

Running Head: SUBLIMINAL PERCEPTION

Does “subliminal perception” (perception without awareness) occur,
and how can it be measured?

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Introduction

The first documented findings suggesting an effect that has come to be called “subliminal perception” (or perception without awareness) came from Pierce and Jastrow's (1884) work testing the human response to very similar, barely distinguishable stimuli. Pierce and Jastrow devised an experiment in which they each had to evaluate which of two pressures on skin was greater, along with a reported confidence level. The significant, and surprising, finding was that even when the subject indicated that they were guessing (zero confidence, implied 50% chance), they were actually correct about which pressure was greater more than 60% of the time. The subjects were consistently more accurate than chance, but were not aware of any difference between the two stimuli. These findings were later confirmed by other researchers, stirring interest about stimuli that were beneath the threshold of conscious awareness.

Popular interest in this field was spurred by the claims of a marketing researcher, James Vicary (Merikle, 2000). In 1957, Vicary claimed that patrons at a movie theatre were exposed to advertising messages *Eat Popcorn* and *Drink Coca-Cola* flashed for 3 millisecond durations and repeated throughout a movie. According to Vicary, patrons were not consciously aware of these hidden messages but responded favourably by significantly increasing their purchases of popcorn and drinks. There has not been any independent evidence to support the claims, and Vicary himself stated that the research was a fabrication (Merikle, 2000).

Nevertheless, extraordinary claims have attracted attention over the years. The notion that peoples' behaviours can be influenced by stimuli they were not even aware of perceiving has generated much interest among the public, and among psychologists. Research into what was coined “subliminal perception” has been marked by debate about what exactly researchers should

measure, and how they can justify evaluating whether subliminal perception occurs at all.

Overall, findings seem to support the discovery that even when an individual does not report awareness of a stimulus, the stimulus can still have an effect upon memory or behaviour. This paper aims to describe the important experiments within the field, while addressing the controversy over subliminal perception, measurement, and experimental methodology.

What is subliminal perception?

The meaning of the term *subliminal perception* has changed over the years, and some prefer to use *perception without awareness* as an alternative that avoids the sometimes contentious issue of *limen* (threshold). Generally speaking, “Subliminal perception occurs whenever stimuli presented below the threshold or limen for awareness are found to influence thoughts, feelings, or actions” (Merikle, 2000). Because an influence on thoughts, feelings, or actions is relatively easy to measure experimentally, the difficult part about the field is evaluating awareness of a stimulus below the subject's threshold. Central to the issue is knowing when a subject is consciously aware of a stimulus, and how this can be reliably ascertained in experiments. Traditionally, the subjects themselves report awareness. While other areas of psychology may disapprove of introspection as a source of data, in the field of subliminal perception this self-report of “awareness” seems to be unavoidable. The inevitable use of the self-report has also led to much debate over how these self-reports should be interpreted.

The dissociation paradigm is the predominant experimental approach used in research on subliminal perception. Perception without awareness is demonstrated only when the subject reports no conscious awareness of the stimulus (null sensitivity) but some other significant effect

shows that the stimulus was perceived nevertheless (Merikle and Joordens, 1997). Provided that the terms of the dissociation can be reliably stated, this paradigm provides sound demonstration of subliminal perception. As Merikle and Joordens point out, however, the terms of the null sensitivity prove to be a point of disagreement for researchers.

Cheesman and Merikle (1984) identify two classes of threshold measures: subjective, and objective. Within the scope of dissociation, this subjective/objective threshold paradigm shows two different ways to evaluate whether a participant is consciously aware of a stimulus. The subjective measure relies on the participant's self report of the existence of a stimulus. In other words, the participant simply indicates whether or not they were aware of the stimulus. A disadvantage of the subjective measure is that a response bias may lead the participant to choose against reporting a stimulus when the participant feels ambivalence. As a result, each person may gauge “awareness” using their own terms, meaning inconsistencies among experiments. An objective measure, on the other hand, is obtained when the subject is forced to choose between fixed alternatives or discriminate between several options – even if they believe the options are equivalent. The objective threshold is “the level of detectability where perceptual information is actually discriminated at a chance level” (Kihlstrom, Barnhardt, & Tatarzyn, 1992, p. 20). This objective measure provides a lower threshold for conscious awareness, leading to more conservative evaluations of when subliminal perception occurs.

Obviously, the nature of the threshold is essential to identifying the existence of subliminal perception since a stimulus is only subliminal when it is below the threshold of awareness. There is disagreement among researchers on whether the subjective or objective threshold measure should be used, or whether the dissociation paradigm as a whole is suitable. The debates on these topics are quite recent, and a review of the current opinions follows.

Debate over terms and methodology

The field of subliminal perception, or perception without awareness, has been marked by continual controversy. In recent years, experts within the field have been debating what qualifies as perception without awareness, and which forms of measurement are valid for experiments. Specifically, researchers question self reports from a subject in an experiment. While Cheesman and Merikle (1984) have addressed the issue by classifying types of self reports, this controversy is far from resolved. Reingold and Toth (1996) describe one of the fundamental issues:

. . . factors unrelated to awareness, such as demand characteristics and preconceived biases, may lead subjects to adopt a conservative response criterion and report null perceptual awareness even under conditions in which conscious perceptual information is available. Response bias represents a threat not only to the validity of the subjective report measure of awareness, but also to its reliability. In particular, variability in response criteria makes it difficult to compare reports of null subjective confidence across-subjects, or within-subjects across conditions. (p. 162)

The dissociation paradigm, described earlier, has been the usual method for determining whether subliminal perception exists. In order to apply dissociation, the subject in the experiment has to indicate no conscious awareness of the stimulus they were exposed to. This paradigm has come under attack, however, because researchers question whether a failure to *measure* conscious awareness really is equivalent to finding a null effect (Epley, 2004). Perhaps the measurement simply is not sensitive enough to detect an existing conscious awareness of the

stimulus. After all, threshold sensitivity already depends on which subjective/objective threshold type is employed (Cheesman and Merikle, 1984). With an even more sensitive measure, the null effect could disappear in any given experiment, ruling out subliminal perception. According to Merikle and Joordens (1997), “The conclusion reached on the basis of this review is that traditional approaches based on the dissociation paradigm are probably doomed to continual controversy because of the inherent difficulties in demonstrating that any behavioral measure actually exhibits null sensitivity to all relevant conscious information” (p. 110).

With the apparent uncertainty of the dissociation paradigm, researchers have looked for new ways to establish whether perception without awareness occurs at all. The “exclusion paradigm” (Debner and Jacoby, 1994) offers a different way of looking at the effect by pitting conscious processing against unconscious processing. For example, subjects in Debner and Jacoby's experiments were presented with a priming word but were told to avoid using the prime in a word completion exercise. The intent of this experimental design was that if subjects were consciously aware of the stimulus, they would avoid using the stimulus to complete words. If they really were not consciously aware of the stimulus, then there would be no conscious effort against using that word. This ruled out the problems with arbitrary thresholds and response bias, since subjects could no longer decide to report awareness on their own terms. Debner and Jacoby's experiment will be described in detail in the following section.

Just-Noticeable Differences (Pierce and Jastrow, 1884)

The first documented experiments by Pierce and Jastrow are not only interesting from a historical viewpoint, but also because the experiment alludes to subjective/objective thresholds

discussed a century later (Kihlstrom et al., 1992). Pierce set out to research just-noticeable differences when the difference between stimuli was below a physiological threshold. Two very similar pressures were exerted on the subject's hands, and the subject was forced to choose which of the two pressures was greater. Along with each choice, the subject rated their confidence on a scale of 0-3. Zero confidence denoted "absence of any preference for one answer over its opposite, so that it seemed nonsensical to answer at all" (Pierce and Jastrow, p. 77).

The results indicated a correlation between guesses and the actual proportion of pressures, even when the subjects were guessing (i.e. subliminal). Of the results at zero confidence, subjects guessed the greater pressure correctly in 62%, 70%, and 67% of trials (under different conditions). These results were consistently above 50%, the expected value for guessing. Therefore, the subjects did perceive the stimuli even though they were not aware of them.

A century later, Cheesman and Merikle (1984) defined a subjective versus objective criteria for the threshold which proves to have a major impact on the interpretation of this early experiment and all the others like it. The subjective threshold would be the point at which subjects in the experiment could no longer report a difference in the stimuli (zero confidence). However, the objective threshold would take into account the successes of the guesses and would rule out subliminal perception in this case (Kihlstrom et al., 1992, p. 20).

Visual Masking and Word Recognition (Marcel, 1983)

Marcel's famous experiments during the 1970s on visual masking and word recognition exemplify an entire class of experiments on the priming effects of words. Subjects were shown a masked prime word (or not) and then a target consisting of a string of letters that was sometimes

semantically associated to the target. This string of letters sometimes formed a real word, but other times was nonsense. Under one condition, subjects were asked whether the prime word was present. In the other condition, subjects were asked whether the target string was a word.

Marcel (1983) found that while the masked primes were not detected by subjects, the associated primes did facilitate decisions about whether the letter strings were a valid word. Therefore, the stimulus is being perceived without the subject's awareness. Many other studies have used similar methods, confirming Marcel's findings and also demonstrating that “pictures, faces, and spoken words can also facilitate subsequent decisions when they are presented under conditions that make it difficult to discriminate one stimulus from another” (Merikle, 2000).

These results were strengthened by another finding, that “the magnitude of the influence of nondetectable stimuli was virtually equivalent to the magnitude of the influence of clearly visible stimuli” (Merikle and Reingold, 1992, p. 60). Although Marcel's results offered convincing evidence for the subliminal perception phenomenon, problems appeared when the results were scrutinized. Critics were not convinced that the experiment established a true null sensitivity, that is, whether observers were completely unable to discriminate between stimuli. This criticism, essentially of the dissociation paradigm itself, is pervasive as described earlier in this paper.

Subliminal Mere Exposure (Kunst-Wilson and Zajonc, 1980)

The “mere exposure” effect refers to the finding that merely being exposed to a stimulus such as an object enhances the subject's attitude toward the stimulus (Zajonc, 1968). This phenomenon is one of affect rather than cognition, and emotional liking or preference after

repeated exposure is exhibited both in humans and in animals. Kunst-Wilson and Zajonc (1980) performed experiments to determine whether the mere exposure effect occurs when the stimulus is presented subliminally, under degraded conditions where subjects indicate no recollection of the stimulus. Their findings are quite surprising, and have since been replicated in many similar experiments.

In Kunst-Wilson and Zajonc's (1980) experiment, subjects were exposed to irregular octagons that could easily be discriminated under normal circumstances. In the exposure phase, the subjects first saw half of the octagons under “degraded” conditions (1 millisecond duration and poor illumination) which were determined to yield only chance level recognition. In other words, the subjects were later unable to recognize the stimuli they had seen during the exposure phase and so the stimuli were presented subliminally. In the second phase, subjects had to make comparisons between two octagons under normal viewing conditions. One octagons had been subliminally presented to the subject during the exposure phase, and the other octagon was novel. Subjects were asked to both indicate which octagon they had seen before (recognition), and which octagon they liked better.

While recognition performance was at chance level, subjects *liked* the previously seen stimuli over the novel stimuli 60% of the time (Kunst-Wilson and Zajonc, 1980, p. 558). Because recognition was indeed at chance levels, this experiment provides convincing evidence that a truly subliminal stimulus influences thoughts or feelings. Unlike Pierce and Jastrow's (1884) and Marcel's (1983) experiments, the mere exposure and related experiments use a new dimension, emotional preference, rather than cognition in order to demonstrate perception without awareness.

Exclusion Paradigm (Debner and Jacoby, 1994)

Recently, Debner and Jacoby (1994) have offered an “exclusion paradigm” which may be able to avoid the disputed aspects of the dissociation paradigm. The word completion experiment illustrates how the exclusion paradigm puts conscious and unconscious processes in conflict with each other. Subjects were first briefly flashed priming words for durations that ranged from subliminal to clearly perceptible. Subjects were then given word stems of partially completed words, and asked to complete the words. However, subjects were instructed to not use the priming word in order to complete the partial word.

If subjects were aware of the priming word, then they should avoid using it in the word completion task. However, if the subjects were not aware of the priming word but had nevertheless perceived it (subliminal perception), then the priming word might influence their word completion task. Debner and Jacoby (1994) found that indeed, priming words presented for very brief durations – the subliminal stimuli – were much more likely to be used in completing words than the priming words shown for longer durations. This provides an interesting new experimental format in contrast to the usual dissociation, since the exclusion paradigm shows distinct results for consciously versus unconsciously perceived stimuli.

Conclusion

While there is much evidence supporting the existence of some kind of perception without awareness, controversy has underscored research in the field. Experts disagree on what should be called subliminal perception, and how such effects can be measured experimentally. Certainly, research has overwhelmingly demonstrated that people can perceive stimuli and act on

them without reporting being consciously aware of the stimuli. However, whether or not this qualifies as true subliminal perception is a matter that is hotly debated.

The dissociation paradigm, as well as the thresholds for conscious awareness, have been thoroughly criticized. However, newer findings – those of Kunst-Wilson and Zajonc (1980), and more recently Debner and Jacoby (1994) – tread in new directions that avoid the classical pitfalls of subliminal experiments. While the controversy will no doubt continue, the overwhelming body of evidence from a diverse set of independent experiments is hard to ignore. It seems that subliminal perception, in some form, does exist and can be reliably measured.

References

- Bornstein, R. F., & D'Agostino, P. R. (1992). Stimulus recognition and the mere exposure effect. *Journal of Personality and Social Psychology, 63*, 545-552.
- Cheesman, J., & Merikle, P. M. (1984). Priming with and without awareness. *Perception and Psychophysics, 36*, 387-395.
- Cheesman, J., & Merikle, P. M. (1985). Word recognition and consciousness. In D. Besner, T. G. Waller, & G. E. Mackinnon, (Eds.), *Reading research: Advances in theory and practice* (Vol. 5, pp. 311-352). New York: Academic Press.
- Debner, J. A., & Jacoby, L. L. (1994). Unconscious perception: Attention, awareness and control. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 20*, 304-317.
- Epley, N. (2004). *Science or science fiction? Investigating the possibility (and plausibility) of subliminal persuasion*. Retrieved November 24, 2004, from <http://www.csic.cornell.edu/201/subliminal/>.
- Kihlstrom, J. F., Barnhardt, T. M., & Tatarzyn, D. J. (1992). Implicit perception. In R. F. Bornstein, T. S. Pittman, (Eds.), *Perception without awareness: Cognitive, clinical, and social perspectives* (pp. 17-54). New York: Guilford Press.
- Kunst-Wilson, W. R., & Zajonc, R. B. (1980). Affective discrimination of stimuli that cannot be recognized. *Science, 207*, 557-558.
- Marcel, A. (1983). Conscious and unconscious perception: Experiments on visual masking and word recognition. *Cognitive Psychology, 15*, 197-237.
- Merikle, P. M. (2000). Subliminal Perception. In *Encyclopedia of Psychology* (Vol. 7, pp. 497-499). New York: Oxford University Press.

- Merikle, P. M., & Joordens, S. (1997). Measuring unconscious influences. In J. D. Cohen, & J. W. Schooler, (Eds.), *Scientific Approaches to Consciousness*. (pp.109-123). Mahwah, NJ: Lawrence Erlbaum Associates.
- Merikle, P. M., & Reingold, E. M. (1992). Measuring unconscious perceptual processes. In R. F. Bornstein, T. S. Pittman, (Eds.), *Perception without awareness: Cognitive, clinical, and social perspectives* (pp. 55-80). New York: Guilford Press.
- Pierce, C. S., & Jastrow, J. (1884). On small differences in sensation. *Memoirs of the National Academy of Science*, 3, 75-83.
- Reingold, E. M., & Toth, J. P. (1996). Process dissociations versus task dissociations: a controversy in progress. In G. Underwood (Ed.), *Implicit Cognition*. (pp. 159-202). Oxford University Press.
- Zajonc, R. B. (1968). Attitudinal effects of mere exposure. *Journal of Personality and Social Psychology Monograph*, 9, 1-27.