at the beginning, after being exposed to the subliminal message, and after writing the story). Each questionnaire contained six items. The next section provides the results from the factor analysis of these items.

The six items in the questionnaires were taken from 3 factors, as stated in the

Method section. A factor analysis (varimax rotation) of the six items in the initial questionnaire showed the presence of three eigenvalues larger than one, indicating the existence of three factors. The rotated factor matrix is shown in Table 12.

**Table 12**

**Rotated factor matrix for the six items in the initial questionnaire across the 128 subjects**

<u>Item</u>	<u>Factor 1</u>	<u>Factor 2</u>	<u>Factor 3</u>
Happy-Unhappy	.660	-.059	-.057
Stimulated-Relaxed	-.160	.480	.013
Controlling-Controlled	.036	.065	.997
Pleased-Annoyed	.928	-.010	.025
Excited-Calm	.044	.997	.051
Powerful-Overpowered	.339	-.176	.144

Taking .4 as a cutoff point, the following factors were defined: factor 1, pleasure, consists of items 1 and 4; factor 2, arousal, consists of items 2 and 5; and factor 3, dominance, consists of item 3. Item 6, Powerful-Overpowered does not load on factor 3 as expected and it does load marginally on factor 1. Mehrabian and Russell (1974) also found in a later analysis that this pair of adjectives did not load very significantly on the dominance factor. The values for items 1 and 4, and 2 and 5 were averaged to obtain the pleasure and arousal factors, respectively.

As stated in the Method section, hypotheses 3 and 4 deal with the pleasure axis



of mood. The analyses of the arousal and dominance factors are presented in Appendix E. Table 13 provides the means and standard deviations for the pleasure factor for the subliminal conditions.

**Table 13**

**Pleasure factor (self-rating) for the subliminal conditions**

Cond	Initial		Intermediate		Final	
	Mean	SD	Mean	SD	Mean	SD
1	80.5	14.53			73.8	16.58
2	80.0	16.69			60.5	17.80
3	80.9	12.04			71.1	23.44
4	77.0	11.78	71.8	14.38	69.2	17.33
5	71.2	21.87	63.5	18.34	71.3	17.18
6	72.8	16.08	77.0	14.69	69.0	15.75

**Hypothesis 3**

This hypothesis stated that subjects would be influenced in the direction of the subliminal message when no writing was taking place. This hypothesis can be tested in conditions 4-6 where, during the first twenty minutes, the subjects received the message without writing the story at the same time. To test this hypothesis, therefore, an analysis of covariance of the intermediate mood rating was conducted, with the initial rating as the covariate. The results indicated an effect for condition ( $F[2,44]=3.311$ ;  $p<.05$ ). The covariate was reliably associated with the dependent measure ( $F[1,44]=15.090$ ;  $p<.001$ ). Employing adjusted means, Scheffé's test of the three

possible comparisons (4 with 5, 5 with 6, 4 with 6) indicated that only condition 5 was significantly different (lower) from condition 6  $F=6.60$ ;  $F_{\text{Crit}}(0.5; 2,44)=6.44$ . As a post hoc analysis, a comparison of conditions 4 and 5 (equal weights) with condition 6 approached but did not reach significance ( $F=5.32$ ;  $F_{\text{Crit}}[0.5; 2,44]=6.44$ ).

A t-test between the initial and intermediate ratings was conducted for each condition, also in a post hoc fashion. Only condition 4 showed a significant difference,  $t[15]=2.47$ ;  $p[1\text{-tail}]<.05$ , indicating that the intermediate rating was lower than the initial one.

#### **Hypothesis 4**

This hypothesis stated that subjects would have a mood change in the opposite direction of the message after having written the stories. Conditions 1-3 and 4-6 were analyzed separately.

**Conditions 1-3.** An analysis of covariance on the final mood rating with the initial rating as a covariate did not show any effects for condition ( $F[2,44]=2.153$ ,  $p>.13$ ). The covariate was reliably associated with the final mood rating,  $F[1,44]=4.951$ ,  $p<.05$ . Post hoc t-tests between the initial and the final ratings indicated a significantly lower final mood for condition 2,  $t[15]=3.83$ ;  $p[1\text{-tail}]<.01$ , and a trend for condition 3 (lower final rating),  $t[15]=1.73$ ;  $p[1\text{-tail}]<.06$ .

**Conditions 4-6.** Two separate analyses of variance were conducted on the final mood

rating, the first one utilizing the initial pleasure rating as the covariate and the second utilizing the intermediate rating as the covariate.

The first analysis did not show an effect for condition ( $F[2,44]=.453$ ; ns). The covariate was significantly associated with the final rating,  $F[1,44]=13.391$ ;  $p<.01$ . The second analysis did not show an effect for condition either ( $F[2,44]=1.085$ ;  $p>.35$ ). The covariate was significantly associated with the dependent measure,  $F[1,44]=7.457$ ;  $p<.01$ .

Post hoc t-tests between the final and the initial ratings indicated that condition 4 had a lower final rating,  $t[15]=2.16$ ;  $p[1\text{-tail}]<.05$ . T-tests between the final and the intermediate ratings indicated that condition 6 had a lower final rating,  $t[15]=2.00$ ;  $p[1\text{-tail}]<.05$ , and also indicated a nonsignificant trend for a higher final rating in condition 5,  $t[15]=-1.56$ ;  $p[1\text{-tail}]<.07$ .

#### Additional analyses

As stated in the Method section, there are three more issues to be checked. These are: first, the tone of the stories written by subjects in conditions 7 and 8 (there was no subliminal message present, just an instruction to write a happy or a sad story, respectively), together with the influence on the mood of the subjects produced by the writing of such a story; second, the intrusion of words to the stories; and third, the effect of the order of presentation of the mood questionnaires, together with the effect of the order of the items in the two forms of the questionnaire.

### Conditions 7 and 8

These two contrast conditions were included in the study to check how the writing of a story of a certain tone would influence the mood of the subjects. The first analysis, therefore, investigated whether the tone of the stories was concordant to that of the request.

**Tone of the story.** Table 14 provides the means and standard deviations for the tone of the story.

**Table 14**

**Means and standard deviations of the tone of the stories for conditions 7 and 8**

<u>Cond</u>	<u>Mean</u>	<u>SD</u>
7	2.72	1.643
8	4.88	.885

It should be remembered that a low value indicates a happier story. An analysis of variance of tone by condition indicated a main effect for condition,  $F[1,31]=21.362$ ;  $p<.001$ . The means indicate that people complied with the request to write a happy story in condition 7 and a sad story in condition 8.

**Mood of the participants.** Table 15 shows the initial and final ratings on the pleasure axis for subjects in these conditions.

**Table 15**  
**Pleasure ratings for conditions 7 and 8**

<b>Cond</b>	<b>Initial</b>		<b>Final</b>	
	<b>Mean</b>	<b>SD</b>	<b>Mean</b>	<b>SD</b>
<b>7</b>	<b>71.8</b>	<b>13.91</b>	<b>69.8</b>	<b>18.74</b>
<b>8</b>	<b>66.9</b>	<b>21.19</b>	<b>55.3</b>	<b>20.38</b>

An analysis of covariance of the final mood by condition with the initial mood as covariate indicated an effect for condition,  $F[1,29]=6.014$ ;  $p<.05$ . The covariate was not reliably associated with the dependent variable ( $F[1,29]=2.736$ ;  $p>.11$ ). T-tests did not show a difference for the before and after ratings for either condition, although a trend for a lower final rating could be observed in condition 8 ( $t[15]=1.33$ ;  $p[1\text{-tail}]<.11$ ).

#### **Word count**

The counting of happy, sad, happy related, and sad related words did not yield large numbers. In fact, these words were not a very common occurrence in the stories. Table 16 shows the mean number of happy and sad words appearing in the stories and their standard deviations, according to condition.

Table 16

**Means and standard deviations of happy and sad words according to condition**

Cond	Happy		Sad	
	Mean	SD	Mean	SD
1	.062	.250	.000	.000
2	.312	.602	.250	.447
3	.250	.447	.062	.250
4	.375	.619	.375	.619
5	.250	.577	.062	.250
6	.312	.793	.187	.544
7	.312	.602	.187	.544
8	.625	1.088	.437	.629

An analysis of variance of happy words by condition did not show an effect for the latter,  $F[7,120]=.894$ ; ns. A similar analysis for the sad words did not yield significance either  $F[7,120]=1.806$ ;  $p>.10$ .

Table 17 provides the means and standard deviations for happy-related and sad-related words according to condition.

Table 17

Means and standard deviations of happy- and sad-related words according to condition

Cond	Happy Related		Sad Related	
	Mean	SD	Mean	SD
1	.750	1.125	.250	.577
2	1.000	.966	.312	.602
3	.875	1.586	.187	.403
4	1.125	1.310	.437	.727
5	.750	1.065	.375	.806
6	.750	1.065	.125	.500
7	1.125	.885	.375	.719
8	.687	.704	.187	.403

Analyses of variance did not indicate any effects for condition for either happy-related words,  $F[7,120]=.407$ ; or for sad-related words,  $F[7,120]=.530$ .

Table 18 provides the total number of words in the story according to condition.

Table 18

**Means and standard deviations of the total number of words in the story**

Cond	Number of words	
	Mean	SD
1	263.5	86.56
2	280.4	90.25
3	247.8	58.31
4	256.5	71.10
5	240.4	95.09
6	249.6	73.52
7	232.5	86.46
8	253.3	73.84

An ANOVA indicated no significant effects,  $F(7,120) = .530$ .

It can be seen that the utilization of the words 'happy', 'sad' and related ones was very sparse. No differences were observed between the conditions in either the utilization of such words or on the total number of words contained in the stories.

**Order of administration of the mood questionnaires**

As discussed above, there were two parallel versions of the mood questionnaire utilized in this study. Both contained the same items, although the order and the direction of these had been changed. Two analyses were conducted to check, firstly, if the order in which the questionnaires were administered influenced the tone of the story, and



secondly, if the order of the items in the questionnaire influenced the response to them (i.e., if the appearance of the pair of adjectives happy-unhappy as the first or as the fourth item made a difference to its rating).

Due to an inadvertent mistake 65 subjects were given questionnaire 1 first. Sixty-three subjects, therefore, were given questionnaire 2 at the beginning of the experiment. An analysis of variance of the tone of the story by the order of the questionnaires showed no effect for order,  $F[1,126]=.949$ . Responses to the happy-unhappy item were analyzed according to their order (first or fourth). The results were nonsignificant,  $F[1,126]=.002$ .

## DISCUSSION

The first hypothesis stated that the tone of the story would be influenced in the direction of the subliminal message, i.e., a happy message would lead to a happy story, and a sad message to a sad story. A two way ANOVA of the raw tone ratings (by tape and picture task) did not indicate any effects although a trend for the interaction was present ( $p < .13$ ). An analysis of the standardized data indicated similar results. When the raw data were dichotomized due to the different use of the range of the scale by the two raters, and in order to distinguish the happy from the sad stories, the analysis indicated an effect of the subliminal tapes for the incubation conditions. For these conditions the happy tape stories were happier than the sad tape stories, with the control stories in between.

The findings are supported by the literature. Subliminals had been shown to influence the performance of a task (Groeger, 1986a; Silverman et al., 1978; Zuckerman, 1960). A novel element of the present study is that the affective aspects of the task were influenced, that is, the tone of the stories was happy or sad (examples of two

stories are provided in Appendix G).

An interesting finding is that no effects upon the task were observed in the conditions in which the story was written while the subliminal message was received at the same time. It might be that the performance of the writing task competed with the subliminal message for internal processing (Dixon, 1981), and, therefore, the subliminal message was not effective. Fisher (1976) has shown that a task can interfere with the messages. When subjects were requested to pay attention to the pattern of a flashing light the effects of a subliminal message were cancelled.

A second explanation relates to the shadowing phenomenon. This phenomenon (Henley, 1975; Swingle, 1979) refers to the persistence of a subliminal in influencing subsequent tasks. Henley has shown that while the subliminal presentation of the words 'happy' and 'sad' did not influence the judgement of neutral faces, the subsequent control trial (no subliminal message) was unexpectedly affected by the previous subliminal message. It appears that shadowing explains the phenomenon observed in the present study more closely than the competition for processing explanation. If the competition for processing hypothesis was right, the picture sorting task should have cancelled the impact of the subliminal in a similar fashion to the writing task in the incubation condition. There are no clear answers as to how and why the subliminal information is not used immediately or it is used later when appropriate. In the Henley's and Swingle's case there was an appropriate channel for the subliminal information (the task being conducted) and it was not utilized immediately. In the present experiment there was not an appropriate channel (the picture sorting task). It appears as if an

incubation is necessary first, and once this is attained, the subliminal will become influential whenever there is an appropriate opportunity. That is, in a repetition of an earlier task, in Henley's case, or, in the present study, in the performance of a new task (writing a story) which allows for the channelling of the subliminal information.

With regards to the nonsignificant results of the raw and standardized data analyses, it maybe due to the choice of a one word subliminal message. The message employed in the present experiment contained one word repeated every five seconds. The choice of a one word message was favoured in order to allow for the checking of the intrusion of the message into the stories. In the pilot studies, where the subliminal effect was found, the message contained three related words (e.g., "happy, elated, upbeat"). It appears, then, that a one word message is less effective compared to a three word message. This is probably due to two elements. In the first place, three words might combine to create a strong effect, that is, the combination of the three related words leads to a happier mood or task. In the second place, the misinterpretation of one stimulus word would render the one word message ineffectual, while probably not having such a large impact on the three word message. While at this point this is only a speculation, it would be interesting to conduct an experiment where the messages vary in the number of related words that they contain.

The finding that the subliminal messages had a different impact on the two groups of conditions (no incubation, incubation) indicates that there are intervening

variables to the subliminal effect. It is difficult to draw a conclusion at this time regarding the causes for the effect. The complexity of the potential interactive effects on task and mood as modified by ongoing behaviour offers interesting possibilities for further research. For example, the performance of an experiment whereby subjects are exposed to emotional and nonemotional subliminal messages while performing emotionally neutral versus emotionally charged tasks, both with and without incubation periods, will allow us to investigate the factors which lie behind the effect found in the incubation conditions.

The second hypothesis stated that subjects would be aware of the tone of the stories they wrote. Although subjects were not aware of the presence of a subliminal message, they could reliably judge the tone of their stories. This is concordant with the literature (Dixon, 1971, 1981), which explains that subjects exposed to a subliminal message can be aware of their behaviour although they are not aware of what brought it about.

The analysis of the correlations of subjects' and raters' judgements according to condition showed no significant differences between the conditions. In conditions 5 and 8 there were significant differences between the ratings of the judges and the subjects. In the subliminal condition (5) the raters judged the stories as sadder than the subjects, while in the supraliminal condition (8) the opposite was the case, the subjects' judgements were sadder than the judges' ratings. This finding might indicate that a

request to produce a sad story oversensitizes subjects leading them to inflated ratings. It is also possible that the subjects' ratings of the sadness of their stories reflect demand characteristics. Asked to write a sad story, subjects inflate the ratings of sadness to present themselves as complying with the experimenter's request.

The third hypothesis stated that the mood of the subjects would be influenced in the direction of the message after listening to the subliminal without writing. With respect to the mood after the exposure, the sad condition was reliably different from the control condition. With respect to the before and after comparisons, there was a significant decrease in the mood rating for the happy condition.

We must also keep in mind that subjects were involved in a picture sorting task with stimulus material that was selected for affective neutrality. Being exposed to an emotionally charged subliminal message that was irrelevant to the dimensions subjects were using to sort the pictures might have affected the subjects' mood. Although several speculations seem plausible it would be interesting to see if both positive and negative affective subliminals would uniformly influence subjects' mood in a negative sense when they are involved in sorting pictures on the basis of affective characteristics. If happy and sad subliminals give rise to uniform increases in sadness when making nonaffective decisions but give rise to consistent or complementary mood changes when subjects are making affective decisions, then we could conclude that the nature of the task interacts with the effects of the subliminal message upon the mood of the

subjects.

In order to further investigate this area, an experiment employing a white noise versus a no tape condition would allow us to see if there is a difference between the initial and the intermediate (post-exposure) ratings, and it would also clarify if it was the influence of the white noise which was the factor behind the increase. In addition, the use of different subliminal messages (some emotional and some not) would allow us to see if the meaning of the words has an impact on the subjects' ratings. As expressed earlier, the use of different intervening tasks, some involving affective decisions and some not, would allow us to see if the nature of the task modifies the influence of the subliminal upon the mood.

The fourth hypothesis stated that the subjects would experience a mood change after writing the stories. It was expected that subjects in the happy conditions would finish the task having a lowered mood, while subjects in the sad conditions would finish the task having a raised mood. From a conservative viewpoint there was no support for this hypothesis, although the t-tests between the intermediate and the final ratings for the incubation conditions showed a decrease in pleasure for the control condition (indicating that writing lowered the mood rating) and no change for the happy condition (as opposed to a decrease in the control condition, see table 13). These findings warrant further investigation of the phenomenon.

Two pilot studies had shown the reversal effect before. In one of those studies, a longer message had been employed. It would be interesting to conduct another study employing different subliminal messages (e.g., "happy, elated, upbeat"). In addition, in the present experiment, the initial mood of the subjects was quite elevated. The presence of a ceiling effect might be impeding a further increase of the subjects' mood. It would be interesting to screen people before a similar experiment and to distinguish them according to their initial mood.

Additional analyses showed that when subjects were asked to write a happy/sad story (conditions 7 and 8) the tone of their stories was significantly different, with the direction of the change being that of the request. Comparing between the two conditions, the final mood of the subjects was also significantly different, the sad condition having a lower pleasure rating than the happy condition. It can only be concluded, therefore, that the performance of a sad task lowered the mood more than the performance of a happy task. This finding is in partial agreement with the supraliminal mood-induction literature (Clark & Isen, 1982; Velten, 1968) which indicates that the performance of a negatively charged task lowers the subjects' mood. It is inconsistent with the literature, however, that the request for the writing of a happy story did not change the subjects' mood. The data from the happy condition indicated that six out of the sixteen subjects actually wrote sad stories. It seems that asking people to write a happy story does not elicit the same effects as a supraliminal mood-



induction procedure. The mood ratings, therefore, do not reflect the impact of writing a happy story on the mood for all subjects.

The total word count did not show a difference between the conditions. Velten (1968) and Goodwin and Williams (1982) had found that a supraliminal negative mood-induction lowered the subject's performance. This was not the case here. This finding is discussed in a later section.

Regarding the word count two issues are worth noticing. First, Groeger (1984, 1986b) and Henley (1975) have shown that the below detection presentation of words leads to a semantic analysis of the stimuli while a below discrimination threshold presentation leads to a structural analysis. Second, Groeger (1986a) has shown that in a forced choice experiment, a subliminal stimulus was effective in intruding into the text.

The present experiment showed that subjects understood the meaning of the messages. In addition, there was no intrusion of happy, sad, happy-related, or sad-related words. This finding indicates that the stories were judged as happy or sad according to their content and not because the stories contained different numbers of the words happy and sad.

In addition, the fact that the meaning of the subliminal messages was understood supports the position that in the present experiment the presentation of the subliminal messages took place below the detection threshold of the subjects.

It should be remembered that one of the experimenters was not blind to the condition of some of the subjects. While demand characteristics could conceivably have played a role, the fact that the interaction between subject and experimenter was standardized, that it lasted approximately two minutes, and that several findings were unexpected seem to diminish the possibility that demand characteristics accounted for the results. The subjects had been randomly assigned to the eight conditions and the raters were blind.

## **General discussion**

### **Mood-task interaction**

The relationship between mood and performance of a task under regular conditions (i.e., no subliminal stimulation present) or under conditions of supraliminal mood-induction procedures follows a recursive pattern. The relationship is such that a positive (negative) mood leads to an improved (decreased) performance which in turn affects the mood positively (negatively). As reviewed by Clark and Isen (1982), for example, people who are in a good mood tend to judge neutral slides in a positive fashion. A positive mood also leads people to reward themselves more, therefore increasing their pleasant mood. In addition, a positive mood leads to an increase in

helping strangers in distress and in approaching strangers for information. The converse situation is true for a negative mood. People in a negative mood make more negative judgements regarding neutral scenes, shy away from helping others and are more elusive in approaching a stranger. All these effects, in turn, lead to situations in which a positive (negative) mood leads to a positive (negative) task performance and this leads back to a positive (negative) mood.

Clark and Isen (1982) hypothesized that moods act as cues for similarly categorized information in memory. It has been shown (Isen et al., 1978) that people in a positive mood are more likely to retrieve positive rather than negative memories. A positive or a negative mood seem to act as a prime for related information. The activation of similarly toned material in memory accounts, according to Isen, for the changes brought about by a specific mood.

The effect of subliminals on the tasks that subjects perform or on their moods is an interesting issue. Several studies have looked at the influence of subliminals on mood and task. Regarding the mood, Robles et al. (1987) induced anxiety by presenting negative subliminal stimuli. Subjects who watched a video tape to which subliminal threatening images were added reported an increase in anxiety ratings. Similarly, Kemp-Wheeler and Hill (1987) have shown an increase in anxiety for subjects who were subliminally presented with threatening words.

With respect to the task, the subliminal presentation of the words 'happy' and 'sad' influenced the perception of neutral faces (Somekh & Wilding, 1973). Silverman

et al. (1978) showed that accuracy in a dart-throwing task could be influenced by the presentation of a subliminal message.

The novelty of the present study is that it concentrated on the interaction mood-task when a subliminal message is involved. In the Robles et al. study, for instance, the subjects whose anxiety ratings were raised were not required to perform a task in order to see if their performance would be similar to that of a naturally anxious person or to that of a person whose anxiety was increased with supraliminal methods.

The findings of the present study introduce a very interesting element. It appears that mood and task were either impacted upon in a separate fashion by the subliminal message or that the interaction between mood and task is different from that observed under supraliminal conditions when these elements (mood and task) are affected subliminally. Two findings support this hypothesis. First, in the no incubation conditions, no effects upon the task were observed. With respect to the mood, however, there was a significant lowering of the mood in the sad condition. This seems to indicate that the subliminal message affected the mood while it did not affect the task.

The second finding was observed in the happy incubation condition where a negative impact on the mood was seen after exposure to the subliminal message. The subjects, however, then proceeded to write a happy story.

It appears then that the interaction mood-task under subliminal conditions differs from the interaction observed under supraliminal conditions or that the subliminal affects

the mood and the task separately. It is of course possible that both hypotheses are correct: the subliminal message affects the two elements separately, and once affected they interact differently than they would supraliminally. This finding is novel and promising. According to Silverman et al.'s (1978) hypothesis, an influence to the task is mediated by internal processes. The present experiment suggests that a task might be influenced without the mood being influenced in the same direction.

One issue that remains unexplained is the lack of impact on the mood of the happy no incubation condition. Given that the initial ratings were elevated, a ceiling effect might be impeding a change in the pleasure ratings. It is also possible that under subliminal conditions, the happy and sad conditions react quite differently than under supraliminal conditions because there are no conscious restrictions imposed on the sad elements.

In order to account for the results, one explanation is that the subliminal impacts upon the mood and the task through separate ways. That is, a subliminal might have a certain impact on mood and a different impact on the task. Zajonc (1980) and Bornstein et al. (1987) have shown an independence between affect and cognition. Subjects exposed tachistoscopically to a geometrical figure had a preference for the familiar shapes even when they could not recognize them among similar stimuli. While the subliminal presentation of a stimulus was sufficient to impact upon affect it was not sufficient to impact upon recognition. In a similar way, a subliminal message in the present study might be affecting the mood and the task independently of one another.

The interesting factor here is that if mood and task are affected independently, then their interaction should probably be different from the one seen with supraliminal inductions. This seems indeed to be the case when a mood affected negatively is not an impediment for the writing of a happy story (happy incubation condition).

An interesting finding is the lowering of the mood in condition 4 after exposure to the subliminal. Spence and Holland (1962) and Dixon (1981) support the idea that a subliminal message will bypass the restricting effects of awareness. In the present case it appears that the happy message is cueing sad events. Although in consciousness people try to avoid unpleasant memories (Isen, 1985), under subliminal conditions a happy tape might bring forward happy memories together with their counterpart, sad memories. Although only speculative, the restrictions on the cueing process observed under supraliminal conditions do not seem to hold under subliminal conditions.

In summary, there is evidence that a subliminal message impacts differently on mood and on task and/or the interaction between these two elements is different under subliminal than supraliminal conditions. In order to investigate this area further, several experiments are suggested. First, the memory cue hypothesis warrants more research. Exposing subjects to emotionally charged subliminals while they perform an emotionally neutral task and then asking them for their memories will let us know if a happy (sad) subliminal stimuli lead only to happy (sad) memories or also to their counterpart. Based on the findings of the present study it seems that a person feels less restricted as a

result of the subliminal nature of the stimulus and might be able to retrieve information from categories that in awareness would be left untouched. The memory cue hypothesis is not contradicted, but it might be the case that a subliminal message activates several nodes at the same time, for instance those that cue the happy and the sad material in memory. Two other areas that require investigation are the separate effects on mood and task and the interaction between these. Subliminal and supraliminal mood-induction techniques should be compared while the mood and the task are monitored to investigate these areas.

There is another important area in this study. The pilot studies indicated the presence of a reversal effect. While from a statistically conservative vantage point there was no evidence of a reversal effect in the present study, the fact that it appeared in two earlier studies together with the results observed in the incubation conditions in the present study (lowered mood in the control condition after writing and no change in the happy condition) warrant further investigation.

What could lead a person to write a happy/sad story and then feel the opposite mood (sad/happy)? A cathartic effect (from Greek, cleansing or purifying) might be taking place here with respect to a sad condition. A release of negative affect in the story leads to a betterment of the mood. There is as well a more pragmatic explanation. In both pilot studies as well as in the present study, several subjects were very involved in the writing task (some disbelieved that twenty minutes had passed). The final mood

might be a reflection of their frustration (happy condition) or relief (sad condition) towards finishing a pleasant or an unpleasant task. An interesting issue is that the experimenters observed that although subjects were writing a story that was later judged as sad they were as absorbed in the task as were the subjects in the happy condition. More investigation is needed to check if a subliminal induction leads to more absorption by the task than does a supraliminal induction.

If a reversal effect is found in further experiments, it opens the scope for several areas of investigation. In the first place what makes it happen should be established. Secondly, if the effect exists there are several potential applications. In the nonclinical field, a reversal effect might be utilized to influence the performance of a task or to induce a certain mood. This mood in turn might be employed in experiments in other areas. In the clinical area the main issue would be to study the alleviation of depression. How clinically depressed individuals react to subliminals as compared to nonclinically depressed individuals and to nondepressed individuals could be studied. In addition, the effects of performing a task under subliminal stimulation and the posterior effects to the mood should be ascertained. If any changes in mood are observed, however, it will be necessary to investigate if these are long lasting.

#### Subliminal and supraliminal influences

Several authors (Kihlstrom, 1987; Marcel, 1983b; Dixon, 1981) maintain that subliminals influence behaviour in a qualitatively different way than do supraliminal



messages. They found that material which is perceived outside of awareness elicits more associations than material perceived consciously. Furthermore, Marcel postulates that the entering into consciousness involves a processing of the information which does not occur for the material kept outside of awareness. Brody (1987) maintains that sub- and supraliminal perception need not give rise to qualitative differences.

A partial explanation for the discrepancies between the authors might be related to the thresholds at which the messages were presented. Groeger (1986b) and Henley (1975) had found that semantic and structural analyses were related to the energy levels of message presentation. A message presented below the discrimination level lead to a structural analysis, while a message presented below the detection threshold lead to a semantic analysis. The different analyses to which the stimuli are subjected might create, therefore, a differential response to subliminal and supraliminal stimuli.

The study of the effects of affective messages presented sub- and supraliminally encounters a further obstacle. The elements of demand characteristics, reactance and transparency of objectives are all complicating factors. For instance, Zuckerman (1960) conducted an experiment in which he presented the message 'write more' subliminally and found an increase in written production. To present the same message supraliminally would likely give rise to increased variance based on factors not operative at subliminal levels. Specifically, some subjects may try to comply, others may try to resist, others may feel offended by the procedure and not write at all, and so on. While the present study did not expose subjects to the same stimuli sub- and supraliminally,

some observations were obtained.

Asking people to write a story of a certain tone does not appear to function as a mood-induction procedure similar to the ones used by Clark and Isen (1982). This conclusion is derived from the findings that six out of sixteen subjects in the happy upon request condition actually wrote a sad story; the mood was not improved significantly for the subjects that did write a happy story; productivity was not influenced, that is, subjects in the sad condition did not write less than subjects in the happy condition; and subjects had no impediments in condition 8 to write sad stories, a fact that is opposed to Isen's finding that subjects try to avoid the effects of sad supraliminal inductions. The difference between the upon request procedure and a supraliminal mood-induction technique could explain why productivity (word count) was not affected in condition 8. According to Goodwin and Williams (1982) and to Velten (1968) a depressed mood should bring about a decrease in productivity, which was not observed here.

In addition to the finding that a request is not an appropriate supraliminal technique for mood-induction, the finding that one third of the subjects in the happy condition wrote a sad story is puzzling. A noncompliance phenomenon can be ruled out since subjects were randomly assigned to conditions, and there were no signs of noncompliance in the sad condition. A closer look at the data of the deviant subjects did not indicate any particular characteristics such as a lower initial mood. A post hoc experiment conducted by the author consisted of a request put forward to 16 subjects to write a children's story. More than one third of the stories were sad. It appears that

children's stories have a sad connotation for some subjects and they are unwilling or unable to override it and write a happy story when requested.

### **Conclusion**

This experiment involved the presentation of a subliminal auditory message. The utilization of Fisher's technique (1975, 1976) was effective. First, several subliminal effects, as described earlier, were observed. Secondly, not one in more than 200 subjects who participated in the pilot studies and in the present studies noticed any peculiarities about the experiment. Several assistants who sat in the experimental room for 30 minutes could not determine the presence or absence of the one word subliminal stimuli employed in this experiment above a chance level.

The subliminal messages were effective in influencing the mood in the sad no incubation condition and in the happy incubation condition, and in influencing the affective tone of the stories in the incubation conditions.

The main conclusions derived from the present study are:

Mood and task are affected in a partially independent fashion by a subliminal message

There is no need for mood mediation in order to affect the task subliminally

The affective tone of the stories did not in turn affect the mood (reversal effect)

The request to write a story is not an appropriate supraliminal mood-induction technique

**Applications and suggestions for further research.** The findings of the present study open the door to several interesting issues. The finding that only the incubation conditions had an impact on the task should be investigated to determine if it is the time that allows the subliminal to become effective, if a shadowing effect is taking place, or if the performance of a competing task (writing while being exposed to the tape) cancelled the effects of the subliminal on the task.

Furthermore, subjects with different initial pleasure ratings should be tested to avoid a ceiling effect in the happy conditions. The studies should also include clinically and nonclinically depressed individuals in order to investigate the applications of the findings, and especially the apparent independence between mood and task. As expressed before, clinical applications could be derived if an alleviation of a depressed mood can be brought about with the use of subliminals. The impact subliminals have on depressed people, that is, on their mood directly, on the performance of a task and on the final mood should be investigated. With respect to nonclinical applications, writing a story under subliminal influence might be employed as a procedure to induce certain moods necessary for other fields of research. It is suggested also, that different messages, emotional and nonemotional, short and long, directed to the person's mood

(e.g., 'I feel happy') or to the task being performed (e.g., 'Write a happy story') be utilized.

In addition, the strength of the influences of sub- and supraliminal mood-induction procedures could be studied by instructing subjects supraliminally to perform a task of a certain tone (e.g., to write a happy story) while employing a subliminal message suggesting the opposite tone.

The present study employed a subliminal technique to investigate effects on the mood and the performance of a task. The results suggest that the technique is useful under certain conditions and that a complex pattern of interactions exists between mood and task, a pattern different from the one evoked with supraliminal mood-induction techniques.

It should be kept in mind that this discussion is based in part on post hoc analyses. It should be emphasized, therefore, that although the speculations offer intriguing possibilities for future research, they are nonetheless based on after the fact analyses of data. Conservatively speaking, some of the hypotheses of this study were not supported by the pre-planned analyses.

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**Appendix A**

**Pictures utilized in the sorting task**

The 24 pictures utilized were taken from National Geographic magazines. They were pasted to a letter size black construction paper and covered by a transparent sleeve. The pictures were taken from the following volumes:

**Table 19. Pictures utilized in the sorting task**

<b>Picture</b>	<b>Volume</b>	<b>Number</b>	<b>Page</b>
1	153	5	702
2	153	5	720
3	142	5	683
4	134	5	627
5	155	5	658
6	152	3	319
7	155	5	694
8	155	5	661
9	155	5	645
10	142	5	597
11	155	5	654
12	155	5	702
13	155	5	670

<b>Picture</b>	<b>Volume</b>	<b>Number</b>	<b>Page</b>
14	142	5	685
15	155	5	Adv. (before page 591)
16	142	5	703
17	153	5	682
18	153	5	615
19	152	3	340
20	155	5	727
21	152	3	346
22	153	5	585
23	134	5	632
24	134	5	647

**Appendix B**

**Questionnaires administered to the subjects**

Below are several questions concerning how you feel right now. For each question, please make a mark at the point closest to your feelings. Answer all questions.

I feel

- |                  |       |                |
|------------------|-------|----------------|
| (99) Happy       | _____ | Unhappy (0)    |
| (99) Stimulated  | _____ | Relaxed (0)    |
| (99) Controlling | _____ | Controlled (0) |
| (0) Annoyed      | _____ | Pleased (99)   |
| (0) Calm         | _____ | Excited (99)   |
| (0) Overpowered  | _____ | Powerful (99)  |

Quest1

Below are several questions concerning how you feel right now. For each question, please make a mark at the point closest to your feelings. Answer all questions.

I feel

Pleased	_____	Annoyed
Excited	_____	Calm
Powerful	_____	Overpowered
Unhappy	_____	Happy
Relaxed	_____	Stimulated
Controlled	_____	Controlling

Quest2

Below are several questions concerning the task you have just finished. Thanks for your cooperation.

(1) How would you rate your story on the following scale?

Happy \_\_\_\_\_ Sad

(2) Did you finish the story?

Yes

No

(3) If your answer to the previous question was no, how much more time would you require?

(4) How would you rate the quality of the story you wrote?

1 2 3 4 5 6 7 8  
Very poor Very good

Finally, it would be helpful to us to know what you think the aim of this study is, and if you were aware of any special details. Feel free to make any additional comments. Please use the space provided below and on the other side of this page.

Quest3

**Appendix C**

**Instructions given to subjects**



Subjects in conditions 1, 2, and 3 were given the following instructions:

We would like you to write a children's story, suitable for ages eight to ten. Feel free to write what you like, but please make sure that the story has a beginning, middle, and end. You have twenty minutes, five to think about the story, and fifteen minutes to write the actual story. Please do so in the space provided. Do not write during the first five minutes.

I will let you know through the intercom when to begin writing, and I will be back in twenty minutes. Do you have any questions?

Subjects in conditions 4, 5, and 6 were given the following instructions:

We would like you to separate these pictures into two categories: those that look more masculine and those that look more feminine. You have twenty minutes, five to think about the criteria to distinguish them, and fifteen minutes to separate them [subjects were shown the first three pictures]. This task can be performed with a high reliability; we suggest that you divide the pictures into three piles at first: obviously masculine,

obviously feminine, and undecided, and then try to differentiate the undecided ones. You might use any other technique that you want.

I will let you know through the intercom when to begin sorting them, and I will be back in twenty minutes. Do you have any questions? [After the twenty minutes had lapsed, subjects were instructed to write the story. They were given the same instructions as above, except that they were instructed to start writing right away. They were given 15 minutes for this task.]

Subjects in conditions 7 and 8 were given the following instructions:

We would like you to write a happy [sad] children's story, suitable for ages eight to ten. Feel free to write what you like, but please make sure that the story has a beginning, middle, and end. You have twenty minutes, five to think about the story, and fifteen minutes to write the actual story. Please do so in the space provided.

I will let you know through the intercom when to begin writing, and I will be back in twenty minutes. Do you have any questions?

**Appendix D**  
**Rating scales**

Subject \_\_\_\_\_  
Rater . \_\_\_\_\_

Set A

(1) How would you rate the story on the following scale?

1 2 3 4 5 6  
Happy Sad

(2) Do you perceive the existence of dreamlike elements?

No Yes

(3) Do you perceive the intrusion of extraordinary events?

No Yes

If Yes, Positive or Negative

(4) Do you feel that the story is under the author's control?

1 2 3 4  
Not at all Somewhat Moderately Strongly

(5) Do you feel that this is a story for children?

1 2 3 4  
Not at all Somewhat Moderately Strongly

(6) Is there a final twist at the end of the story?

No Yes

If Yes, does it make the ending Positive or Negative

(7) Comments

Set B

Subject \_\_\_\_\_

Judge \_\_\_\_\_

Total

Happy

Sad

Happy related words

Sad related words

Total number of words

Set C

Subject \_\_\_\_\_  
 Judge \_\_\_\_\_

Happy \_\_\_\_\_

Sad \_\_\_\_\_

Optimistic \_\_\_\_\_ Pessimistic

Soft \_\_\_\_\_ Hard

Active \_\_\_\_\_ Passive

Cruel \_\_\_\_\_ Kind

Heavy \_\_\_\_\_ Light

Bass \_\_\_\_\_ Treble

How would you rate the quality of the story?

1 2 3 4 5 6 7 8  
 Very poor Very good

The third scoring sheet provided in this appendix (set C) was not employed. It consisted of two unipolar scales, one each for happiness and sadness, six pairs of adjectives, and a scale for the quality of the story. To select the pairs of adjectives that best distinguish between stories, 14 volunteers were each given a sad and a happy story and asked to rate them using 15 pairs of adjectives taken from Osgood, Suci and Tannenbaum (1967). The pairs that distinguished better among the two stories, and that were consistent across the raters were kept for the final scoring. Two pairs, optimistic-pessimistic and kind-cruel belong to the evaluation axis (similar to the Pleasure factor, as defined by Mehrabian and Russell); two pairs, active-passive and treble-bass belong to the activity axis (similar to the Arousal factor); and the last two, soft-hard and light-heavy load on the potency axis, equivalent to the Dominance factor.

The three scorers (three female psychology undergraduate students who volunteered to participate in order to gain experience with the running of experiments) were instructed to rate the emotional tone of the story, disregarding grammar, style, and spelling. They were instructed to concentrate on what was written and not to imagine the end if the story was unfinished. They were also told to keep in mind that happy stories very often carry sad elements and vice versa. They were told to disregard last minute (or last sentence) attempts at changing the tone of the story. Each scorer was given six stories for training, two happy, two sad, and two neutral ones. A meeting was

conducted to compare the ratings and to answer any questions. After the scoring of the 128 stories had been completed four elements indicated the need for a rescoring of the data. First, it was very difficult to translate the unipolar scales into a compatible bipolar scale, as the ones utilized in the other sections of the experiment (mood questionnaires and subjects' rating of their own stories). Second, there was a disagreement between the judgements of several stories and those of the present experimenter and of an assistant. Two additional people were asked to judge several stories and the discrepancies with the judges' scorings were evident. Third, the conditions under which the judges worked raised some doubts. The three judges, who knew each other, worked almost always together, and in a fast manner. It seems that the ratings were not the best and towards the middle of the task most ratings showed a regression to the mean, indicating little differences among the stories. Lastly, when a rescoring was considered, several elements that seemed to appear regularly in the stories were scheduled for rating. It is in this way then, that the second scoring scale was devised (set A) and a rescoring conducted. The scoring of the other set (B) proceeded as planned.



**Appendix E**  
**Supplementary analyses**

In the first part of this Appendix the analyses of the Dream, Extra, Child and Twist variables are provided. In the second part, the analyses of the arousal and dominance factors of mood are presented.

**Table 20**  
**Means and standard deviations for Dream and Extra**

Cond	Dream		Extra	
	Mean	SD	Mean	SD
1	.562	.442	.469	.499
2	.437	.479	.344	.397
3	.375	.465	.312	.442
4	.250	.408	.250	.408
5	.281	.407	.094	.272
6	.406	.455	.437	.479
7	.156	.352	.250	.408
8	.156	.301	.094	.272

A low value indicates the presence of less dreamlike or extraordinary events in the stories. Two one-way ANOVAs (Dream by condition, and Extra by condition) indicated no significant overall effects ( $F[7,120]=1.868$ ;  $p>.09$  for Dream and  $F[7,120]=1.905$ ;  $p>.08$  for Extra).

Table 21 provides the means and standard deviations for Child (on a four point scale) and Twist. High values indicate a story suitable for children and the existence of

a twist at the end of the story.

**Table 21**

**Means and standard deviations for Child and Twist**

Cond	Child		Twist	
	Mean	SD	Mean	SD
1	3.18	.750	.187	.358
2	3.00	.983	.250	.316
3	3.25	.796	.375	.428
4	3.19	.814	.219	.407
5	3.06	.854	.344	.437
6	3.19	.750	.562	.442
7	3.16	.851	.344	.437
8	2.81	.793	.219	.407

An ANOVA of Child by condition showed no effect for the latter ( $F[7,120]=.476$ ). A similar analysis, Twist by condition also showed no effects for condition ( $F[7,120]=1.460$ ;  $p>.19$ ).

With regards to the analysis of the mood axes, table 22 provides the means and standard deviations for the arousal factor for the eight conditions.

**Table 22**  
**Arousal factor (self-rating) for all conditions**

Cond	Initial		Intermediate		Final	
	Mean	SD	Mean	SD	Mean	SD
1	27.1	15.44			60.2	19.58
2	46.7	28.70			74.6	22.85
3	44.9	22.12			62.8	26.02
4	39.4	19.69	32.9	25.92	56.0	28.53
5	37.3	23.06	33.5	20.73	46.8	26.66
6	44.1	24.27	41.9	22.00	62.7	21.15
7	51.1	18.69			68.0	20.81
8	43.3	19.66			60.7	23.62

A t-test of the initial and the final ratings indicated a significant difference,  $t[127]=7.61$ ;  $p[\text{two-tail}]<.001$ . An analysis of covariance of the final rating by condition, with the initial rating as the covariate indicated no effects for condition ( $F[7,119]=1.588$ ;  $p>.15$ ). The covariate was significantly related to the final rating ( $F[1,119]=6.033$ ;  $p<.02$ ). The results indicated that subjects were more aroused at the end than at the beginning of the experiment and that there were no differences between the conditions at the end of the experiment.

Table 23 provides the means and standard deviations of the dominance factor for the eight conditions.

**Table 23**  
**Dominance factor (self-rating) for all conditions**

Cond	Initial		Intermediate		Final	
	Mean	SD	Mean	SD	Mean	SD
1	34.9	22.90			48.2	24.02
2	50.3	31.01			41.4	28.52
3	43.8	15.79			55.2	27.04
4	38.0	18.45	46.5	24.41	53.5	28.59
5	41.4	19.89	50.5	14.93	53.4	19.52
6	46.1	21.98	48.1	23.76	62.0	21.45
7	40.6	22.14			56.0	24.06
8	40.3	17.96			53.8	20.48

A t-test of the initial and the final ratings indicated a significant difference,  $t[127]=4.07$ ;  $p[\text{two-tail}]<.001$ . An analysis of covariance of the final rating by condition, with the initial rating as the covariate indicated no effects for condition ( $F[7,119]=1.026$ ;  $p>.42$ ). The covariate was not significantly related to the final rating ( $F[1,119]=1.744$ ;  $p>.19$ ). The results indicated that subjects felt more in control at the end than at the beginning of the experiment and that there were no differences between the conditions at the end of the experiment.

**Appendix F**

**List of happy- and sad-related words**

**Happy-related words**

Happiness joy fun excitement luck pleasantness gladness gaiety  
cheerfulness delight thrill

**Sad-related words**

Sadness upset melancholy depression sorrow worry misery heart-break  
mournful unhappiness

Words that included the roots of the above mentioned ones were also counted

**Appendix G**

**Examples of stories written by the subjects**



The following two stories belong to conditions 4 and 5, respectively. They are both unfinished.

Once upon a time, there lived a little turtle named Junior. He lived in a pond near a very big city. One day, three men came and captured Junior and brought him to a pet store to be sold. Junior was very sad, because he left his family and friends behind. He was left all alone in a glass tank, with no one to talk to or play with. Children used to come into the store, and knock on the glass of his tank, to try and make him play, but Junior wouldn't. He was too lonely.

Then, one day, a little girl named Suzanne came in to the store and bought Junior. She brought him home with her and put his glass tank right beside her bed. Suzanne bought lots of neat toys for Junior, but he still wouldn't play and be happy.

"Why are you so sad little turtle?" asked Suzanne.

"I miss my friends and my family" cried Junior.

"But I'm your family now", said Suzanne, "and I want you to be happy".

"I just can't" said Junior. "Not without my family!"

Then Suzanne got an idea. She decided she would try to make Junior happy again.

That day, she went to the pond where Junior used to live. She talked to his family and asked them if they'd like to come live with her. They missed Junior just as much

as he missed them, so they said yes. So Suzanne brought Junior's family home with her.

But there was one more surprise. She went to the pet store before going home, and bought another turtle, that looked just as lonely as Junior.

Suzanne got home that day and she was very excited! Junior was asleep so she told his family and new friend to be careful not to wake him as they moved into the tank. They all waited anxiously for Junior to wake up!

Junior opened his eyes (unfinished)

Once there was a turtle who lived in the sea. He was very unhappy. He was sick of playing turtle games, doing turtle things, eating turtle food. He was bored of being a turtle. He decided that he was going to go out into the world and find out what would be more exciting to be. He wanted to see the world and do new things. Being a turtle was just not for him. So the day came when he left his home, his friends, his family and relatives to seek the new "him". His family was sad to see him go but abided to his wishes.

First the turtle went to a field. He saw a flower. He thought to himself, "that is the most beautiful thing in the world" and that's what he wanted to be. He stood beside the flower. One day a human came along and picked the flower, the flower wilted and

died. It lost its beauty and the turtle decided that, that was not going to happen to him.

Then he went to the mountains. He wanted to be strong and powerful like a mountain, so he stood beside a mountain for a long time but soon got very bored and lonely. So he decided that being strong was not for him either. (Unfinished)