

Subliminally Activated Symbiotic Fantasies: Facts and Artifacts

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A quantitative review of subliminal symbiotic activation research is presented. Ss viewed MOMMY AND I ARE ONE and other psychoanalytically relevant or neutral stimuli at subliminal exposure levels, and comparative effects on adaptive behavior were observed. The review procedure was one in which the results of a meta-analysis were corrected for statistical artifacts. Small but significant effects were revealed. All observed variance between studies is attributable to random sampling and measurement error. Future research designed to replicate basic experimental effects is deemed superfluous. Some implications for psychoanalytic theory, cognitive science, and subliminal perception research are discussed.

Subliminal psychodynamic activation refers to an experimental research method developed by Lloyd Silverman at New York University that is designed to test clinical psychoanalytic propositions under controlled laboratory conditions. Subjects in these studies are exposed to psychodynamically relevant and psychodynamically irrelevant visual stimuli at speeds and in lighting conditions such that verbal discrimination between the stimuli is precluded. Behavioral measures, self-report inventories, and projective techniques are used to examine the effects of the subliminal stimuli on behavior. This research method is a particularly strong one in that double-blind conditions are maintained. Subjects are blind to the stimulus conditions by virtue of subliminal exposure levels. Experimenters are kept blind to stimulus conditions by having research assistants prepare the stimulus cards ahead of time.

The impetus for developing the subliminal psychodynamic activation method came from Silverman's two professional roles. As a research psychologist, he was dissatisfied with the dubious scientific status of psychoanalytic theories and especially with the inadequacy of psychoanalytic clinical material as epistemically persuasive research data. As a practicing psychoanalyst, he did not object to the use of clinical material in *developing* hypotheses about behavior. He believed, however, that such data were fatally flawed as tests of those hypotheses. First, many analysts (e.g., Langs, 1982) have objected to the use of recording devices on the grounds that they destroy the therapeutic frame that is believed to be essential for curative processes to operate. Information about a patient's actual words, when provided through the analyst's memory, cannot be con-

sidered reliable. Second, the psychoanalytic setting is a highly reactive one in which the analyst's biases and expectations can be expected to skew the patient's behavior in a confirmatory direction. Third, consensus among analysts regarding what observational data is relevant to various psychoanalytic concepts is notoriously poor. Finally, causal attributions are impossible, because the treatment context does not allow for random assignment of patients to various treatment conditions. The controlled experimental manipulation of various stimuli and contexts is impossible in the clinical setting.

The first subliminal psychodynamic activation research examined the relation between conflict over libidinal and aggressive impulses and the intensity of schizophrenic psychopathology. Subliminal psychodynamic activation would later be used to examine the impact of oedipal dynamics on competitive performance. I presented meta-analyses of these literatures in an earlier work (Hardaway, 1986/1987). In the late 1960s, Silverman became intrigued with disagreements between psychoanalytic theorists regarding the significance of pre-oedipal phase issues in normal development and psychopathology. Much of this disagreement involves the dynamics of the so-called symbiotic phase and symbiosis-related issues arising during the subsequent separation-individuation phase. He knew these disagreements would never be resolved through more case reports, so he decided to use the subliminal psychodynamic activation method in order to contribute to the resolution of theoretical controversies over symbiotic dynamics (see Silverman, Lachman, & Milich, 1982, for a historical overview).

Theoretical Background

The concept of symbiosis is of critical importance in psychoanalytic ego psychology and object relations theory, both for its role in normal development and in psychopathology. Mahler (1968) used the term to describe the psychological aspects of the relationship between mother and infant from approximately 2 to 6 months after birth. She viewed the mother's empathic responsiveness to the infant's needs during this period as crucial in the development of the infant's sense of well-being. She believed that the infant of that age is not yet capable of distinguish-

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ing internal from external states, and the mother's adequacy in providing for the youngster's needs is thought to facilitate the emergence of the ability to distinguish between those states by ensuring that the infant is not overwhelmed by the bombardment of external stimuli. The mother is gradually recognized as the source of need satisfaction, an object of nurturance separate from the self, and a source of relief from the stress and pain that accrues from limited capacities for coping with the external world. The dynamics of the symbiotic phase set the stage for the child's psychological "differentiation" from the mother in the separation-individuation phase that follows it (Mahler, Pine, & Bergman, 1975).

The separation-individuation phase, which begins at approximately 6 months of age and continues through approximately age 3, consists of the emergence of the children's sense of separateness from the mother as they explore their world and recognize their capacity to manipulate aspects of the external environment. Children's capacity to distinguish internal from external states and representations of self from representations of mother are thought to be at once exciting and frightening. Children experience a "love affair" with the world around them but fear that too much separation from the mother will result in the loss of her. This period of early childhood is thought to be characterized by the struggle of the child to avoid psychological separateness and abandonment through symbiotic wishes and fantasies while fighting to prevent the diffusion of identity and loss of individuality that also characterizes the symbiotic relationship. The vestiges of these struggles are thought to recur throughout the life cycle.

Symbiotic dynamics are thought to be of significance not only in normal development but also in abnormal development. Mahler (1952) attributed childhood schizophrenia to the failure to progress beyond the symbiotic developmental period and the concomitant failure to consistently distinguish internal from external states. Others (e.g., Burnham, Gladstone, & Gibson, 1969; Winnicott, 1963) have implicated these failures as etiological factors in adult schizophrenia. Although they are in agreement regarding the importance of symbiotic dynamics in schizophrenia, psychoanalytic theorists disagree considerably regarding the precise role that such wishes and fantasies play in the mental life of the schizophrenic patient and the way symbiotic issues should be handled in treatment. Some speak of schizophrenic patients' attempts to form symbiotic relationships with their analysts. Gratifying these symbiotic wishes is believed to be therapeutic by providing corrective emotional experiences in the context of a relationship (e.g., Mahler, 1968; Searles, 1965). Other analysts view symbiotic dynamics in schizophrenia very differently. They attempt to promote a sense of self in their patients that is quite distinct from the patients' sense of others in order to reinforce clear self-object boundaries (e.g., Des Lauriers, 1962; Lidz, 1973), because the symbiotic fantasy is thought to endanger reality testing and promote psychopathological behavior.

Similarly, there is considerable disagreement among theorists regarding the role of symbiotic dynamics in nonpsychotic disorders. Symbiotic issues arising during the separation-individuation phase are thought by some theorists to be implicated in the development of personality disorders and neurotic disorders

(Fairbairn, 1952; Guntrip, 1969; Kernberg, 1975). Others (C. Brenner, 1976; Easser, 1974; A. Freud, 1969) maintain a more traditional psychoanalytic view that neurotic disturbances and pathological narcissism are rooted in oedipal phase conflicts. Additional disagreement between analysts exists in regard to the way in which symbiotic issues are handled in therapy. For some, exploitation of symbiotic dynamics is implied by such concepts as the "holding environment" and the "empathic mirroring selfobject"—functions the effective psychoanalyst serves and that may contribute to the emergence of healthy functioning (e.g., Kohut, 1971, 1977; Winnicott, 1963). For others (e.g., Langs, 1982), insight is the only legitimate agent of change.

Subliminal Symbiotic Activation

Subliminal symbiotic activation (SSA) studies were originally designed to test clinical inferences that symbiotic-like fantasies, that is, fantasies of oneness with the "good mother of early childhood" (Silverman & Weinberger, 1985, p. 1297) have palliative effects on schizophrenic symptoms. The typical study has used a within-subjects design. Subjects are seen individually for an experimental and a control session in counterbalanced order across subjects. Each session begins with a baseline assessment of psychopathology. Then subjects receive four to eight exposures of either the experimental or the control stimulus followed by a reassessment of psychopathology. They are exposed to the alternate stimulus on the following day. The difference in each session's gain scores has been computed in order to assess the treatment effects. The words *MOMMY AND I ARE ONE* are the experimental stimulus used most frequently. These words were chosen as a succinct representation of symbiotic-like wishes after Silverman's colleague and spouse, D. K. Silverman, reported that one of her female patients uttered them frequently in therapy sessions when describing her relationship with her mother. The most commonly used control stimulus is *PEOPLE ARE WALKING*. Subsequent studies have examined the adaptation-enhancing effect of *MOMMY AND I ARE ONE* on nonschizophrenic populations (e.g., Dauber, 1984; Martin, 1975; Silverman, Kwawer, Wolitzky, & Coron, 1973).

Between-groups designs have been used both within a treatment context (e.g., Bryant-Tuckett & Silverman, 1984; Palmatier & Bornstein, 1980; Schurtman, Palmatier, & Martin, 1982; Silverman, Frank, & Dachinger, 1974) and with "normal" student volunteers (e.g., McGreen, 1985; Parker, 1982). Subjects are randomly assigned to either the experimental or the control group. Between-groups analyses on gain scores, final status scores, or covariate-adjusted scores are conducted in order to assess the treatment effect.

Additional studies have tested two alternative hypotheses. One hypothesis is that the "oneness" stimulus need not include *MOMMY*, the "good mother" of early childhood, as its object. These studies have used others, for example, *DADDY, GIRL*, and *TEACHER*, as the objects of oneness (e.g., Ariam & Siller, 1982; R. Cohen, 1977; Condon & Allen, 1980; J. Jackson, 1983; Kaye, 1975; Parker, 1982; Ross, 1978; Shifren, 1981; Sommer, 1984). The other hypothesis is that oneness is not the critical ingredient, but rather that the positive affective tone of any stimulus alluding to *MOMMY* is sufficient to enhance adaptive behavior.

Table 1
Other Adaptation-Enhancing Stimuli

Other stimulus type	k	n
Other MOMMY stimuli		
MOMMY AND I ARE TWO	4	148
MOMMY LOVES ME AS I AM	1	30
MOMMY AND I ARE THE SAME	1	30
MOMMY FEEDS ME WELL	1	50
MOMMY FEEDS ME	1	32
MOMMY IS INSIDE ME	1	30
MOMMY AND I ARE ALIKE	1	30
MOMMY FEELS FINE	1	10
MOMMY AND I ARE ALL	2	24
I MAKE MOMMY WHOLE	2	24
MOMMY HOLDS ME SAFELY	2	24
I CANNOT HURT MOMMY	1	32
MOMMY IS ALWAYS WITH ME	1	32
Other ONENESS stimuli		
MY PROFESSOR AND I ARE ONE	1	36
MY TEACHER AND I ARE ONE	1	40
MY GUY AND I ARE ONE	1	28
MY GIRL AND I ARE ONE	2	66
GIRLFRIEND AND I ARE ONE	1	30
DADDY AND I ARE ONE	6	194
MY LOVER AND I ARE ONE	6	134
MOTHER AND I ARE ONE	1	40
MA AND I ARE ONE	1	40

Note. k expresses the number of independent samples tested; n expresses the total number of subjects contained in the k samples.

These studies have used messages suggesting a number of different types of relationships with mother, for example, MOMMY LOVES ME AS I AM (e.g., Berry, 1984; Bronstein & Rodin, 1983; Dauber, 1979, 1984; Kaplan, 1976; Mendelsohn, 1981; Oliver & Burkham, 1982; Silbert, 1982; Steinberg, 1975; Ungaro, 1981; Varga, 1973). Table 1 lists the stimuli that have been used as alternatives to MOMMY AND I ARE ONE.

The Subliminal Symbiotic Activation Controversy

Until recently (Balay & Shevrin, 1988; Hardaway, 1986/1987), the only integrative reviews of this research domain were those conducted by Silverman and his colleagues (e.g., Silverman, 1982b, 1983; Silverman et al., 1982; Silverman & Weinberger, 1985; Weinberger & Silverman, 1987). Silverman's reviews are of the narrative and box-score variety, and he has stated that the ratio of supportive to nonsupportive findings is as great as 4:1. Silverman's major conclusions may be summarized as follows: (a) stimuli that suggest a state of symbiotic-like oneness with mommy will reduce psychopathology and enhance adaptive behavior; and (b) stimuli that do not convey a sense of oneness with mommy will not reduce psychopathology and enhance adaptive behavior. He hypothesized that fantasies of symbiotic-like oneness with mommy are "ubiquitous" (Silverman, 1978, p. 562), and they may constitute one of the so-called nonspecific factors implicated in psychotherapeutic change (Silverman & Weinberger, 1985).

Experimental outcomes have not been uniformly positive. For example, Leiter (1982) reported increases in manifest schizophrenic symptoms following the MOMMY AND I ARE ONE stimulus. Loveland (1977) and Porterfield and Golding (1985) reported no effect of the MOMMY stimulus on their schizophrenic samples. Condon and Allen (1980) examined two adaptation-enhancing stimuli, MOMMY AND I ARE ONE and DADDY AND I ARE ONE, in the context of systematic desensitization of insect-phobic women. They reported nonsignificant results with means opposite the predicted direction.

Silverman (1982a, 1982b, 1983) offered several explanations for replication failures. When schizophrenic samples were used, he noted that only "relatively differentiated" schizophrenics respond adaptively to the oneness fantasy hypothesized to be elicited by the MOMMY AND I ARE ONE stimulus (Silverman & Weinberger, 1985, p. 1300). *Differentiation* refers to the extent to which a subject's description of mother differs from that subject's description of self on an adjective rating scale (Silverman, Spiro, Weisberg, & Candell, 1969). Relatively undifferentiated schizophrenics are believed to respond adversely, because

such a fantasy also can pose a threat, however, it can lead to a loss of sense of self, an experience to which schizophrenics are particularly vulnerable. Thus whether or not a schizophrenic will respond positively to the stimulation of a symbiotic fantasy will depend on the degree to which this threat is mobilized. (Silverman, 1982b, p. 204)¹

Silverman suggested that positive findings are most reliable for male subjects, whereas a fantasy of oneness with DADDY may feel safer for female subjects, who are alleged to be less differentiated from their mothers than male subjects. Treatment strength was adduced to be an important consideration in examining outcome (Silverman & Weinberger, 1985). Subjects exposed to the relevant stimulus most often (high dosage) are expected to evince more change than those who are exposed to the stimulus least (low dosage). Silverman (1983) also emphasized that some replication failures may be due to inadequate tachistoscopic and room-lighting conditions.

Some of the studies that Silverman cited in support of his conclusions have been criticized for methodological deficiencies. Significant threats to internal validity, external validity, and statistical construct validity have been alleged by several independent researchers (Condon & Allen, 1980; Porterfield & Golding, 1985). The reliability and validity of some of Silverman's dependent measures have been questioned. There is some intimation that only Silverman and his colleagues can produce positive findings, and statistical analyses have been impugned because of the use of one-tailed *t* tests on unreliable gain scores. Balay and Shevrin (1988) questioned the control message's neutrality and argued that significant effects could be due to pathology intensification elicited by PEOPLE ARE WALKING.

Additionally, Allen and Condon (1982) criticized Silverman's reviews of this literature for containing excessive post hoc explanations of replication failures. They noted that Silverman's

¹ From *Curative Factors in Dynamic Psychotherapy* (p. 204) by S. Slipp (Ed.), 1982, New York: McGraw-Hill, Inc. Copyright 1982 by McGraw-Hill, Inc. Reprinted by permission.

summaries of the literature were based on the vote-taking aggregation procedure, which has been criticized elsewhere for its methodological inadequacy (Glass, 1976; G. Jackson, 1980). Specifically, Allen and Condon (1982) characterized Silverman's reviews as "overly simplistic, arbitrary, and misleading . . . his use of crude support-refute dichotomous aggregation strategy in the absence of explicit information about sample size, statistical power, and methodological characteristics does not provide strong evidence" (p. 132). They also questioned the validity of Silverman's explanations because "he arbitrarily offers the most immediately appealing ones, apparently without regard to the explanatory consistency across investigations" (p. 132).

This criticism is probably harsh, because Silverman (1982b, 1983) followed the commonly accepted review procedures of the time. These typically involved examination of specific study characteristics in an attempt to account for experimental outcome variation, and Silverman's interpretations do have some prior supporting experimental evidence. Nevertheless, Silverman's reviews are beset with methodological problems. First, they provide no indication of the magnitude of effects. Second, moderator variables are hypothesized without consideration of the effects of statistical artifacts on outcome covariation. Third, there is no systematic presentation of study characteristics. Finally, the specter of bias can be raised; it is appropriate that a review of this literature be reported by an investigator other than and not associated with Silverman.

Balay and Shevrin (1988) reviewed this literature independently and certainly cannot be considered favorably biased toward Silverman's claims. Nevertheless, their review suffers all the other flaws of Silverman's reviews, and then some. They attempted neither an exhaustive nor a random sampling of available studies. They presented no rationale for including the studies reviewed or excluding the dozens omitted. Curiously, they used the same "misleading . . . crude support-refute dichotomous aggregation strategy" (Allen & Condon, 1982, p. 132) for which Silverman had been castigated 6 years earlier. Although Balay and Shevrin (1988) did discuss methodological characteristics in some detail, they failed to provide information regarding sample size and statistical power. Worse, their review of the symbiotic activation studies included only a box-score analysis of those studies using schizophrenic patients. Other symbiotic activation studies were reviewed narratively. Balay and Shevrin's conclusions are rendered more problematic by their failure to use previously available meta-analyses (Hardaway, 1986/1987), cited in B. Bower (1986) and Silverman and Weinberger (1985), that contradict their conclusions.

Purposes of the Quantitative Review

This investigation serves four purposes. The first is to provide an independent, quantitative evaluation of Silverman's (1982b, 1983) claims regarding the existence and reliability of an experimental effect. The second purpose is to quantitatively examine existing data for evidence of moderating variables. The third purpose of the investigation is to discuss the significance of this research for psychoanalytic theory, cognitive science, and subliminal perception research. Finally, I provide recommenda-

tions for future primary research based on a systematic presentation of study characteristics. This review eliminates most of the bias difficulties of the earlier reviews. The quantitative review procedure addresses the methodological limitations of previous reviews. It is one in which the results of a meta-analysis are adjusted to correct for statistical artifacts.

Overview of Procedure

Validity generalization procedures developed by Hunter, Schmidt, and Jackson (1982) were used. These procedures are designed to test for the influence of statistical artifacts on the observed variation between study outcomes. These artifacts include variation in measurement reliability, random sampling error, and differences in strength of treatment. This is an approximate data-pooling procedure (Bangert-Drowns, 1986) that rejects the traditional use of significance testing in examining aggregated data. Instead, error variance is computed directly and subtracted from the observed variance of the cumulated effect sizes. This reveals the actual magnitude of variation across independent samples in addition to its statistical significance.

Each independent research sample is represented by one effect size and is individually adjusted according to the reliability of the dependent variable. Each reliability-adjusted effect size is weighted according to its sample size in the cumulation. The variance of the effect sizes is based on the weighted difference between each effect size and the weighted mean. Sampling error is computed and subtracted from the total variance to reveal the true variance. If sampling error accounts for 75% or more of the total variance, no moderator analysis is conducted. Hunter and colleagues (1982) consider the frequency-weighted, reliability-adjusted, mean effect size to be the best estimation of the population value.

Correlational or subgroup analyses to identify moderator variables proceed only if the residual variance after sampling error correction is greater than 25% of the observed variance. Theory and logic dictate which few variables are examined, unlike other procedures that test all variables (cf. Glass, McGaw, & Smith, 1981). This substantially reduces the problem of correlated predictors and capitalization on chance in finding significant relations.

Method

Studies

An SSA study was defined as an experiment in which psychodynamically relevant (symbiotic-like) stimuli were presented at such brief exposures that subjects were unable to discriminate between experimental and control stimuli. These studies differ from other subliminal perception studies in that the stimuli are derived from clinical psychoanalytic theories and are hypothesized to affect ongoing behavior. *Psychological Abstracts* and *Dissertation Abstracts International* from January 1964 through January 1987 were examined to locate the studies. Reference sections of identified studies were examined for additional relevant studies.

Studies were included in this review only if the following criteria were met: (a) The experimental stimuli were hypothesized by the experimenters to reduce psychopathology and enhance the performance of

adaptive behavior, (b) a psychodynamically relevant stimulus was contrasted with a psychodynamically irrelevant stimulus, using a homogeneous sample of subjects (i.e., subjects were taken from the same population); (c) a tachistoscope was used to present the stimuli visually (this excluded studies using tape recorders or slide projectors for which procedural standards are not comparable or well established); and (d) each contrast was based on at least 10 subjects per cell. These criteria ensured that the statistical products of this cumulation represent the relation between the theoretically relevant predictor constructs (oneness with MOMMY, affiliation with MOMMY, and oneness with others) and one criterion construct, adaptive behavior. Kraemer (1983) recommended pooling samples of 10 or more subjects to ensure that sample effect sizes are relatively unbiased estimates of the parameter.

Coding Characteristics of the Reviewed Samples

The following items were recorded for each sample included in this review: (a) experimental stimulus, (b) sample size, (c) number of exposures to the experimental stimulus (hereafter referred to as dosage) per session, (d) number of sessions per week, (e) total dosage, (f) stimulus modality (verbal, pictorial, or both), (g) design type (within subjects or between groups), (h) subject's sex, (i) clinical diagnosis of subjects, (j) differentiation from mother, and (k) laboratory affiliation. Each sample was characterized according to the adequacy of the stimulus-display conditions as described by Silverman (1984).

A design-validity rating (high, medium, or low) was assigned to each sample on the basis of subliminality, threats to internal validity, and adequacy of statistical reporting for effect size computation. A high validity rating was assigned if a study used either a double-blind, between-groups design or a completely counterbalanced double-blind, within-subjects design with the means and standard deviations recorded for each treatment condition by each order of stimulus presentation. A medium validity rating was assigned to double-blind designs where either experimental mortality exceeded 15% or a within-subjects design recorded means and standard deviations for each treatment condition as a whole but not separately by order of stimulus presentation. A low validity rating was assigned to any study that did not use a double-blind design or that used nonrandom assignment of subjects. Low validity ratings were also assigned to within-subjects designs failing to report means and standard deviations for each treatment condition, so that the effect sizes had to be estimated from a summary statistic on correlated gain scores.

Effect Size Computations

The effect size estimator used in these analyses was the standardized mean difference, Cohen's *d* (J. Cohen, 1977). It expresses the difference between experimental and control group means relative to the within-groups standard deviation. Cohen's *d* is defined as

$$d = \frac{M_e - M_c}{S}, \tag{1}$$

where M_e and M_c are the experimental and control group means, respectively, and S is the within-groups standard deviation on the final status scores. Effect size estimates were obtained directly through Equation 1 when cell means and standard deviations were reported. Conventions for computing *d* from other summary statistics have been widely used in other meta-analyses and are summarized in Glass et al. (1981).

The final status effect size was used whenever possible, because gain scores are notoriously unreliable (J. Cohen & Cohen, 1984). When a dependent groups *t* test or a covariate adjusted *F* ratio was reported without the accompanying cell means and standard deviations, then the appropriate algebraic convention was used to retrieve the final status

effect size. In some samples incorporating a within-subjects design, this effort was thwarted by the reporting of a dependent groups *t* test on the change between experimental and control conditions of *within-sessions* gain scores. Not only are the between-conditions scores correlated with one another, but so are the original within-sessions scores in these studies. There is no convention for retrieving the final status effect size from the reported *t* test. Gene Glass (personal communication, April 23, 1985) advised using the conversion formula for the dependent groups *t* test (Glass et al., 1981) and then coding those samples for their statistical reporting (in)adequacy, so that they could be analyzed as a subset later should evidence of moderator variables be discovered. I used the formula he recommended and incorporated adequacy of statistical reporting into the design-validity coding. All studies presenting only *t* tests on such confounded scores were assigned low validity ratings.

Imperfect measurement reliability introduces error into the effect size computation (Hedges, 1981). Each effect size was adjusted accordingly as suggested by Hedges (1981) and Hunter et al. (1982), via the following equation:

$$d' = d/\sqrt{r_{xx}}, \tag{2}$$

where *d* is the final status effect size and r_{xx} is the reliability coefficient of the dependent variable. Retest reliability coefficients were used whenever available. Otherwise, interrater or internal consistency coefficients were substituted. When a range of values for a reliability coefficient was reported, an attempt was made to use a value derived from similar subject populations. When this was not possible, the most measurement error was assumed and the smallest coefficient was used (John Hunter, personal communication, April 4, 1985).²

Cumulation Procedure

One effect size per sample was used. When more than one effect was reported on a sample, the mean of the available effects was used, so that independence of effect sizes was maintained. Each was adjusted individually according to its estimated measurement reliability and multiplied by the sample size. The mean of these frequency-weighted effect sizes represents the best estimate of the population standardized mean difference, and it was computed as

$$\bar{d} = \frac{\sum_{i=1}^k (n_i d_i)}{N}, \tag{3}$$

where *k* is the number of independent samples. The variance of the frequency-weighted mean represents the observed variation of results between samples and was derived next:

$$S_d^2 = \frac{\sum_{i=1}^k [n_i (d_i - \bar{d})^2]}{N}. \tag{4}$$

Third, variance due to sampling error was estimated and subtracted from the observed variance to yield the best estimate of the true population variance:

$$S_e^2 = \frac{4(1 + \bar{d}^2/8) \sum (1/r_{xx})_i}{N}. \tag{5}$$

² The specific conventions used for reliability coefficients can be obtained on request from Richard A. Hardaway.

The actual distribution of the population is described as

$$\delta = \bar{d} \quad \text{and} \quad \sigma^2 = (S_d^2 - S_e^2) \quad (6)$$

(Hunter et al., 1982, p. 102).

This cumulation procedure yields the population standardized mean difference (δ) between experimental and control conditions. Hunter (1979, September) and Hunter et al. (1982) indicated that, in most research domains, almost all of the observed variance in effect sizes between studies can be attributed to the statistical artifacts of random sampling error and differences in measurement reliability.³ The analysis stops if these artifacts account for 75% of the observed variance. No search for moderator variables is conducted unless substantial residual variance (σ^2) remains. Five variables were identified a priori for moderator-variable analyses in such an event: (a) stimulus dosage, (b) laboratory affiliation, (c) sex of subject, (d) differentiation from mother, (e) stimulus-display conditions, and (f) design validity.

In response to a request made by an anonymous reviewer of an earlier draft of this article, I also conducted a "file-drawer" analysis of the SSA studies. This yielded Rosenthal's fail-safe N , the number of unreported null findings needed to reduce the observed effect size to a nonsignificant level (Rosenthal & Rosnow, 1984). First, the Z scores are computed, corresponding to the effect sizes for each sample. Then the Z_k for the studies combined is computed as

$$Z_k = \frac{\sum_{i=1}^k Z_i}{\sqrt{k}} \quad (7)$$

The fail-safe N is the number of unpublished studies averaging a Z of zero, which would be needed to reduce Z_k to a barely significant value of 1.645. It is computed as follows:

$$\text{Fail-safe } N = (k/2.706)[k(\bar{Z})^2 - 2.706], \quad (8)$$

where \bar{Z} is the mean Z obtained for the k studies. Rosenthal and Rosnow (1984) considered as robust to the file-drawer problem any cumulation for which the fail-safe N reaches $5k + 10$. The $5k$ reflects their belief that there is unlikely to be more than five times the number of studies cumulated in the meta-analysis sitting around unpublished in various file drawers.

Results

Sixty-four SSA studies were identified. Eight studies failed to meet the inclusion criteria and were omitted from the review. Two studies (D. Brenner, 1980; Brush, 1982) were excluded, because experimental contrasts were computed between samples of subjects from different populations. Four studies (Ben-Hur, 1979; Meyers, 1981; Raffee, 1980; Sackheim, 1977) used apparatus other than tachistoscopes to present stimuli subliminally. Mindes's (1983) dissertation was excluded because he used fewer than 10 subjects per cell in his final analyses. Forest-Letourneau's (1974) dissertation was excluded because the effects of the symbiotic-like stimulus were confounded with those of a stimulus hypothesized to have pathogenic effects. Thus, there was a final pool of 56 studies included in the analysis (see Appendix), which yielded effect sizes on 111 independent samples.

Validity Generalization

Table 2 shows the results of the approximate data pooling of the three types of SSA studies. The results of the MOMMY AND

Table 2

Approximate Data Pooling of Subliminal Symbiotic Activation Samples With Correction for Sampling Error

	MOMMY AND I ARE ONE	Other MOMMY stimuli	Other ONENESS stimuli
\bar{d}	.41	.14	.22
k	72	19	20
N	2,562	496	608
S_d^2	.24	.08	.16
S_e^2	0	0	0

Note. The effect size is the standardized mean difference of the population (δ) as estimated by \bar{d} ; k is the number of independent samples; N is the total number of subjects; S_d^2 is the observed variance of the k sample effects; S_e^2 is the best estimate of the population variance (σ^2) after corrections for sampling error and differences in measurement reliability.

I ARE ONE analysis reveal that the average experimental-condition subject scored almost one half of a standard deviation higher than the average control-condition subject. Furthermore, all of the observed variation in outcome between studies can be attributed to statistical artifacts (i.e., error due to insufficient sample size and differences in measurement reliability). This is a statistically significant effect. According to the available data, any apparent outcome differences by laboratory, stimulus dosage, sex of subject, or other variables is artifactual. The MOMMY AND I ARE ONE experimental effect is a real one.

The results of the analyses of studies using other MOMMY and other ONENESS stimuli are presented in Table 2 as well. The mean effect size for each of these sets of samples is substantially smaller than that of the MOMMY AND I ARE ONE sample. Nevertheless, the results of both analyses are statistically significant. All of the observed variation in outcome between studies is most parsimoniously attributed to sampling error and differences in measurement reliability.

This pooling of effect sizes expresses the standardized mean difference between the experimental and control conditions for each set of SSA samples. Table 3 is the binomial effect size display (Rosenthal & Rubin, 1982) for the MOMMY AND I ARE ONE

³ This is because most studies have miniscule power, relative to the probable effect size parameter, to detect that effect with a null hypothesis significance test. The differences in observed effects between studies simply reflects the large variation that can be expected with very small sample sizes. Researchers often erroneously infer methodological causes for these differences, when very low power renders "insignificant" results as probable, or more probable than "significant" ones, even when a moderate population effect is known to exist. Literature reviewers who "count votes" are likely to conclude that a phenomenon has not been reliably demonstrated when it has been and that more research is needed. Those using meta-analytic techniques are at risk of discovering moderator variables where none actually exist. Unreliability in the dependent variable simply makes these problems more severe by spuriously inflating the observed variation in results both within and between research samples. The validity generalization procedure corrects for these statistical artifacts mathematically, thus providing relatively precise estimates of the population parameters as well as an automatic test for the presence of moderator variables.

Table 3
Binomial Effect Size Display for MOMMY AND I ARE ONE Treatment Outcome

Condition	Improved	Unimproved	Sum
Treatment	60	40	100
Control	40	60	100
Sum	100	100	200

treatment. Table 3 shows that the MOMMY AND I ARE ONE treatment is associated with an increase in the rate of improvement in adaptive behavior from 40% to 60%. The difference in improvement rates is 20% ($r = .20$). That is a substantial effect given that the "treatment" consists of a few 4-ms exposures to the experimental stimulus. A binomial effect size display for other ONENESS stimuli would show an increase in improvement rate from 44% to 56% ($r = .12$); the improvement rate due to other MOMMY stimuli only increases from 46.5% to 53.5% ($r = .07$).

Moderator variables. Five moderators of experiment outcome were selected a priori for analyses if the residual, error-corrected variance (S_e) shown in Table 2 was found to be greater than zero. It was not. According to the logic of the validity generalization procedures developed by Hunter et al. (1982), one does not conduct a moderator variable analysis under these circumstances, because all observed variation in outcome across studies has been accounted for by statistical artifact. Even large observed differences between subgroups of one of the hypothesized moderators could not be considered statistically or substantively significant. This analysis reveals that the experimental hypothesis regarding effects of MOMMY AND I ARE ONE is generally valid across a wide range of subjects and conditions. Given the sometimes heated exchanges between Silverman and critics regarding the ability of independent researchers to replicate results, it might prove edifying to display the subgroup analysis of laboratory affiliation. Table 4 reveals what had already been deduced from the examination of Table 2. There is no difference in outcomes attributable to laboratory.

File-drawer analysis. The file-drawer analysis (Rosenthal & Rosnow, 1984) yielded a Z_k for the combined studies of 9.42. To reduce Z_k to a barely significant 1.645, 2,287 unreported studies with effect sizes averaging zero would be required. How many unpublished SSA studies are likely to be sitting around in various file drawers? The estimate for this analysis is 370. Thus, the results must be considered very robust. The fail-safe

Table 4
MOMMY AND I ARE ONE Subgroup Analysis by Laboratory Affiliation

	Silverman affiliated	Independent
\bar{d}	.41	.41
k	41	31
N	1,479	1,083

Table 5
Dosage Distributions for MOMMY AND I ARE ONE Samples

Statistic	Dose per session	Sessions per week	Total sessions	Total dosage
M	8.03	2.42	5.80	29.39
SD	7.07	5.93	8.71	47.92
Q_1	4	1	1	4
Mdn	4.5	1	1	8
Q_3	8	2	4	32
Mode	4	1	1	4
Minimum	1	1	1	3
Maximum	16	5	30	192
Skew	1.50	0.72	1.66	1.34
Kurtosis	-2.74	-3.00	1.12	6.20

Note. Q_1 = first quartile; Q_3 = third quartile.

N of 2,287 studies exceeds the estimate of unreported file-drawer studies by more than sixfold.

Characteristics of the Samples

An examination of sample characteristics may be useful in planning nonredundant research. Descriptive statistics of stimulus dosage distributions for the 72 MOMMY AND I ARE ONE samples are displayed in Table 5. Dosage is not normally distributed. Each distribution is skewed very positively; none are mesokurtic. Medians and modes provide the best information regarding central tendency, and the quartiles provide a good picture of variability. Clearly, there is an underrepresentation of samples in which subjects are exposed to MOMMY AND I ARE ONE more than four times in a single session. Indeed, 50% of all subjects received eight or fewer stimulus exposures. If dosage is recomputed as the amount of time that the subject is exposed to the experimental stimulus, the average subject received 32 ms of treatment. Seventy-five percent of all subjects received 128 ms or less of treatment spread across four or fewer sessions.

Table 6 displays the other characteristics for each type of SSA study. There have been far more male subjects than female subjects in the MOMMY AND I ARE ONE and other MOMMY studies. Female subjects were represented equally only in the other ONENESS studies. Nevertheless, there is a large absolute number of female subjects tested among the MOMMY AND I ARE ONE studies, indicating the interest with which researchers treated the hypothesized Sex \times Treatment Outcome interaction.

Interestingly, Silverman's (1982b) contention that relatively undifferentiated subjects respond poorly to MOMMY AND I ARE ONE appears to be based on only 3 samples of subjects. Only 16 samples of subjects were clearly within the relatively differentiated category. The vast majority of subjects were not examined on this variable. Differentiation from the mother has not been posited as relevant for other types of stimuli, and no undifferentiated samples were exposed to them.

Stimulus-display characteristics were reported inconsistently in the literature. Only six MOMMY AND I ARE ONE samples were tested under conditions clearly inadequate by Silverman's (1984) criteria, as were two of the other ONENESS samples. Most of the SSA samples used adequate tachistoscope settings and

Table 6
*Characteristics of the Subliminal Symbiotic
 Activation Samples*

Characteristic	MOMMY AND I ARE ONE		Other MOMMY stimuli		Other ONENess stimuli	
	<i>k</i>	<i>N</i>	<i>k</i>	<i>N</i>	<i>k</i>	<i>N</i>
Subject sex						
Female subjects	17	550	4	124	8	218
Male subjects	37	1,250	14	322	7	202
Both male and female subjects	15	682	1	50	4	148
Unspecified	3	80	0	0	1	40
Differentiation						
Undifferentiated	3	90	0	0	0	0
Differentiated	16	518	14	322	8	256
Mixed	4	106	1	30	0	0
Unspecified	49	1,848	4	144	12	352
Stimulus display						
Inadequate	6	12	0	0	2	80
Adequate	45	1,758	15	388	7	172
Unspecified	21	632	4	108	11	356
Diagnosis						
Schizophrenic	23	732	14	322	8	256
Depressed	3	72	2	48	0	0
Other diagnoses	16	603	2	76	1	32
No diagnosis	30	1,155	1	50	11	320
Stimulus modality						
Verbal	30	1,126	9	212	10	328
Verbal and pictorial	42	1,436	10	284	10	280
Experimental design						
Within subjects	39	1,213	16	370	14	384
Between groups	33	1,349	3	126	6	224
Design validity						
High	28	1,197	2	77	6	224
Medium	28	883	13	319	9	282
Low	16	482	4	100	5	102
Laboratory						
Silverman/NYU	41	1,479	14	357	9	244
Independent lab	31	1,083	5	139	11	364

Note. Data were tabulated on the number of independent samples (*k*) and the total number of subjects (*N*).

room illumination, but a large number of the MOMMY AND I ARE ONE and the other ONENess samples did not report these conditions, so adequacy could not be assessed.

Among all SSA samples, schizophrenic patients and undiagnosed undergraduate students composed the majority of the subject pool. The other diagnosis category represents a potpourri of classifications, including chronic cigarette smokers, alcoholics, insect phobics, and so forth. Only one or two samples of each were examined. Subjects with a depression diagnosis were also tested infrequently.

Other sample characteristics appear to have been relatively well examined at each level with the exception of low validity designs, which are a clear minority. There is no cause for concern that MOMMY AND I ARE ONE treatment effects are the spurious product of poorly designed experiments.

Discussion

A major finding of this meta-analysis is that the subliminal presentation of MOMMY AND I ARE ONE produces a modest but

reliable improvement in adaptive behavior. All of the observed variation in outcome across studies is attributable to random sampling error and differences in measurement reliability. The cumulations of other MOMMY and other ONENess samples reveal small but reliable improvements in outcome. No variation in outcome occurs across studies that cannot be predicted on the basis of sampling and measurement error alone. Studies differ considerably in laboratory of origin, diagnosis and sex of subjects, and specific experimental procedures. For this reason, the approximate data-pooling procedure provides a much more accurate and reliable statement of the treatment effect than does any single study examining a comparable number of subjects. On that basis alone the results must be considered very robust. The file-drawer analysis further attests to this and definitively eliminates any reasonable suspicion that a positive report bias in the available literature endangers these conclusions. Future research designed merely to replicate this basic effect appears superfluous, contrary to the assertions of Balay and Shevrin (1988).

The other important finding is that no treatment-effect moderator variables have been uncovered. The absence of method variance eliminates concerns that specific design flaws or systematic laboratory biases are producing spuriously positive results. A large number of well-designed studies from independent laboratories exists in this literature. The MOMMY AND I ARE ONE stimulus appears to be a more reliable agent of change than even Silverman contended. For example, he had asserted that female subjects do not respond as well to that stimulus as do male subjects (Silverman & Weinberger, 1985). These results indicate otherwise. Might female subjects respond more positively to other stimuli, for example, DADDY AND I ARE ONE or MOMMY AND I ARE TWO? I had hoped that the poolings of other MOMMY and other ONENess samples would help to answer such questions. Unfortunately, because of sample-size considerations, the answer remains unknown. The total sample size for each cumulation is relatively small for the effect sizes observed. The number of independent samples and total subjects exposed to specific stimuli is even fewer. Nevertheless, the small treatment effects that have emerged suggest that continued research should be conducted with these alternative stimuli. Female subjects may respond more positively to other stimuli, but that may also be true of male subjects. These other two cumulations do suggest that neither the mere presence of the term MOMMY, the positive affective tone of the message, nor the ONENess message alone are sufficient to produce a reliable improvement in adaptive functioning similar to MOMMY AND I ARE ONE.

The mean effect sizes produced by the cumulative analyses of these studies are small relative to those recorded in meta-analyses of psychotherapy-outcome research and other literatures where values of .70-.90 are typical. Nevertheless, these values can hardly be considered theoretically trivial. Most subjects were exposed to the experimental manipulation for a total of only 32 ms or less. The observed mean effect sizes appear quite large when compared with treatment strength.

SSA and Psychoanalytic Theory

Silverman (Silverman et al., 1982) intended for the subliminal psychodynamic activation method to contribute data that

would help to resolve disagreements among psychoanalysts about the significance of symbiotic phase issues in psychopathology and normal development. The research program has engendered considerable controversy of its own, so the extent of its significance for psychoanalytic theory has been obscured. Now that a quantitative analysis has settled the question regarding the existence and reliability of experimental results, it is possible to proceed with an evaluation of the success of SSA research in achieving its objectives.

Symbiotic-like dynamics in schizophrenia. SSA experiments are controlled tests that provide considerable support to those clinicians expounding the adaptation-enhancing view of symbiotic-like dynamics in schizophrenia. Twenty-three samples of schizophrenics have been exposed to MOMMY AND I ARE ONE, and the results provide unequivocal demonstration of the pathology-reducing effects. Differentiation from mother was hypothesized as a moderator of the impact of a symbiotic-like stimulus or fantasy on schizophrenic psychopathology. Silverman et al. (1982) thought that this variable might account for disparate observations that had led to disagreement among psychoanalysts about the effects of symbiotic dynamics in schizophrenia. They believed that incomplete differentiation of self-representations from object(mother)-representations as measured by Silverman's adjective rating scale (ARS) was important in explaining the failure of some schizophrenic subjects to respond as predicted to MOMMY AND I ARE ONE. That belief was based on the results of only three samples of such subjects, so the failure to find substantial effects may reflect nothing more than sampling error. Silverman (1970) attributed the pathology-intensifying effects of the stimulus I AM MOMMY for a sample of male schizophrenic subjects to the elicitation of oneness fantasies that were too intense and thus threatening to a distinct sense of self even for relatively differentiated schizophrenic individuals. Bronstein and Rodin (1983) used a semantically similar stimulus (MOMMY AND I ARE THE SAME); however, they found no effect at all for that stimulus. Thus, there is no consistent support for the hypothesis that differentiation from the mother moderates response to MOMMY AND I ARE ONE, or by extension, symbiotic fantasies. It is unfortunate that researchers have not examined this variable more systematically, especially given its theoretical significance.

There are other difficulties with the concept of differentiation as used in SSA research. Silverman (Silverman, Lachman, & Milich, 1984b) was uncertain as to whether the differentiation phenomenon measured with the ARS was really a trait or a state variable. There have been times when a trait interpretation appeared to be intended, such as in the original studies with schizophrenic subjects. Silverman also believed that the ARS should be administered immediately before stimulus exposure, because the degree of differentiation could change enough to affect outcome. A state interpretation appears warranted in this context. I once asked Silverman if he was using the concept in the way that Margaret Mahler (Mahler et al., 1975) had defined it, and he responded with a definitive *NO* (Silverman, personal communication, December 1984), even though much of the theoretical basis for SSA research derives from Mahler's work. To my knowledge there are no data available that bear on the psychometric properties of the ARS, and I share Balay and

Shevrin's (1988) concerns regarding the meaning of scores on this instrument. It is disputable that the instrument possesses any content validity, much less construct validity.

Differentiation from mother is a concept that is logically related to stimulus dosage. Highly differentiated subjects would be expected to tolerate relatively high doses of a symbiotic-like stimulus without feeling threatened by a loss of ego boundaries. Yet the stimulus dose distributions are too skewed toward the low-dose end to make definitive statements regarding their impact as a moderator variable. Indeed, I found no studies that exposed subjects to high doses in a single session. There is clearly more work to be done on the dose-response relation. Silverman (1970, 1978, 1982a, 1982b, 1983, 1984) had asserted long ago that the symbiotic-like stimulus could be adaptation enhancing as long as a secure sense of self could be maintained at the same time. Too much merging of self- and object-representations is predicted to result in pathology intensification. He hypothesized that his relatively undifferentiated schizophrenic subjects did not respond adaptively to MOMMY AND I ARE ONE precisely because even low doses overwhelmed their tenuous ego boundaries. The apparently less reliable responses of female subjects were attributed to a similar problem, although their actual degree of differentiation from their mothers was assumed rather than studied systematically (and that unreliable response pattern is more apparent than real, as the meta-analysis shows). Certainly, psychoanalytic ego psychology and object relations theory indicate that some differentiation of self- and object-representations is necessary for mature and healthy ego functioning. If this is true, then one might expect to observe a quadratic relation between stimulus dosage and response in which adaptive functioning continues to improve with stimulus exposure up to a point and then begins to worsen as doses get higher and the merging stimulus presumably becomes threatening. A second-order function such as this should hold true for all individuals regardless of sex or diagnosis if there is merit to the differentiation hypothesis. Some preliminary data to this effect has been found by Snodgrass (1988) in recently completed dissertation research that examines the effects of single-session high doses of MOMMY AND I ARE ONE.

Symbiotic-like dynamics in other populations. The adaptation-enhancing benefits of MOMMY AND I ARE ONE are well demonstrated for schizophrenic patients. What of the nonpsychotic populations? A variety of subjects with other clinical diagnoses have been examined, including those suffering from depression, alcoholism, obesity, and simple phobias. There is no clinical population that has been studied with the same interest as that of schizophrenic individuals. Most have been examined in only one or two experiments, so conclusions regarding symbiotic-like dynamics in any specific clinical group are not tenable at this time. Nevertheless, when combined the 19 samples, representing 675 subjects, attest to the relevance of symbiotic-like issues in nonpsychotic disorders. Thirty samples representing almost 1,200 subjects selected from the nonclinical population have been exposed to MOMMY AND I ARE ONE, lending some credence to the hypothesis that symbiotic-like dynamics are active and relevant in normal development as well.

The SSA research program has demonstrated that exposure to a symbiotic-like stimulus contributes to treatment effective-

ness. Well over a dozen studies have been conducted in which MOMMY AND I ARE ONE was used as an adjunct in a treatment program. Subjects in these studies have been exposed to the stimulus several times per week for the duration of treatment with significant improvement beyond their counterparts in the same programs who were exposed to the control stimulus. Besides symptom improvement, exposure to the symbiotic-like stimulus has been shown to facilitate self-disclosure (Linehan & O'Toole, 1982), enhance rapport (Frauman, Lynn, Hardaway, & Molteni, 1984), improve performance of assertive behavior (Packer, 1984), and improve academic performance and study habits (Ariam & Siller, 1982; Bryant-Tuckett & Silverman, 1984).

Critique. The strengths of the SSA program lie in its double-blind design methodology, the phrasing of research hypotheses in falsifiable terms, and the logical derivation of experimental stimuli from clinical theory. The yield of data from these studies is impressive, and the research program enjoys partial success in contributing experimental data pertinent to the theoretical controversies regarding symbiotic dynamics. It has not provided a definitive resolution to any of those issues for several reasons. I have already discussed the failure to establish construct validity for the differentiation-from-the-mother concept. There are other shortcomings as well.

Recent research in cognitive development poses a serious challenge to descriptions of a symbiotic phase in psychoanalytic formulations. Horner (1985) reviewed a variety of studies that cast doubt on the notion that infants are unable to distinguish internal from external events even at birth. The infant may never be in an undifferentiated state of symbiotic oneness as thought by Mahler (1952, 1968) and other psychoanalysts. What are the implications of the experimental data from SSA studies for the concept of symbiotic dynamics given these discoveries? The SSA experiments yield no data contradictory to the research cited by Horner (1985). Furthermore, the studies have not been designed in such a way that would permit scientists to infer that the responses to MOMMY AND I ARE ONE are a function of psychological experiences arising during the symbiotic phase of development.

Silverman et al. (1982) used the term *symbiotic-like* instead of *symbiotic* because of doubts regarding the comparability of oneness fantasies in adults with the actual needs and experiences of the infant. They asserted that oneness wishes might emanate from later developmental phases. The data from other ONENESS studies is suggestive. As a group, these studies failed to demonstrate that others are as reliable objects of oneness gratification as mommy, but individual studies do show substantial effects with some individuals under certain circumstances. For example, Kaye (1975) reported that MY GIRL AND I ARE ONE produced stronger results among a group of male schizophrenic subjects than did MOMMY AND I ARE ONE. Silverman et al. (1982) speculated that MY GIRL might represent a maternal representation from the oedipal period. Similarly, R. Cohen (1977) and J. Jackson (1983) found decreased psychopathology in samples of female schizophrenic subjects following exposure to DADDY AND I ARE ONE, and Silverman and Grabowski (1982) observed significant reduction in anxiety in their female subjects following exposure to MY LOVER AND I ARE ONE. Silver-

man (1983) speculated that female subjects were more likely to be threatened by MOMMY AND I ARE ONE because of differentiation problems, so their oneness fantasies would be more likely to involve someone else as the symbiotic object. These results are as easily attributed, however, to the gratification of postsymbiotic-phase dynamics.

Another shortcoming in this research program is the failure to elucidate the role of fantasies in response to MOMMY AND I ARE ONE. The clinical hypothesis leading to the SSA experimental paradigm states that symbiotic-like *fantasies* can be adaptation enhancing, but the corpus of available studies presents little data bearing on the activation of fantasies per se. Research has focused on replicating the basic effect and extending its study among different subject populations. There has been little attempt to investigate the specific nature of the covert processes involved in responding to the MOMMY AND I ARE ONE stimulus. Silverman, Lachman, and Milich (1984a) reported some incidental data regarding the activation of fantasies. Some heroin addicts who were administered doses of MOMMY AND I ARE ONE as part of their methadone treatment reported dreams in which a child and a mother figure were involved in a situation where one rescued the other. None of the addicts receiving a control message reported such a dream. Weinberger (1987) reported that work is underway in which attempts are being made to obtain evidence of symbiotic-like content in subjects' fantasies after exposure to MOMMY AND I ARE ONE. It is premature at this time, however, to assume that MOMMY AND I ARE ONE effects are mediated by the activation of fantasies.

Other unanswered questions remain as well. Do wishes or fantasies of oneness with the good mother of early childhood express *motivated* behavior, or do they function as *defenses* against fear of abandonment? What individuals are likely to demonstrate the most salutary responses to symbiotic-like activation? Are there any individuals who will respond adversely? Because of the number of issues remaining to be resolved, these studies using subliminal psychodynamic activation methodology cannot be interpreted as strongly supporting any specific formulation of pre-oedipal theory, but they do provide support for the operation of psychodynamic (unconscious and motivated) mental processes. Despite its failure to provide complete resolution to any specific question about symbiotic phase dynamics, the SSA method may be capable of doing so in the future.

SSA and Cognitive Science

The discovery of a reliable and predictable enhancement of adaptive behavior following subliminal presentation of MOMMY AND I ARE ONE has relevance to the study of the mind beyond matters strictly of interest to the psychoanalytically inclined investigator. Modern cognitive science is composed of several distinct disciplines that have in common the goal of understanding the mind, and more specifically, the origins, structures, and processes of knowledge and cognition. Surely the processes by which MOMMY AND I ARE ONE produces its surprising effects are cognitive. The SSA literature has consequences for cognitive science, because a science of the mind must be able to accommodate its results.

How does a subliminal presentation of MOMMY AND I ARE ONE work? The question is better phrased, "What is the immediate effect of the message that produces an adaptive response?" It is reasonable to speculate that the immediate effect is rather short-lived. The human organism would be ill-suited to survive and procreate if such fleeting stimuli had the power to produce long-lasting changes in behavior. An adaptive organism must prove capable of responding effectively to environmental changes on a moment-to-moment basis. It is simply implausible that an SSA stimulus would have the power to constrain behavior for more than a very brief period of time. Thus, the most rational place to look for a mechanism of effect is among state variables. State affective variables are most promising candidates.

A number of SSA studies have examined the impact of MOMMY AND I ARE ONE on state affect. Packer (1984) measured situational anxiety in an assertion training program with "underassertive" women and found it substantially reduced in subjects who were exposed to the symbiotic-like stimulus as compared with those exposed to the control stimulus. Fulford (1980) and Silverman and Grabowski (1982) have also produced reductions in state anxiety in their subjects. Schurtman et al. (1982) observed reductions in state anxiety and hostility in alcoholic subjects after exposure to MOMMY AND I ARE ONE in a treatment adjunct study. Silverman et al. (1973) found that their homosexual subjects responded to the symbiotic-like stimulus with improvement of scores on a Rorschach threat index. Garske (1984) found that state anxiety and state anger changes were strongest on the same day as exposure to the symbiotic-like stimulus; differences between experimental and control group subjects diminished when a second set of measurements was taken on the following day.

With the exception of Silverman et al. (1973), these studies all examined the effect of MOMMY AND I ARE ONE directly on state affect by measuring subjects' responses on self-report instruments, such as the State-Trait Anxiety Inventory (Spielberger, 1979). Different approaches for assessing emotional states have been used in more recent studies. Frauman et al. (1984) examined affective valence in elicited fantasies and in intentional self-disclosure. Subjects were exposed to either MOMMY AND I ARE ONE or PEOPLE ARE WALKING and then hypnotized (Stanford Hypnotic Susceptibility Scale: Form A; Weitzenhoffer & Hilgard, 1959). For the final tasks in the hypnosis session, subjects participated in three age-regression exercises in which they were to imagine doing something with mommy, with a teacher from grade school, and with the hypnotist. After subjects completed each task, they answered questions about their perceptions, feelings, and relationship with the main character. Their answers were scored on a scale measuring positivity of rapport. Later in the experiment, subjects selected 5 topics from a list of 56 that they would be willing to discuss with the hypnotist. These topics had been previously ranked according to positive or negative emotional valence. The experimental group produced age-regressed fantasies of more positive valence than did the control group. The experimental group also chose more positive topics on the intentional self-disclosure task. Weinberger, Keiner, and McClelland (1988) recently completed a study in which subjects were assigned to a MOMMY

AND I ARE ONE, PEOPLE ARE WALKING, or MOMMY IS GONE stimulus condition. Subjects were asked to record as many childhood memories as they could in 4.5 min. They then scored each memory for positive and negative affective valence. The MOMMY AND I ARE ONE group produced significantly higher scores on positive valence of their memories than did subjects in either of the other two conditions.

The experiments described here demonstrate the role of emotional variables in subjects' responses to a symbiotic-like stimulus. MOMMY AND I ARE ONE appears to stabilize mood and to evoke memories with positive emotional qualities. I have proposed that this effect is a transient one. Yet there are more than a dozen separate studies that Silverman (1983) labeled treatment adjunct studies, and in 6 of these follow-up data are available that demonstrate positive effects up to 6 months after the end of the experiment. Such long-term effects do not preclude a state-affective mechanism, however. Subjects received tachistoscopic exposures of the symbiotic-like stimulus several times per week throughout the duration of their treatment programs. MOMMY AND I ARE ONE was presented frequently and in conjunction with the other therapeutic and educational aspects of the treatment program. By improving the positive emotional valence of subjects' thoughts and stabilizing mood, the symbiotic-like stimulus may have facilitated the influence of the therapist (cf. Frauman et al., 1984; Weinberger, 1987) and minimized disabling levels of anxiety and distress that would interfere with learning and performing new skills (cf. Bryant-Tuckett & Silverman, 1984; Packer, 1984).

Presentation of MOMMY AND I ARE ONE may operate by triggering associations to early childhood experiences of the safety and gratification available from a nurturant mother figure. The early childhood mother figure appears to be an affect-laden concept across cultures as well as ages. The powerful emotional appeal of reunion with an early childhood mother figure is one well known to adults who have suffered severe trauma. Professional soldiers have observed throughout millennia that even the fiercest warriors, when lying mortally wounded on the battlefield, can be heard to cry out for their mothers (Gau, 1985). Children everywhere look to their mothers for succorance when tired, hungry, frightened, sad, terrified, confused, and so forth. Alleviation of these forms of distress, so often associated with reunions with the mother, could form memory events with mood-stabilizing properties that are activated with exposure to the symbiotic-like stimulus.

This explanation of the effects of the symbiotic-like stimulus is consistent with work conducted by Gordon Bower and associates at Stanford. G. Bower (1981) presented an extensive research program on the relation between emotions and memory. In many of his experiments, subjects exhibited emotional-state-dependent memory for a variety of recall tasks including childhood experiences, free associations, and fantasies. He proposed an "associative network theory" in which an emotional state is an event that can be represented in memory along with other coincident stimuli. Triggering an emotional state can facilitate recognition and recall of circumstances correlated with it. Similarly, a gratifying symbiotic-like emotional response could be activated either by a stimulus with symbiotic-like content or by

vividly imagining or wishing for the kind of relief from distress that is associated historically with the mother.

Critique. MOMMY AND I ARE ONE appears to operate by altering emotional states. This explanation is consistent with the data as well as with G. Bower's (1981) associative network theory of mood and memory. The consequences to cognitive science may be considerable. Gardner (1985) described the intentional decision to deemphasize the role of affective factors in cognitive science, because deliberation on that matter was thought to complicate research unjustifiably. Certainly cognitive psychology has made notable progress in recent years by focusing on the "cold" features of cognitive processes (Nisbett & Ross, 1980). The time may have arrived, however, in which failure to include mood and emotion in cognitive-scientific research programs may obscure rather than facilitate understanding of even the most basic mental processes. In addition to G. Bower's work, there is a rapidly growing body of literature demonstrating the influence of "hot" processes in cognition (e.g., Bornstein, 1989; Cantor, Zillmann, & Bryant, 1975; Kostandov & Arzumanov, 1977; Somekh & Wilding, 1973). The SSA research program contributes to this converging evidence by attesting to a pivotal role for mood and emotion in cognitive processes.

It could prove informative to investigate the specific nature of emotional responses to MOMMY AND I ARE ONE more closely. Free responses may be particularly fertile soil for the researcher investigating mood concomitants of symbiotic-like activation. The Frauman et al. (1984) study described earlier showed that free-response measures can be sensitive to the mood-altering effects of MOMMY AND I ARE ONE. Recently, Weinberger et al. (1988) suggested that mood effects of the subliminal presentation of a symbiotic-like stimulus might be predicted to be more apparent on free-response measures than on self-report instruments. McClelland, Koestner, and Weinberger (1989) hypothesized that self-report instruments are more sensitive to social cues and task demands than free-response measures, which they believe are more sensitive to internal states.

When free-report instruments become common in experimental designs, individual differences in responsiveness to MOMMY AND I ARE ONE and other symbiotic-like stimuli may emerge that have previously remained unapparent. There are some data from other subliminal perception studies that indicate that responsiveness to subliminal stimuli can be affected by certain subject and task variables such as alertness and hemisphericity (Dixon, 1981). There may be others, such as cognitive style (e.g., sensitization vs. repression). The impact on cognitive science from additional SSA research could be enriched considerably if experimental hypotheses were informed by more careful attention to issues such as these that have arisen in other kinds of subliminal perception research. Whether individual differences in response to symbiotic-like stimuli will emerge remains to be seen, but if present they have been too subtle to detect with the extant structured instruments. Free-response protocols may be more sensitive and of considerable value in exploratory SSA research.

Subliminal Perception and SSA

Rationale and technique of the subliminal manipulation. The research described in this article has made use of an allegedly

subliminal methodology for the purpose of exposing subjects to the psychodynamically relevant stimulus in a manner that would preclude its recognition. This is necessary because the theoretical model underlying SSA dictates that in order to influence behavior, the significance of a psychodynamically relevant stimulus must remain unconscious. In psychodynamic models of the mind, it is possible that one can be conscious of a stimulus (and its *manifest* meaning) without being conscious of its significance (*latent* meaning). These situations are thought to occur regularly in psychotherapy and other significant personal relationships. Consciousness is defined as the immediate and accurate discrimination of a situation and its meaning. It functions in an inhibitory manner such that the emotion- and impulse-laden childlike responses characteristic of unconscious determinants are replaced by more socially and age-appropriate ones.

A stimulus (or its meaning) cannot be considered conscious unless a person is capable of distinguishing it from within an indeterminately large and complex array of stimuli; an unconscious influence is any determinant of behavior that is not noticed or appreciated as such (Bowers, 1984). It is this situation that SSA procedures seek to produce. When there is little or no difference between the *manifest* and *latent* meanings of a situation, the latter tend to become conscious, and the more impulsive, childlike response is inhibited. MOMMY AND I ARE ONE refers to the early childhood relationship so directly that the SSA experimental paradigm requires consciousness of the stimulus to be degraded substantially.

How is this accomplished? The standard duration of stimulus exposure in SSA experiments is 4 ms. Room and tachistoscope blank field illumination levels are generally set as equal; the stimulus field illumination is set at or below the former (ratios from 1:1 to 3:1). Ascending threshold tasks are run with stimulus duration beginning at 4 ms and increasing by 3-ms intervals. Viewing conditions are defined as subliminal if no subject is able to report seeing anything more than a flicker of light at fewer than 13 ms of stimulus exposure. Stimulus field illuminations are lowered and the ascending threshold tasks are rerun if any subject does report seeing more than a flicker of light.

Two SSA studies reported comparisons of these allegedly subliminal conditions with supraliminal viewing conditions. Silverman and Grabowski (1982) examined the effects of the stimulus MY LOVER AND I ARE ONE on a group of 30 female subjects. They had determined in previous experiments that some female subjects might respond more positively to this stimulus than to MOMMY AND I ARE ONE. The subliminal condition consisted of 4-ms exposures under the room and tachistoscopic lighting conditions that have been described. The supraliminal condition consisted of exposing stimuli for 10 s. Subjects were used as their own controls, so that the control and experimental stimuli were presented in counterbalanced order across subjects. Significant reductions in state anxiety were found following the experimental stimulus when compared with the control stimulus, but only in the subliminal condition. The reliability adjusted effect size was .76 for the subliminal condition and .15 for the supraliminal condition.

Garske (1984) used a between-groups design to study the effects of MOMMY AND I ARE ONE on state anxiety and to test

the difference in responsiveness to the stimuli under subliminal and supraliminal viewing conditions. Tachistoscope and room lighting conditions were set as described previously. Tachistoscope speed was 4 ms for the subliminal condition and 5 s for the supraliminal condition. In the subliminal viewing condition, a significant reduction in state anxiety accrued to the subjects in the MOMMY group as compared with the subjects in the control group. A moderate *increase* in state anxiety was observed in subjects in the supraliminal MOMMY group as compared with subjects in the supraliminal control group. Reliability-adjusted effect sizes were .62 for the subliminal viewing condition and $-.46$ for the supraliminal viewing condition.

The Silverman and Grabowski (1982) and Garske (1984) studies seem to corroborate that stimulus recognition needs to be impaired substantially for the hypothesized effect to emerge. These and other SSA experiments have tested subjects' abilities to notice stimuli in the subliminal viewing condition by using discrimination tasks that generally fall into one of the three following categories: (a) distinguish a blank card from a stimulus card; (b) distinguish one stimulus card from another with or without prior supraliminal exposure to the cards; and (c) label successive exposures of stimulus cards as the same or different from the one preceding. Subjects receive 10–20 discrimination trials.⁴ They are offered cash for correct identifications. A percentage correct score is computed on each subject's guesses. In most SSA studies, discrimination of stimuli does not exceed chance for any subject. In a few studies, 10%–20% of the subjects do produce guesses that deviate substantially from the expected 50% hit rate. When the data from these subjects is excluded from statistical analyses, the results of the experiments do not change significantly.

Some criticisms of SSA subliminal technique. Are these procedures adequate to ensure that the stimulus remains subliminal? From the perspective of modern signal detection theory (SDT), they are not. SSA studies are vulnerable to criticism on several grounds. First, selection of a 4-ms exposure time for all subjects is arbitrary and inappropriate. A hard-nosed SDT methodologist would insist that exposure levels be determined for each subject individually. Loveland's (1977) experiment was the only one I reviewed in which exposure times were determined for each subject (ranging from a maximum of 20 ms to a minimum of 9 ms).

Another criticism is that the SSA discrimination tasks really tell one little about the detectability of the stimuli. In SDT this is done by computing a detectability statistic, d (not to be confused with the effect size estimator used in this meta-analysis). It expresses the normalized mean difference in an observer's responses between the stimulus and no-stimulus distributions in a discrimination task. The rationale for this computation is that knowledge about the presence or identity of a stimulus is not an all-or-none condition. Observers will have varying degrees of recognition and certainty about a stimulus as intensity levels change, and they will choose some subjective criterion in deciding what to report in a discrimination task. The d statistic produces a precise comparison of an observer's responses in the no-stimulus and stimulus conditions that is free of this subjective criterion.

A simple percentage correct score confounds sensitivity to

the stimulus with the response bias that accompanies each observer's subjective criterion. Lupker (1986) illustrated how response bias can affect discrimination tasks by positing a variety of possible interpretations to a subject's claim of no knowledge when queried about the presence or identity of a stimulus. For example, a subject may have the correct identification in mind but fail to report it because of doubt and a desire to maintain a high report criterion. Similarly, partial recognition of the stimulus might be achieved, allowing a reasonable guess as to its identity if forced, or the stimulus might be momentarily recognized in its entirety but quickly forgotten. A large number of discrimination trials in both stimulus and no-stimulus conditions is necessary before it can be determined that a response bias is not obscuring sensitivity to the stimulus. Because SSA investigators have not computed d and have not used a large enough number of discrimination trials to do so, it could be argued that their subjects have had varying degrees of knowledge about the allegedly subliminal stimuli.

How is one to interpret SSA results in light of these potential criticisms of the subliminal manipulation? It might be tempting to dismiss them as an anomaly worth ignoring, especially for those who are uncomfortable with talk of "unconscious" processing or psychodynamics, or for those who may be less than fond of Lloyd Silverman and his research legacy. Stimulus discrimination procedures have been arguably less than ideal, but they are far from meaningless. It is important to remember that almost all of the recent criticisms of subliminal manipulations (e.g., Holender, 1986) have occurred in the context of psychonomic research devoted to testing specific "stage" theories of semantic processing. A common experimental manipulation in that research presents a pattern-masked (subliminal) prime word some milliseconds before the supraliminal presentation of a polysemous word. The disambiguating effect of the prime is assessed immediately thereafter. Momentary identification with rapid forgetting or even partial recognition of the prime could render the experiment invalid for testing early selection stage theories of semantic activation that allege that such activation occurs before conscious identification of a word. The methods and research aims of SSA studies are quite different, and the weaknesses from the SDT perspective of the subliminal technique do not invalidate the research program.

Although I recommend that exposure conditions be separately determined for each subject in future research, I am not too concerned about the uniform use of the 4-ms exposure time in the studies reviewed. As a consequence of this, a few subjects might be fully conscious of the stimulus, others would be unconscious to varying degrees, and there might be no central nervous system registration of the stimulus for a few remaining subjects. This would inflate the dispersion of scores on the dependent variable, thereby spuriously reducing the observed F or t ratios. At worst, researchers have committed a methodological error that produces a systematic *underestimation* of the experimental effect.

⁴ These methods are not equally valid, but the quality of the detection test does not constitute a moderator of outcome in this literature. Table 2 reveals no more variability across studies than would be expected from sampling and measurement error alone.

If one remembers that the SSA process model considers an unconscious influence as one that is not noticed or appreciated as such, then it is okay if some subjects have some knowledge of stimulus content. The subject who has the correct phrase in mind but disbelieves his or her impression cannot quickly identify the stimulus or appreciate its influence on subsequent behavior. The same is true for subjects who might partially recognize aspects of the stimulus and for those whose knowledge of the stimulus is so fragile that it is immediately forgotten. It is certainly true that it is not known what response criterion individual subjects chose in responding during discrimination tasks, but that is not strictly necessary in this research. By offering monetary incentives, SSA discrimination tasks put subjects on a continuous positive reinforcement schedule for correct identification of the stimulus. They are on an extinction schedule for incorrect guesses. Subjects are motivated to use whatever strategy each believes will result in the most correct guesses, the highest payoff. It does not require a large number of trials or the computation of d under these circumstances to ensure that the stimulus influence is unconscious by SSA definition.

Incidentally, there is little evidence that subjects have possessed even partial knowledge of the stimulus. The results of the cumulations of other ONENESS and other MOMMY experiments should have produced mean effect sizes approaching that of the MOMMY AND I ARE ONE cumulation if partial knowledge of the stimulus is a valid alternative to the assertion that subjects have been unconscious of its identity. On the few occasions that subjects have reported detecting something on the stimulus card in an SSA experiment, they have usually reported seeing nothing more than a line. Free-recall tasks have been used rarely, but they are instructive in demonstrating the lack of even partially accurate stimulus identification. Frauman et al. (1984) used a free-recall procedure. At the end of the experiment, subjects were given a disclosure questionnaire and asked to write down their guesses about the content of the subliminal message after the experimenter left the room. Subjects were given all the time they required. The investigators reported

The verbatim subject responses and the respective percentage of the total number of responses of each response ($N = 72$) is as follows: *no idea*, 26%; *didn't see anything*, 17%; *nothing or none*, 17%; *don't know*, 8%; *something about hypnotist*, 6%; *?*, 4%; *flashes of light*, 4%; *something about hypnosis*, 3%; *about the suggestions*, 3%; *left blank*, 3%; *numbers*, 3%; *about food*, 1%; *red*, 1%; *something about the past*, 1%; *green shadows*, 1%; and *life is short*, 1%. (Frauman et al., 1984, p. 482)

These verbatim responses illustrate that subjects have no recollection of having seen either the experimental or the control stimulus. Fully 79% of the subjects wrote a response in which there was no speculation about stimulus content. Most of those who did hazard a guess about content offered one related to the *manifest* content of the study, which involved hypnosis. Of course, it is possible in SSA studies that subjects have momentarily recognized the stimuli, but the knowledge was so fragile that it was forgotten immediately. That event would constitute a serious problem for semantic activation research where momentary consciousness is enough to disambiguate a polysemous word, but measurements on the dependent variable in

SSA research do not take place so quickly. A briefly conscious, immediately forgotten stimulus is still an unconscious influence.

Critique. Despite the lack of evidence that subjects have ever even partially recognized SSA stimuli, researchers have been somewhat complacent in the design of discrimination procedures. There are good reasons to urge the use of SDT methods in the future. However, I recommend the adoption of a relatively standardized procedure that is relevant to the definition of unconscious processing of most concern to clinical psychologists and SSA investigators. This definition implies the rejection of the traditional forced-choice discrimination test (Bowers, 1984). Instead, it would appear more appropriate to present subjects with a large list of phrases, perhaps 50–100, among which the experimental phrases would be listed. This list should include but not be limited to phrases that are similar in the number and form of characters as the experimental stimuli. Subjects may also be presented with the response option “I saw nothing other than a flicker of light.” They should be queried after each and every presentation of the stimulus in the experiment and be offered monetary incentives to guess correctly. They will either fail to identify the stimulus or succeed. Those who succeed can be dropped from the primary data analysis.

Finally, the responses of subjects to symbiotic-like and control stimuli should be studied routinely under supraliminal conditions as well as at varying stimulus durations below the limen. The specific nature of the qualitative differences in responses between these conditions remains obscure, as does its significance. Dixon (1981) asserted that subliminal stimuli are less potent the closer intensity comes to the limen. It will be interesting to determine if the extent of responsiveness to symbiotic-like stimuli varies continuously or abruptly with stimulus intensity. Qualitative differences in response to the stimuli at various intensities may also clarify much of the nature of the cognitive-affective processes that mediate adaptive responding.

Concluding Remarks

This quantitative analysis of SSA studies has revealed a moderate and reliable treatment effect for the stimulus MOMMY AND I ARE ONE that generalizes across laboratories and subject populations. Criticisms stating that there are a dearth of well-designed studies in this literature are clearly the result of incomplete and biased sampling. The cumulation provides converging evidence with other lines of research (e.g., Shevrin, 1988) of psychodynamic mental processes. The experimental stimulus was logically derived from clinical psychodynamic postulates regarding the significance of the relationship with the “good mother” of early childhood. Treatment effects emerge only under subliminal viewing conditions and appear to be mediated by the emotional significance of the experimental stimulus. There is considerable support for Silverman’s (1978) hypothesis that associations to the relation of oneness with the early childhood mother figure may function as a “ubiquitous therapeutic agent.”

This quantitative analysis has identified a number of unanswered questions, as well. Future research efforts are best directed at these questions. Additional work designed merely to

replicate treatment effects is unnecessary. It has not been established that the mood-stabilizing effects are mediated by the stimulation of fantasies. Emotional responses may be directly elicited by MOMMY AND I ARE ONE. Individual differences in responsiveness to the stimulus have not been examined in any detail. Considerable work remains to be done in identifying the circumstances under which symbiotic-like stimuli are most effective and the ways in which emotional responses may vary according to those circumstances. Of most relevance to psychoanalytic theory development is the construct validity of the differentiation-from-the-mother concept and its alleged relation to therapeutic and adverse reactions.

As a closing comment, I would like to propose some changes in the standard reporting format of original research in this area. It would assist in the preparation of future quantitative cumulations of the research if reports were to include the complete zero-order correlation matrix between all variables. Means, standard deviations, and reliability coefficients for each can be appended to the table containing this matrix. The most useful summary statistic for this literature is the correlation coefficient, because the independent variable is ratio scaled. Even if researchers continue to treat the independent variable as a categorical one, the point-biserial correlation between independent and dependent variables should be used. Correlation coefficients have the advantage of being easily understood effect size estimators, and they can be plugged directly into statistical matrices for path analyses and factor analyses in future meta-analytic reviews. That would allow for the more fine-grained testing of research hypotheses than was possible at this time, given the present state of the literature.

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(Appendix follows on next page)

Appendix

- Ariam, S., & Siller, J. (1982). Effects of subliminal oneness stimuli in Hebrew on academic performance of Israeli high school students: Further evidence on the adaptation-enhancing effects of symbiotic fantasies in another culture using another language. *Journal of Abnormal Psychology*, *91*, 343–349.
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