

A Meta-Analysis of Consumer Choice and Subliminal Advertising

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ABSTRACT

A meta-analysis is used to demonstrate the ineffectiveness of subliminal advertising to influence the consumer's decision between alternatives. A review of narrative reviews is provided to illustrate that sample size and effect size is seldom used as the basis for evaluating whether subliminal marketing stimuli are an effective means for influencing consumer choice behavior. The results of the meta-analysis indicate that there is very little effect. The resulting coefficient had a value $r = 0.0585$, which places the effectiveness of subliminal advertising on choice between the impact of aspirin on heart attacks and the relationship between alcohol abuse and a tour of duty in Vietnam (Rosenthal, 1990). © 1996 John Wiley & Sons, Inc.

Subliminal advertising is a technique of exposing consumers to product pictures, brand names, or other marketing stimuli without the consumers having conscious awareness. Once exposed to a subliminal marketing stimulus, the consumer is believed to decode the information and act upon it without being able to acknowledge a communication source. For some marketers, subliminal advertising is believed to add a new dimension to the media, allowing for simultaneous product and service promotion without interfering with the consumer's activities. Thus, the essence of a commercial can be projected repeatedly, allowing consumers to pursue activities without interruptions and marketers to have increased product exposure.

The major issue of subliminal advertising is whether consumer exposure to subliminal stimuli can effectively manipulate the behavior of consumers and provide advertisers with a tool to bypass consumers' defenses without their being aware of what is happening. Even though numerous literature reviews and a U.S. Congressional Subcommittee have addressed the topic, there is still no consensus on the effectiveness of subliminal advertising in affecting consumer choice. In the work described in this article a meta-analysis was conducted to provide a systematic and integrative review of the topic, which would play a significant role in resolving the question of the effectiveness of this technique. Most marketers are interested in influencing consumer choice through advertising, and use sales results as the ultimate measure of advertising effectiveness (Assael, 1987). Therefore, the basis of this meta-analysis rests upon the assumption that choice behavior is a critical measure of the effectiveness of subliminal advertising.

This article is organized into three main sections. The first section is a summary of previous reviews of subliminal advertising, sources of information that provide much of the needed background material for the meta-analysis. The second section discusses in detail the problem formulation, the hypotheses tested, the retrieval of studies, and the rules and mathematics of the meta-analysis. The last section discusses the results and conclusions of the meta-analysis.

The Nature of the Controversy

The U.S. House of Representatives Committee on Science and Technology held a hearing in the 1980s to explore subliminal communication and the growth of subliminal technology enterprises. In the statement of Dr. John Kemp (1984), Assistant to the Deputy Chief, Mass Media Bureau, the issue of subliminal advertising effectiveness was addressed:

First, as a social scientist, I must note that there is considerable doubt in the scientific community that these techniques are effective. There is a whole host of problems, stemming from such things as the fact that individuals have highly varying levels of perception, making generalized threshold levels of subliminal perception very complicated. Another such problem is that to the extent these messages are designed to change people's behavior, scientists as well as advertisers know that subtle appeals are often more interesting than effective. (*Subliminal communication technology*, 1984)

Even though he expressed doubt about the effectiveness of subliminal communication, other well-known scientists who testified before the committee expressed views diametrically opposed to those of Dr. Kemp. Dr. Hal C. Becker, Behavioral Engineering Corporation; Dr. Howard Shevrin, University of Michigan Medical Center; and

Dr. Lloyd H. Silverman, New York Veteran's Administration, cited studies that showed that subliminal advertising was effective. Academic support for their position is mixed, however, and counterarguments supporting Dr. Kemp's view have been provided by Balay and Shevrin (1989) and Saegert (1987).

Similarly, narrative academic reviews provide conflicting evidence about the effectiveness of subliminal advertising. Of the nine leading journal reviews of subliminal advertising, five conclude that it is ineffective and four arrive at the opposite conclusion. The earliest review, "Psychology and the Invisible Sell" (Barthol & Goldstein, 1957), poses a number of relevant methodological issues. Their conclusion is summed up in a single sentence—"At best, the process is weak." Twenty years later, a narrative review concluded that "some overt behaviors can be influenced by tachistoscopically presented subliminal stimuli if they appeal to the appropriate unconscious wish" (Saegert, 1979). This review discusses the apparent success of Silverman and his colleagues in increasing pathological behavior in subjects (Silverman, 1976). However, Saegert later refuted the potential applicability of Silverman's research to advertising (Saegert, 1987). The review article "Subliminal Advertising: What You See is What You Get" (Moore, 1982), is aimed at resolving the controversies in the popular media about subliminal advertising. The overall conclusion of Moore's review categorizes all subliminal advertising effects as "an epiphenomenon, not worthy of any marketing application." Two subsequent reviews supported Moore's conclusion. In "Subliminal Messages—Between the Devil and the Media" (Vokey & Read, 1985), the phenomena of "back masking" was reviewed. Back masking is the recording of subliminal, backward messages on audio media. During 1983, legislation was considered to ban or label back masked records in Arkansas, Texas, and Canada. However, following the disclosure that "Professors Find No Satanic Messages in Rock Music" (Associated Press, 1983), the popular media lost interest in the topic and the pending legislation was withdrawn. In "Subliminal Advertising: What is the Controversy About?" (Dudley, 1987), a sample of subliminal research from 1959 through 1985 was reviewed. The conclusion was that "The possibility that subliminal stimulation offers an effective means of controlling consumer or political behavior is highly unlikely." The review "Subliminal Perception: The Eyes Have It" (Ascroft, Clarke, & Crane, 1988), questions the typical position taken by academics concerning the value of subliminal perception in the advertising context. The opinion of the authors is clear—subliminal advertising has merit and researchers should "dust off the tachistoscopes." Another recent research study argues that "contained research in the area is justified" because "the broader topic of subliminal presentation receives continued study by psychologists and is an area of considerable debate" (Rosen & Singh, 1992). Finally, Theus (1994) provides a similar conclusion. Although

Theus's review indicates that subliminal stimuli seems to have little influence on choice behavior, the author argues the method "might be effectively applied by advertising or marketing specialists hoping to use subliminal techniques to make a difference in consumer attitude and/or perhaps consumer preference."

In summary, the above narrative reviews and the Committee did not provide conclusive evidence about the effectiveness of subliminal advertising. The often-used vote-counting procedure (which tallies the conclusions of independent studies) does not provide sufficient information for evaluating the overall effectiveness of subliminal advertising. First, vote counting only obscures the investigation, because the sample size of the independent studies is disregarded (Glass, McGraw, & Smith, 1981). Second, the vote-counting technique does not fairly account for the effect sizes of each individual study. Narrative reviews generate additional confusion because readers have to evaluate the merit of each reviewer's conclusions. For example, the reader must determine if the narrative reviewer excluded studies and must determine how the included studies were weighted in the formation of a conclusion. Narrative reviews are not only subjective but are scientifically unsound and are an inefficient way to extract useful information (Light & Pillemer, 1984). On the other hand, meta-analysis, which has never been applied to subliminal advertising prior to this work, offers an accepted and objective methodology for evaluating its effectiveness. Even if a study is excluded from a meta-analysis, the statistical analysis can be quickly repeated and an objective decision can be reformulated based upon inclusion of the new data. Narrative reviews do not have the same flexibility, objectivity, and ease of replication. In the next section, the methodology for the meta-analytic approach used in this article is described. The approach is intended to demonstrate a more scientific alternative to the narrative reviews of subliminal advertising. The study limits the domain because it is not designed to explore all available information on subliminal stimuli. This meta-analysis is designed to scientifically evaluate whether or not subliminal marketing stimuli are an effective means for influencing consumer choice behavior.

METHODOLOGY

The methodology section discusses the procedures used for formulating the problem, locating and including studies, abstracting results, and computing effect sizes. The methodology used in this review is patterned after the systematic approach developed by Cooper (1984), and utilizes an integrative research framework to conduct a meta-analysis of the effectiveness of subliminal advertising.

Problem Formulation

The hypothesis to be tested by the study is that subliminal marketing stimuli have an effect on consumer choice behavior. A subliminal stimulus is referred to as *subliminal subception* if the experiment tests only discrimination without awareness and *subliminal perception* if the experiment uses some type of masking or supraliminal stimulus in combination with the subliminal stimulus (Murch, 1964). Most of the subliminal advertising studies use one form or another of a subliminal stimulus in combination with the supraliminal stimulus. There has been a fair amount of consistency in the use of either a tachistoscope or professionally prepared graphics for the presentation of subliminal advertising stimuli in controlled laboratory environments. Only two studies attempted to directly stimulate consumers in the marketplace. One study used a projector in a movie theater (Dudley, 1987), and one study used a live television broadcast (DeFleur & Petranoff, 1959).

The variables used in subliminal advertising studies cover a wide range of directly and indirectly observable phenomena. Examples from the literature include basic drive stimulation (Byrne, 1959), brand preference (Hawkins, 1970), advertising recall (Kelly, 1979), attitudes toward advertisements (Kilbourne, Painton, & Ridley, 1985), recognition (Champion & Turner, 1959), and choice behavior (DeFleur & Petranoff, 1959). These effectiveness studies may be separated into two broad categories (Moore, 1982).

The first category contains studies that support the weak claim, the hypothesis that subliminal advertising stimuli produce an evaluative or cognitive response. The evaluative response studies include those studies that evaluate the effectiveness of subliminal stimuli on persuasion, attitude, attractiveness, or beliefs. Cognitive response studies evaluate the effectiveness of subliminal stimuli on comprehension, brand salience, learning, recognition, thoughts or arguments generated, memorability, or recall.

The second category contains studies that support the strong claim, the hypothesis that subliminal advertising stimuli produce a direct behavioral consequence such as choice. Choice behavior studies evaluate the effectiveness of subliminal stimuli on choice, choice behavior, selection, or actual product preference. In terms of a general hypothesis, the strong claim supports the view that unobtrusive stimuli can effectively influence the consumer's purchase behavior or selection process (Theus, 1994).

Because the research findings have varied greatly from study to study, an integrative research review was selected as the perspective of measurement and statistical analysis to quantitatively evaluate the magnitude of the study outcomes (Glass, McGraw, & Smith, 1981). Through the process of aggregating previous research results, an effect size can be computed. The effect size statistic provides the basis

for evaluating whether or not the average effect of subliminal advertising has a direct behavioral consequence on choice, choice behavior, selection, or product preference (Light & Pillemer, 1984).

Retrieval of Research Results

Research results were located through primary and secondary channels, as well as through computer searches and informal channels (Cooper, 1984). The informal channels included discussions with colleagues and librarians who had previously conducted searches of the subliminal advertising literature. The search of the primary channels (primary publications) began with a hand search of the Business Index and Dissertation Abstracts International. Although there were no dissertations found that satisfied the criteria of inclusion (refer to the rules below), the titles served as an informal guide to the subliminal research trends of the last century. The Business Index provided a current source of articles that formed the basis of an ancestry search of the literature. An attempt was also made to locate nonjournal studies and reports by government agencies and private organizations in order to reduce the publication bias for null results (Light & Pillemer, 1984).

A computer-based search was conducted using *choice* and *subliminal* as the primary keywords. Variations of these keywords, such as *subliminal persuasion*, *subliminal perception*, *subliminal stimulus*, *subliminal advertising*, *choice behavior*, and *selection* were obtained from the Thesaurus of Psychological Index Terms (American Psychological Association [APA], 1988) and included in the search strategy. A partial bibliography was prepared from a search of Psychological Abstracts, PsycALERT, the Educational Resources Information Center (ERIC), Social SciSearch, Sociological Abstracts, and ABI/Inform.

Rules for Selecting Studies

The objective of the rules for selecting studies for the meta-analysis followed in this study is to include all studies that are strongly relevant to subliminal advertising based upon the argument that choice behavior is influenced by subliminal stimuli. The domain of the meta-analysis is consumer choice and the guiding hypothesis is that subliminal marketing stimuli have an effect on consumer choice behavior. As indicated by Light and Pillemer (1984), the domain and the guiding hypothesis are the objective basis for including studies. The studies to be excluded are those that are irrelevant to the study of effects of subliminal advertising as defined. The general rules for exclusion are as follows:

1. Exclude all studies of pathological behavior or studies using psychiatric patients.

2. Exclude all studies that are not subliminal perception experiments, that both a subliminal stimulus and some form of a supraliminal stimulus. (Murch, 1964).
3. Exclude all studies that are not related, in a broad manner, to the study of consumers and advertising. An example of a study to include would use a brand name or a product image subliminal stimulus. Studies to be excluded would be distantly related to consumers and consumption, such as studies of subliminal electrical stimuli.
4. Exclude all studies not using some form of choice behavior. Choice behavior is defined by the *Thesaurus of Psychological Index of Terms* (APA, 1988) as “a motivational or judgmental process involved in the decision or tendency to select one alternative over another or others.”
5. Exclude all studies that do not report tests of statistical significance.

Several subliminal advertising studies were excluded from the meta-analysis based upon the above rules. James Vicary's "Eat Popcorn" and "Drink Cola" theater study (Bachrach, 1959; Brean, 1958) and the DeFleur and Petranoff (1959) study "A Television Test of Subliminal Advertising" were rejected because they lacked the necessary statistics to compute an effect size. The often-cited studies conducted by Key (1972), Bagley and Dunlap (1980), Kelly and Kessler (1978), Kelly (1979), and Beatty and Hawkins (1989) were excluded because the experiments did not include some form of choice behavior. Finally, parts of some studies were also excluded. For example, Hawkins's (1970) study provided two experiments. The first experiment was rejected because a subjective thirst rating was used. The second experiment was included because the subjects were asked to choose a brand of perfume after being exposed to a subliminal stimuli. Finally, Table 1 summarizes the subliminal advertising studies reviewed and selected for the meta-analysis.

Abstracting Research Results

A code sheet was developed to facilitate the abstraction of information from the published research. The code sheet used five major divisions to organize information from the retrieved studies—Identification, Stimulus, Effect, Subjects, and Validity. The divisions were used as a guide to retrieve and record information systematically from the published research:

Identification Each study was given an identification number followed by the bibliographic information.

Table 1. Effect Size Summary.

Study	Effect Size (<i>d</i>)	Sample Size	Significance ^a
Byrne (1959)	0.2482	105	-
Champion and Turner (1959)	0.1978	38	-
Hawkins (1970)	0.0977	20	-
George & Luther (1975)	0.4109	37	-
Cuperfain & Clarke (1985)	0.5737	30	-
	0.5660	32	-
Kilbourne, Painton, and Ridley (1985)	0.0326	99	-
	-0.2942	355	+
Gable et al. (1987)	0.0898	425	-
	-0.3094	425	-
	-0.4093	425	-
	0.2196	425	+
Caccavale, Wanty, and Edell (1981)	0.0000	106	-
	0.2630	106	-
	0.0736	106	-
	0.0481	106	-
	0.0761	106	-
	0.2877	106	-
	0.4067	106	-
	0.2013	106	-
	0.0879	106	-
	0.3902	106	+
Weinstein, Drozdenko, and Weinstein (1986)	0.1082	89	-

^aA plus sign indicates a statistically significant outcome supporting subliminal advertising.

Stimulus

Three types of information were recorded under this division heading. First, the subliminal treatment was described. Each treatment was classified by type (e.g., word or picture), presentation time and frequency, display conditions (e.g., lab or classroom), and device used to present the stimulus (e.g., slide projector or tachistoscope). Second, the type of control used in the study was described. If the study omitted a no-treatment group, then information was collected to determine whether or not an expected value could be computed based upon chance outcome. Finally, data describing the type of supraliminal treatment (e.g., movie, picture, or text) were collected. Data describing the presentation times, the theme, the display conditions, and the device used (e.g., slide projector, movie, or picture frame) were also collected.

Effect

The Effect division was used to collect data used in the computation of effect sizes. The effect size was expressed in terms of the variable *g* and the cor-

rected value d , as described by Rosenthal (1984). Data were collected to describe the different types of choice measures used, such as rank order, brand choice, product rank, and ad preference. The amount of time that elapsed between exposure and effect measurement was also recorded.

Subject	The division for Subject was used to record data about the type of subject, the size of the treatment group, and the size of the control group.
Validity	The division for Validity ranked each experiment according to four criteria. Each experiment was evaluated in terms of the use of a control group, the use of random assignment, the definition of a threshold of awareness, and a posttest for awareness. A high score of 4 was given to experiments that satisfied all criteria.

The effect size was computed with the use of the formula

$$g = \frac{\bar{Y}^E - \bar{Y}^C}{s},$$

where \bar{Y}^E is the experimental group mean, \bar{Y}^C is the control group mean, and s is the pooled within-group variance. The variance is defined as

$$s = \sqrt{\frac{(n^E - 1)(s^E)^2 + (n^C - 1)(s^C)^2}{n^E + n^C - 2}},$$

where n^E , s^E represent the sample size and the standard deviation for the experimental group, and n^C , s^C represent the sample size and the standard deviation for the control group. The effect size g is corrected for small sample size bias by the formula

$$d = \left(1 - \frac{3}{4N - 9}\right)g,$$

where d is the standard notation used for all effect sizes computed in the meta-analysis.

RESULTS AND DISCUSSION

The effect sizes were collected from nine journal articles (Table 1). Four journal articles provided multiple effect sizes, yielding a total of

23 effect sizes relevant to the strong-argument hypothesis. The statistical tests of the studies were used as the units of the analysis, as opposed to using a summary statistic for each published article. Because each study provides important information for statistical evaluation, each study was abstracted with the use of the code sheet. Table 2 provides the characteristics of each statistical test. The effect sizes were combined with the use of the formula

$$d = \frac{\sum_{i=1}^k w_i d_i}{\sum_{i=1}^k w_i},$$

where d_i are unbiased effect sizes and

$$w_i = \frac{1}{v_i} = \frac{2(n_i^E + n_i^C)n_i^E n_i^C}{2(n_i^E + n_i^C)^2 + n_i^E n_i^C d_i^2}$$

weighs each effect size by the reciprocal of its variance v_i (Hedges & Olkin, 1985). Cooper (1984) says that if the reviewer is calculating effect sizes on small samples, then Hedge's weighting should be used. By

Table 2. Study Characteristics.

Study	Frequency ^a	Measure	Product
Byrne	137	Choice, rank order	Beef Sandwich
Champion	180	Brand choice	Wonder Rice
Hawkins	35	Brand choice	Brand F,L Perfume
George	100	Purchase choice	Nestle's Chocolate
Cuperfain	5	Product rank	Zero Detergent
	5	Product rank	Woolite Detergent
Kilbourne	1	Brand choice	Marlboro
	1	Brand choice	Chivas Regal
Gable	1	Ad preference	Olympus Camera
	1	Ad preference	Miller Beer
	1	Ad preference	Kraft Cheese
	1	Ad preference	Shaeffer Pen
Caccavale	1	Purchase intention	Mel's Zels Pretzels
	1	Purchase intention	Mel's Zels Pretzels
	1	Purchase intention	Bedda Chedda Cheese Curls
	1	Purchase intention	Bedda Chedda Cheese Curls
	1	Purchase intention	Brentwood Farm Cheese
	1	Purchase intention	Brentwood Farm Cheese
	1	Purchase intention	Pop's popcorn
	1	Purchase intention	Pop's Popcorn
	1	Purchase intention	Ohio Apples
	1	Purchase intention	Ohio Apples
Weinstein	1	Purchase Choice	Golden Delights Candy

^aFrequency of subliminal stimulus, number of times presented.

applying the weighting factor, Hedge's d provides an unbiased estimate of the average effect size for the small sample of studies included in the meta-analysis.

The combined estimate for the 23 effect sizes is 0.0045, with a 95% confidence interval of $(-0.0615, 0.0704)$. In other words, the results show no significant positive or negative effect, even after combining 23 experiments. Thus, with a sample size of 3,565, the combined effects provide evidence that subliminal advertising does little to influence choice behavior. In order to determine if the studies share a common population effect size, a test of homogeneity was used. This statistical test is useful in determining if the effects from independent studies differed significantly from chance, and if the underlying treatments are similar (Light & Pillemer, 1984). The equation for the test of homogeneity is given by

$$H_t = \sum_{i=1}^k w_i (d_i - d_t)^2,$$

where d_t is the weighted mean and w_i is the reciprocal of the variance (as defined above). The results of the test indicated that the sample of effects were heterogeneous, with H_t equal to 63.49 ($p = .000007$). Closer inspection of the data revealed that two experiments (Gable, Wilkens, Harris, & Feinberg, 1987) contributed to the heterogeneity of the sample. The two studies were removed ($d = -0.3094$ and $d = -0.4093$), and the effect size was recomputed. The combined estimate for the remaining effect sizes is 0.1173, with a 95% confidence interval of $(0.0418, 0.1928)$. This result shows a small homogeneous effect. Thus, the conclusion remains the same—by combining the 21 homogeneous studies with a combined sample size of 2,715, subliminal advertising has only a small effect upon choice behavior.

The magnitude of the combined homogeneous effects can be compared to other published studies in order to evaluate the importance of the effect. For example, several studies referred to by Rosenthal (1990) can be used as a baseline to evaluate the effect of subliminal advertising on choice behavior. The homogeneous subliminal advertising effect size (d) was converted to a correlation coefficient with the use of the formula provided by Cooper (1984):

$$r = \frac{d}{\sqrt{d^2 + 4}}.$$

The resulting correlation coefficient ($r = 0.0585$) falls between the effect of aspirin on heart attacks and the relationship between alcohol abuse and a tour of duty in Vietnam (Rosenthal, 1990):

Effect of aspirin on heart attack $r = 0.03$

Choice and subliminal advertising	$r = 0.06$
Vietnam service and alcohol abuse	$r = 0.07$
AZT in AIDS treatment	$r = 0.23$
Benefits of psychotherapy	$r = 0.32$

With the use of the binomial effect size display (Rosenthal & Rubin, 1982), this effect size is associated with an increase in success rate from 47% to 53%. Cohen (1977) provides an alternative method to evaluate the size of effects. Large effects are identified with values like $d = 0.8$ or $r = 0.5$, medium effects cluster around $d = 0.50$ or $r = 0.30$, and small effects fall below $d = 0.20$ or $r = 0.10$. Using Cohen's definitions, the effect of subliminal advertising on choice behavior is small.

Various correlations were run to determine if any of the variables from the coding sheet were related to the 23 computed effect sizes. The type of supraliminal treatment was significantly related to the effect size ($r = 0.669$, $p < .025$). Thus, the data indicate that the largest effects are associated with movies, followed by text and pictures. All other correlations, such as effect size versus the validity rating, the type of subliminal stimulus, the use of posttest for awareness, the use of a threshold awareness level, and the subliminal presentation frequency were found to be not significant.

CONCLUSION

The meta-analysis of choice and subliminal advertising described in this article provides objective evidence that the effect of subliminal marketing stimuli on influencing consumers' choice behavior or selection process is negligible. Unlike the previous published reviews of subliminal advertising, this meta-analysis systematically retrieved all studies that supported the strong argument that choice behavior is related to subliminal advertising stimuli. The hypothesis that subliminal advertising stimuli produce a direct choice consequence was evaluated statistically by aggregating effect sizes.

The 23 studies included in this analysis were selected based on a predetermined set of rules. With the use of the published statistics, such as Z scores and proportions, effect sizes were calculated. Even though the effect sizes were not homogeneous, the conclusion after the removal of the outliers remains the same, namely, that the effects of subliminal advertising on choice behavior are small. Because the cumulative effect is small, the hypothesis that subliminal advertising stimuli produce a direct choice consequence is very weakly supported. Therefore, the meta-analysis conducted in this study leads to the conclusion that subliminal advertising has little influence on the consumer's decision to select between alternatives.

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