

The Power of Subliminal Messaging

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ABSTRACT

Cognitive and social psychologists are now learning that stimuli presented subliminally can have a considerable influence on cognitive processes such as emotional responses. Studies have shown that women are more emotionally expressive than men. It is unclear, however, if women are more susceptible to the emotional modulation of behavior imposed by an affective stimulus presented subliminally (Pereira et al., 2004). To compare the influences of subliminal messaging on men and women this study was conducted in two parts. In the first experiment 20 volunteers were asked to rate a neutral picture, based on their first impression, on a scale of 1 to 7 (1 being unpleasant and 7 being pleasant). Before each picture a negative prime such as “bored” or a positive prime such as “happy” was presented subliminally for 1 ms; 5 different positive and 5 different negative words were used. The results suggest that regardless of the subliminal prime, there was no significant difference ($p > 0.10$) between male and female emotional response ratings. A second experiment was conducted with 8 volunteers and the same pictures used in the first experiment; however, in the second experiment only the two most influential primes, one positive (“enjoying”) and one negative (“torture”), were used. The results show that the most influential negative and positive subliminal primes had a significant effect ($p < 0.001$) on the subject’s emotional response ratings.

INTRODUCTION

Many cognitive processes are beyond conscious awareness or voluntary control. The question of what we are able to perceive on a subconscious level (that which we do not consciously perceive) has been much of the debate of psychological studies since the early 1800’s (Merikle, 1998). Despite this early interest in unconscious perception, however, it has only been within the past fifteen to twenty years that our understanding of this field has advanced considerably.

Subliminal means “beneath the threshold of conscious awareness.” Subliminal perception is said to occur when stimuli presented below the threshold of awareness influences information processing, emotion or action (Cleeremans, 1991). The ability to process and make use of unseen visual input may be possible due to a secondary neuronal pathway, which branches from the optic nerve, bypassing the main reception site for normal vision (area V1 or the primary visual cortex) and extends to an area of the midbrain known as the superior colliculus. Studies employing functional magnetic resonance imaging (fMRI) to localize and compare neural activity in the brain during the execution of conscious and unconscious vision tasks support this theory. The results of such studies show more activity in the cortex when the patient is aware of presented stimuli, whereas more activity in the superior colliculus when the patient is unaware of the presented stimuli (Weiskrantz, 1992).

Experimental results have shown that although the observers indicated that they were unaware of perceiving the stimuli, their guesses indicated that at some level they did in fact process sufficient information to make accurate guesses regarding the stimuli.

Recently, Epley and Gilovich (1999) have documented dramatic effects of subliminal messaging in their study involving college students primed with words associated with the elderly. This experiment resulted in the primed treatment group walking more slowly after leaving the experimental testing than the non-primed control group. In another study, Klapp and Hinkley (2002) subliminally presented an arrow pointing left or right or up or down on a screen. Participants were asked to respond to the visibly presented target arrow by indicating which direction the arrow was pointing. Results showed that when the target and subliminally presented arrow were both arranged in the same direction, reaction time was faster than when the arrows were in different positions. These two studies suggest that social behavior, or emotion, can be activated automatically, with no conscious thought or meditation.

Further evidence indicates that cognition influences emotion and emotion influences cognition. Zajonc (1980) argued that emotions can be elicited without cognition. The evidence supporting this argument stems from studies with subliminal presentations of emotional stimuli. One of the best-known examples of an unconscious emotional process is the influence of subliminal primes on evaluations of consciously accessible targets. Berridge and Winkielman (2003) conducted an experiment in which participants rated Chinese characters preceded by a subliminal smiling face more positively than Chinese characters that were preceded by a subliminal frowning face.

It is a common belief that women are more emotional than men. In fact, previous studies have shown that women are more emotionally expressive than men (Pereira et al., 2004). The question however, is whether men and women process emotional stimuli differently. Bradley et al. (2001) investigated sex differences in emotional picture processing and obtained results that demonstrated that women were more reactive to unpleasant stimuli than males. Differences in brain anatomy and cognition between sexes have been increasingly documented. For example Gur et al. (2002) observed that women have larger orbital frontal cortices than men and speculated that women have greater tissue volume available for modulating amygdala input leading to gender differences in emotional behavior.

Lee et al. (2002) also examined the effect of sex on brain activity during the viewing of alternating sets of faces depicting happy or sad expressions in photographs. Consistent with the findings of Canli et al. (2002), the imaging data suggested that male and female subjects used different sets of neural correlates when processing faces showing either happy or sad expressions. These studies thus support the hypothesis that men and women deploy different neural circuits for processing emotional stimuli (Lee et al., 2002).

Despite the scientific evidence supporting subliminal messaging there still remains much debate. The goal of this study was to determine whether males and females rate the same pictures differently when presented negative or positive prime words subliminally. The study tested the effectiveness of subliminal primes presented at 1ms.

MATERIALS AND METHODS

Both experiments were run in a computer lab on a computer with the Windows 98 operating system and SuperLab software. Instructions were provided on the computer screen and the participants had time to ask questions before the experiment began. The experiment consisted of 50 neutrally rated target pictures (i.e. key, butter, plate, desk,

etc.) which were collected from the internet. The pictures were rated neutral in a previous study conducted by Bellezza et al. (1986). Once the pictures were formatted to resemble approximately the same size (i.e. 5x5), a coin was tossed to determine which type of emotional word, positive or negative, would be subliminally flashed before each picture. The positive and negative words were collected from an experiment conducted by Siegle (1994). This study used five negative words (i.e. bored, suffering, torture, depressed, and unhappy) and five positive words (i.e. happy, enjoying, cheerful, smile, and joy). The instructions were as follows:

In this experiment you will rate a series of 50 pictures with regard to how pleasant or unpleasant they make you feel. These ratings will then be used to select stimuli for a future experiment. You will be using the scale below to make your ratings:

1	2	3	4	5	6	7
very unpleasant			neutral			very pleasant

Use the numbers on the top row of the keyboard to indicate your rating. Do not spend too much time deciding on a rating; your first impression should suffice. Before each picture is shown a “+” sign will appear on the screen. This is the area on the screen that you should focus on. When you are ready to rate a picture and move on, press the space bar. Once you have rated the picture by pressing 1-7 on the keyboard the picture will go off the screen automatically and another “+” sign will appear on the screen. Remember to rate each picture based on your first impression using the 7-point scale. If you have any questions please ask your instructor now, otherwise please press the space bar to begin.

Experiment 1

Twenty participants (10 males, 10 females) were randomly chosen using Mini Tab software from a master list of 40 volunteers who agreed to take part in the study in exchange for \$15.00. A coin was then tossed to determine which experimental setup group each student would be in. There were two groups of 10 participants, 5 females and 5 males each. The two groups served as a means of comparison because they differed in the order the primes were presented. For example, when one group was presented a positive prime, the other was presented a negative prime.

The target pictures were presented in alphabetical order with a prime word flashed before each target picture at a 1 ms speed, which was even faster (i.e. more subliminal) than presentation speeds utilized throughout the literature. Each picture was arranged in a sequence of three slides. The sequence consisted of a focus slide, which contained a plus sign (+) in the middle of the screen to ensure the participant was focusing on the right area of the screen. This slide was changed when the participant was ready to move on, which was done by pressing the spacebar. The focus sign was followed by the subliminally presented prime, or positive or negative word, which was followed by the neutrally rated target picture (remaining presented on the screen until the volunteer rated the picture), which was then again followed by a focus sign, marking the start of the next sequence. At the end of the experiment the participant was thanked for their participation

as well as debriefed about what they were exposed to. They were then again allowed to ask questions regarding the experiment. The concluding instructions were as follows:

Thank you for participating in this study, I truly appreciate your time. In actuality you have been exposed to a series of pictures which had subliminal primes presented before each prime. These primes were both positive and negative words, which were hypothesized to affect your ratings on each picture. If you have any questions regarding this experiment of subliminal messaging please do not hesitate to ask your instructor before leaving today. Thank you once again.

After the mean ratings for each subject were computed, the most influential word primes from the original list of 5 negative and 5 positive primes were determined by computing the response means for each prime. One positive and one negative prime was determined by comparing the mean ratings following each prime. These two words were then used in the conduct of the second experiment.

Experiment 2

The second experiment utilized the same 50 pictures, presented in the same order. Only the two most influential primes were presented subliminally. The study utilized 8 (4 females, 4 males) volunteers; the experiment was conducted under the same conditions as Experiment 1. The subjects were tested in two groups, consisting of 2 females and 2 males each. The response means for each subject were calculated as well as the difference in means for each prime.

RESULTS

Experiment 1

Tests of between-subject effects showed no significant difference between groups 1 and 2 ($p > .10$). The data from both groups were then combined. The mean pleasantness ratings (and standard deviations) as a function of gender and prime are presented in Table 1.

Table 1. Mean pleasantness ratings as a function of gender and prime*. Standard deviations are given in parentheses.

Gender	Positive Prime	Negative Prime	Mean
Female	4.03 (.26)	4.28 (.36)	4.15
Male	4.44 (.61)	4.62 (.66)	4.52
Mean	4.23	4.45	

* scale: 1 (extremely unpleasant) – 7 (extremely pleasant)

A 2 (gender: male or female; between) x 2 (prime: positive or negative; within) mixed ANOVA revealed no significant gender x prime interaction ($p > .10$), no significant main effect of prime ($p > .10$), and no significant main effect of gender ($p > .05$).

To determine which primes were most effective, subsequent analyses were performed. The mean pleasantness ratings for each word prime (averaged across gender) are presented in Table 2.

Table 2. Total average response ratings for each prime*. Standard deviations are given in parentheses.

Word Prime	Mean	
Torture	3.85	(.68)
Suffering	4.04	(.63)
Smile	4.08	(.78)
Cheer	4.18	(.70)
Joy	4.27	(.71)
Unhappy	4.41	(.70)
Bored	4.48	(.63)
Depressed	4.55	(.72)
Happy	4.58	(.72)
Enjoying	4.81	(.66)

* scale: 1 (extremely unpleasant) – 7 (extremely pleasant)

A one-way repeated measures ANOVA revealed a significant difference between the word primes ($F(9, 162)=6.10, p<.001$). Post-hoc pair-wise comparisons revealed that the most influential positive prime was “enjoying” and that this prime was rated significantly more pleasant than each of the other nine primes. Furthermore, pair-wise comparisons revealed that the prime rated most unpleasant was “torture” and that this prime was rated significantly more unpleasant than each of the other nine primes.

Experiment 2

No significant difference was found between groups 1 and 2 so the data from both groups were combined for the remaining analyses. The mean pleasantness rating (and standard deviation) as a function of gender and prime are shown in Table 3.

Table 3. Mean pleasantness rating for positive and negative primes*. Standard deviations are given in parentheses.

Gender	Positive Prime	Negative Prime	Mean
Female	4.82 (.19)	3.63 (.30)	4.23
Male	4.86 (.05)	3.64 (.23)	4.25
Mean	4.84 (.13)	3.64 (.25)	

* scale: 1 (extremely unpleasant) – 7 (extremely pleasant)

A 2 (gender: male or female; between) x 2 (prime: positive or negative; within) mixed ANOVA revealed that the primes had a significant effect ($F(1,6) = 149.308, p < .001$): pictures primed with the positive prime “enjoying” were rated significantly more pleasant than pictures primed with the negative prime “torture.” No significant gender x prime interaction ($p > .10$) and no significant effect of gender ($p > .10$) were found.

DISCUSSION

For decades subliminal perception has been a source of controversy. The question being debated is whether we are affected by stimuli that are presented below the threshold for conscious experience, or remain outside our conscious awareness. Two main hypotheses were tested in this study: 1) emotional subliminal primes can have an effect on the way an individual rates a neutral picture, 2) females will be more likely to rate the pictures more extremely. The response ratings of the pictures, in the first experiment appear to be independent of the emotional subliminal prime presented. Although one plausible explanation for the results of the first experiment is that stimuli outside awareness do not elicit an emotional experience, it is important to explore alternative explanations. Explanations for these results could possibly be attributed to the strength of the primed words. Although the words were taken from a previous study the intensity of the words might not have been strong enough to affect the response ratings. Furthermore the presentation speed used was questionable and may have been too fast to be perceived.

Although Experiment 1 did not reveal any significant influence of subliminal prime on neutral-picture rating, it revealed that some primes were more effective than others. Experiment 2 isolated the two most influential word primes as a means of improving power and sensitivity in experimental design. The only variables altered in this setup were the prime words. The most effective primes were determined by finding the average responses for each word prime. Once all the averages were calculated the highest average for the positive words, as well as the lowest average for the negative words was determined and these two words, "torture" and "enjoying" were subliminally presented in the second study. Once the study was conducted averages for both negative and positive response ratings were determined. The results correlated with the averages calculated for each prime at the end of the first study. The results from experiment 2 support the hypothesis that subliminal messaging has an effect on subjects' response ratings of neutral pictures.

CONCLUSION

Two experiments were conducted to demonstrate the effectiveness of subliminally presented stimuli, as well as to determine whether or not male and females respond differently to the same subliminal stimuli. Results of this study indicate that emotional subliminal primes are not an accurate way of influencing an individual's rating response.

It was found, however, that there were differences among the subliminal primes and because of this it is possible that the primes had some sort of influence, although not statistically significant. Research methods for experiments testing subliminal messaging vary throughout the literature and the speed at which subliminal primes are successful were not specifically identified for this particular study. A more accurate method for testing the effects of subliminal primes should be evaluated by testing alternative presentation times. Furthermore, the marginal significant difference observed between genders could too be further supported and enhanced by altering the presentation times. It cannot be concluded from the first experiment, with certainty how effective subliminal messages, specifically emotional primes, are.

The second experiment demonstrated the effectiveness of subliminal messages. Although there was no statistically significant difference between male and female

response ratings, there was a significant difference in the response ratings due to the positive and negative primes. The experiment was successful after finding the most influential word primes.

Future research in this field should examine whether there is any evidence that unconsciously perceived information can have an impact for longer than 24 hours. If more personally relevant materials are used, it may be possible that the impact of unconsciously perceived information may extend. Another important direction to explore is whether there are differences in individuals' sensitivity to the effects of subliminally presented information. For example are there characteristics that distinguish individuals who are particularly sensitive to subliminal messages?

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