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EFFECTS

Persistent Complex Subliminal Activation Effects: First Experimental Observations

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Abstract

A strong recent focus on unconscious processes has increased interest in subliminal stimulation and other experimental activation technologies. Five experiments using male and female university students ($N = 365$) were carried out to compare 5 millisecond exposures of “mommy and I” –stimuli with 5 millisecond control stimulation. Measures of self–mother similarity and other variables taken 7 to 14 days after exposure were more strongly correlated among experimental participants. Such complex persistent effects may follow when powerfully activating stimuli administered under wholly unconscious conditions provokes schematic processing of social information and behavioral confirmation. These scientifically exciting and ethically problematic findings imply a need for further reduction of the role accorded to conscious volition and control in psychology.

Keywords: Subliminal, Preattentive, Unconscious, Enduring, Persistent, Prolonged, Protracted, Lasting, Long–term

Wide–spread recognition of the importance of unconscious mental functioning has led to rapidly increasing interest in subliminal stimulation and comparable technology that allows formal study of phenomena once considered beyond the reach of science. Workers in subliminal perception and cognition investigate the conditions under which effects can be maximized or at all produced (e.g. Abrams & Greenwald, 2000; Bernat, Bunce, & Shevrin, 2001; Birgegard & Sohlberg, 2001; Masling, Bornstein, Poynton, Reed, & Katkin, 1991;

Merikle, 1992; Monahan, Murphy, & Zajonc, 2000; Snodgrass, Shevlin, & Kopka, 1993). Others test theories about unconscious functioning, paying comparatively less attention to technical detail regarding how subliminality is accomplished, and the procedures for establishing that participants are unaware of stimulus content (Andersen & Miranda, 2000; Baldwin, 1994; Bornstein, Leone, & Galley, 1987; Chen & Bargh, 1997; Orbach, Shopen-Kofman, & Mikulincer, 1994; Weinberger, Kelner, & McClelland, 1997). All however need to know how long subliminal effects will last. Much of modern life and our political institutions are predicated on the assumption that humans can make rational decisions and exert a high degree of conscious self-control. Behavioral effects in the absence of recollection of learning (implicit memory) do not significantly modify that perspective, but persistent effects from subliminal stimulation would cast doubt on the validity of assuming that humans have a high capacity for conscious self-control that unconscious stimulation can compromise for a few minutes or hours at the most. For research, persistent effects also raise more acute ethical issues (cf. Bonebakker, Jelicic, Passchier, & Bonke, 1996).

Estimates of the persistence of subliminal effects range from half an hour (Silverman, 1977) to 24 hours (Merikle & Daneman, 1998), but our study suggests that longer effects cannot be ruled out. Merikle and Daneman (1996) meta-analyzed studies of memory for information presented during general anesthesia. Although the effect at delays more than 36 hours was very small, it was not impressively smaller than the significant results secured at less than 36 hours. The anesthesia literature also contains single reports suggestive of long-term effects, a point to which we return below. Seamon, Brody and Kauff (in Bornstein, 1989) found evidence for the mere exposure effect (Monahan et al., 2000) one week after subliminal stimulation. Their study raises the question if persistent subliminal effects can be of a more complex kind than a change in preference for previously presented materials. Reports of long-term semantic priming have been published. These reports however come from research domains in which “long-term” refers to a few minutes (Becker, Moscovitch, Behrman, & Joordens, 1997; Joordens & Becker, 1997). Our experiments concern outcomes at times ranging up to four months, with the central evidence being collected one to two weeks after stimulation. Glassman and Andersen (1999) used short sentences displayed for 4 seconds to produce transference of significant-other information to a new unknown person, with effects present two to three weeks later. Their observation provokes the question of whether persistent effects caused by stimulation the effects of which people do not understand can be obtained also using stimulation they never even knew occurred.

In a reanalysis of a previously conducted experiment,¹ we discovered what seemed to be complex, persistent effects of subliminal stimulation. Ten days after exposure to the seemingly odd phrase “mommy and I are dissimilar”, experimental participants’ depression scores were more strongly correlated with similarity in their descriptions of self and mother, than was the case in the control group. In both conditions, we found participants whose profiles for self agreed closely with their profiles for mother when they were asked to rate how well 40 adjectives fit their own and their mother’s personalities. Others had profiles for self that did not agree closely with their profiles for mother. Correlating self- and mother profiles within participants to obtain scores for “Self-Mother Similarity”, these within-participant scores for profile similarity were then in turn correlated with other variables, like the Beck Depression Inventory. When these latter correlations were computed separately for the experimental and control conditions we found that they were consistently higher in the experimental conditions.

In the present paper we take the above results as our point of departure. We then add more evidence to finally suggest that this report contains the first reliable findings indicating persistent and complex effects of subliminal stimulation. We arrive at this conclusion after

having applied simple, straightforward statistical analyses to five partly dissimilar but conceptually streamlined experiments totaling 365 participants.

Persistent Effects and Subliminal Psychodynamic Activation

Our studies originated in the Subliminal Psychodynamic Activation paradigm (SPA). The strongly personal and emotional nature of the stimuli focused on in SPA perhaps partly explains why we found persistent effects. Highly controversial when created by Silverman (1970) thirty years ago, SPA is less controversial today. General acceptance of the ubiquitousness of unconscious mental functioning has helped reduce controversy (e.g. the American Psychologist 1999 "Behavior: It's involuntary" special section). Acceptance of masked computer or tachistoscopic presentation of verbal stimuli as valid means of priming has had the same effect.

In SPA, participants are exposed to brief sentences designed to bear psychodynamic import under conditions precluding conscious awareness. The most thoroughly researched stimulus is "mommy and I are one" (MIO, Hardaway, 1990; Weinberger & Hardaway, 1990). It was designed to temporarily fulfill unconscious wishes for oneness with the good mother of early childhood (Silverman & Weinberger, 1985). Based on the developmental theory of Margaret Mahler, the effects of these exposures were thought to be positive in the normal case (Silverman et al., 1982). They have since been proven to vary widely, and individual differences predict effects (Bruchhauser, 2001; Sohlberg, Billinghamurst, & Nylén, 1998). A hypothesis with some empirical support is that MIO activates an unconscious associative network processing relational, interpersonal information (Sohlberg, Birgegard, Czartoryski, Ovefelt, & Strömbom, 2000; Sohlberg & Jansson, 2002). Attachment theory (e.g. Bowlby, 1980; Fraley, 2002) and the interpersonal SASB model (Benjamin, 1996a, 1996b) provide plausible clues to the content of these networks (Sohlberg et al., 1998a; Sohlberg, Claesson, & Birgegard, in press). Although only a die-hard Mahlerian would not raise an eyebrow at the "mommy and I are one" phrase in itself, its effects are therefore now less of a mystery than during the height of the controversy surrounding them (Balay & Shevrin, 1988; Fudin, 1986; Weinberger, 1989).

Unconscious Activation, Social Information, and Relational Schemas

As social cognition research moves into areas of unconscious processes such as those involved in the projection of person attributes (Andersen, Reznik, & Manzella, 1996; Glassman & Andersen, 1999), and motivation, attitude formation, and social judgment (Baldwin, 1992; Baldwin, 1999; Bargh, 1994; Bargh, 1997; Bargh & Chartrand, 1999; Bargh, Chen, & Burrows, 1996; Bargh & Ferguson, 2000), areas of methodological overlap and theoretical convergence with SPA research become evident. Bargh (1997) argued that subliminal stimuli and consciously perceived stimuli associated in non transparent ways, a technique often used to produce automaticity, produce identical effects in social cognition research (cf. Wheeler & Petty, 2001).

A useful theoretical bridge for the present purposes is the "relational schema". Introduced by Baldwin (1992), this social cognition-based concept covers a structure comprising an image of the self, an image of the other, and regularities in patterns of interpersonal relatedness. Activation of a relational schema has effects on self-concept, expectancies, motivation, and emotion, as well as on procedural memory associated with whatever interpersonal script or goal motivation is contained in the interaction. Baldwin (1999) later cited Carlston and Smith to suggest that a relational schema can be seen as a "chunk of associative network". The

relationship seems close between his conceptualization and the associative network conception developed by us to make sense of the data obtained in SPA research.

The present study

Overview

We investigated the structure of reportable mental contents a week or more after participants were stimulated with subliminal "mommy and I"– phrases. Both "mommy and I are dissimilar" and the SPA classic "mommy and I are one" were used. Though the effects of these two stimuli may not be identical when studied in detail (more on this in the General Discussion), for the present purposes and with support in the data we treat them as interchangeable. Our focus is on the striking way in which the effects of both "mommy and I"– stimuli differed in the same way from those observed after a neutral control stimulus. As noted, the stimulation appeared to cause a change in how Self–Mother Similarity correlated with other variables. All these other variables have in common that they theoretically relate to a "self-with-mother" relational schema.

What we measured

We have interpreted the Self–Mother Similarity scores as indicating level of identification with mother (e.g. Sohlberg & Jansson, 2002; Sohlberg, Stahlheuer, & Tell, 1997). Here it suffices to note that they indicate level of profile similarity when participants first rate themselves on 40 adjectives, and then rate mother on those same adjectives. An English version of this measure was recently tested by Bruchhauser (2001) with positive results. The other variables varied across experiments and included depression (the Beck Depression Inventory, Beck, Steer, & Garbin, 1988), memories of how participants' mothers acted toward their children (Structural Analysis of Social Behavior, SASB, Benjamin, 1974; Pincus, Gurtman, & Ruiz, 1998, and a revised version of the Hazan and Shaver 1986 attachment instrument), fear of intimacy (Fear of Intimacy, FIS, Descutner & Thelen, 1991), and adult attachment (a revised version of Collins & Read, 1990).

The Experiments

Experiment 1 was originally designed to investigate immediate mood effects of "mommy and I are dissimilar" (Thörn, 1997). This was done as a contrast to the better known SPA classic "mommy and I are one". "Mommy and I are dissimilar" is "mamma och jag är olika" in Swedish, and "olika" is much more common in daily use than "dissimilar" in English.

The apparently persistent effects in Experiment 1 prompted a replication in Experiment 2. We then also looked for effects of a second experimental stimulus, "mommy and I are one". Because intriguing but ethically problematic effects were obtained in that experiment too, we turned to three data sets that were already collected but not reported. Providing further evidence for persistent effects they are included here as Experiments 3, 4, and 5.

Correlations can change even if levels do not

As we developed the project from which the present studies emanate (Sohlberg, Arvidsson, & Birgegård, 1997; Sohlberg, Billingshurst, et al., 1998; Sohlberg, Samuelberg, Sidén, & Thörn, 1998), we stimulated participants subliminally and then measured Self–Mother Similarity and other variables after seven days. The seven day data were used to understand, on an individual difference basis, why there had been such a variation between participants as we measured their mood immediately after "mommy and I are one" in our very first experiment. Keeping procedure constant required that the new individual difference measures were taken after the subliminal stimulations, not before. A seven day waiting period seemed like a safe enough margin to claim that participants' psychological status was back to normal, and that the data could be used just as if they had in fact been collected before

stimulation, not after. In support of that judgment, comparisons across conditions revealed no significant difference.²

However, while levels of Variable A and Variable B may not increase or decrease after an experimental manipulation, the way A and B correlate might well change (e.g. DeSteno & Salovey, 1997). Hypothetically, if a relational schema for self-with-mother is primed, a change in how Self-Mother Similarity and depression correlate may even be more likely than increases or decreases of levels in these variables. This is not to say that persistent effects of subliminal stimulation could not arise as an increase or decrease of a particular variable, only that in our context such effects, if they exist, seem less easy to detect than the correlation change kind of effect we report here.

Why Persistent Effects?

We are wary of offering definitive interpretations of serendipitous findings, but three factors may collectively provide a framework within which to evaluate the data. They are sketched briefly here, and given more attention in the General Discussion. First, the stimuli we use might be strongly activating because they allude to a fundamental attachment relationship involving emotion and motivation. Second, stimulation conditions in our lab are strongly incompatible with conscious awareness. This ensures processing of stimulus meaning and disables conscious control mechanisms. Third, the activation may have become self-sustaining via the schematic processing of information and behavioral confirmation effects. We found these assumptions helpful as we tried to understand why variables were repeatedly found to correlate more strongly in groups stimulated with "mommy and I"-stimuli than in groups given control stimuli, even though assessments were made a week or more after stimulation.

Experiment 1

Method

Participants, Experimenters, and Design

Two female experimenters ran 74 male student volunteers from Uppsala University. Participants were compensated with cinema vouchers and randomized to an $n = 38$ "mommy and I are dissimilar" group or an $n = 36$ "people are walking" control group. "People are walking" is Silverman's standard control phrase. In Swedish it is "folk promenerar" but we abbreviate it PAW here.

Participants were seen on two occasions. The first session was individual for each person, and contained tachistoscopic exposures and a few tests. The second was a group questionnaire session (5–25 persons). Intersession interval in Experiment 1 was set at no less than 7 days and was close to 10 days on average.³

Materials and procedure

Session 1. This session included presentation of the stimuli by way of a PsyTec tachistoscope (Persona AB, Stockholm, Sweden), an apparatus equipped with a contoured eyepiece connecting directly to an 80 X 55 mm screen onto which the text is projected approximately 100 mm from the participants' eyes (virtual viewing distance 600 mm). The room was dimly lit during exposures. Subliminal exposure time was set at 5 ms, and eight exposures separated by 10 s were used for each participant. Regular projection slides were used to present the stimuli. Experimenters were blind to which stimulus they presented to individual participants.

Following exposures, participants did a brief test of motor precision (tracing a line with a pen on paper), were given 4 min 30 s to write down things they remembered from their childhood, and then rated these memories for positivity/negativity (EMT, the Early Memories Test, Weinberger et al., 1997). Finally they were asked how much time had passed since they looked into the tachistoscope. All these measures were included only to keep the procedure constant from previous studies (e.g. Sohlberg, Arvidsson, et al., 1997; Sohlberg, Billingshurst, et al., 1998) and the data were not analyzed.⁴

Finally, participants were asked what, if anything, they had seen in the tachistoscope. An ascending threshold task was then used as a second way of ensuring that the critical exposures were not conscious to participants. The exposure time was gradually increased and participants reported what they saw each time. When they reported seeing something structured (e.g. "a line"), no further stimulations were given, and the exposure duration was defined as their threshold for supraliminal perception. Erdelyi (1992) argued that there is no unarbitrary standard for ascertaining whether a stimulus is unconscious. Exposures well below a "subjective threshold" (Cheesman & Merikle, 1986) satisfy meaningful demands for unawareness; if participants cannot report seeing anything at the critical exposure duration, and only at much longer durations report seeing anything structured, we claim they are unaware of stimulus content. Using 4 ms exposures, Silverman (1984) required no detection of anything structured until 12 ms, at the earliest, to accept 4 ms stimulation as subliminal. Merikle, Smilek and Eastwood (2001) suggest that subjective measures are preferable for assessing awareness.

Session 2. The second 30 minute-session included three questionnaires. Participants were seated in a lecture room, and given the questionnaires face down by an experimenter blind to group. In the order presented, the questionnaires were:

The Self–Mother Similarity test. Used extensively in our previous studies, this is a 10 minute rating procedure in which participants rate first themselves and then their mothers on each of 40 adjectives (e.g., "humoristic", "dominant", "outgoing", "sad"; 1= adjective fits "a little", 5= adjective fits "very well"). Similarity scores are calculated as Pearson coefficients between self- and mother-ratings. With a theoretical range from -1.00 to 1.00 , scores in normal samples range from approximately $-.40$ to $.90$. Split-half type reliability was originally calculated from two $N = 20$ pilot samples and found to be $.77$ and $.79$ (Spearman–Brown corrected Pearson r s).

SASB Intrex Relationship Long Form, first half (Structural Analysis of Social Behavior, Benjamin, 1996b). This SASB Intrex version is a 72-item questionnaire that requires participants to rate on a 0 to 100 scale the degree to which different statements about mothers' behavior toward them, and her response to their own behavior toward her, were true when they were 5 to 10 years old. The SASB model contains two basic dimensions of interpersonal behavior: affiliation and interdependence. To this is added "focus", or the direction of the rated behavior (action vs. reaction). Various scores and indices can be derived from the data. The "Disrupted Attachment Group" part of the SASB model (Florsheim, Henry & Benjamin, 1996) may relate to depression and was analyzed here. This was done for the action focus (what the person remembers mother doing to him). In SASB terminology, the data pertain to Focus 1 (action toward someone) Clusters 6, 7, and 8 with "mother" as the rated person. Cluster 8 *Ignore* represents negative undercontrol, Cluster 7 *Attack* represents negative affiliation but is neutral in terms of control, and Cluster 6 *Blame* represents negative overcontrol. Benjamin (1974, 2000) reports high reliability and validity for the Intrex used here.

The Beck Depression Inventory (BDI). Originally intended for clinical contexts, Beck's Depression Inventory is useful in normal samples as well if used to indicate dysphoria rather than clinical depression (Beck et al., 1988).

Statistical analysis

Correlation coefficients were compared between groups. Significance tests of the differences were two-tailed. The differences are also given as effect sizes (" q ", i.e. the difference between z -transformed r s; Cohen, 1988), and compared with Cohen's (1988) criteria for small (.10), medium (.30), and large (.50) effects. An *a priori* decision was taken to regard as bivariate outliers observations with standardized regression residuals above 2.5 or below -2.5 (StatSoft, 1994). Using these criteria, anywhere from 0 to 5 outliers were detected and eliminated in each group and analysis.⁵ Correlation coefficients are materially affected by restrictions of range but no remarkable differences between groups were detected.

Results

Self-Mother Similarity vs. Depression

With respect to the Self-Mother Similarity (SMS) vs. depression (BDI) association, Table 1 shows that these variables had 13 per cent variance in common in MIDIS ($r = -.36$). They had almost nothing in common in PAW ($r = .02$). The effect size q for this difference was $-.36$. While not significant, this effect is medium in size (Cohen, 1988) and indicates that the experimental group rated their depression and their own and their mothers' personalities in such a way as to increase the correlation between the SMS and the BDI scores.

Memories of How Mother Acted (SASB) vs. Depression

With respect to Memories of how mother acted (SASB), Table 1 shows that in two out of three cases variables had more variance in common when correlations were computed in the experimental group than in the control group. Thus, "mommy and I are dissimilar" was associated with a stronger correlation between depression and memories of mother as Ignoring ($r = .34$ vs. $.20$, a "small" $q = .15$ effect), as well as a much stronger correlation between depression and memories of mother as Blaming ($r = .75$ vs. $.37$, a "large" $q = .57$ effect, $p < .05$).

/ Insert Table 1 here /

Threshold task

The average stimulation duration for detection of a "line" or something equivalent was 133 ms, to compare with 5 ms during the critical exposures. There was no significant difference between the groups (MIO $m = 180$, $sd = 445.6$; PAW $m = 84$, $sd = 104.7$, $t[72] = 1.26$, $p = .21$. Using Mann-Whitney to control two univariate outliers in MIO $p = .62$).

Discussion

Ten days after stimulation there were higher correlations between Self-Mother Similarity and depression in the experimental "mommy and I are dissimilar" group than in the control group. Higher correlations were found also between SASB Intrex, a measure that concerned participants' ratings of their mothers directly, and depression. In one case the difference between groups was $p < .05$ significant.

We are aware of no previous demonstration that complex subliminal effects can be found after such a long delay. Methodological explanations readily came to mind, but seemed unable

to account for the data. Further, if real, persistent effects might be based on more than simple mood change. If the experimental stimulation affected participants' moods, sad participants would earn higher BDI scores and indicate they remembered more negative behavior from mother on the SASB. Conversely, happy participants would earn lower BDI scores and indicate they remembered less negative behavior from mother. This explanation means however that all correlations should be affected to the same degree. In the experimental group, SASB Blame had 57 per cent variance in common with BDI. For Attack the figure was only 2 per cent. This made it difficult to rule out involvement of specific cognitive content in whatever structures might have been activated by the stimulation. Birgegard (1999) pointed out that if "mommy and I are dissimilar" activated a schema comprising memories related to relationship episodes in which some participants felt "dissimilar" from their mothers and depressed, such episodes are less likely to involve perceptions of being Attacked, than memories of being Ignored or Blamed. This followed the reasoning of Frolund (1997) and Nathanson (1987) that shame is a prominent affect in depression. For shame to arise there must be both a problem in communication and some remainder of positive feeling with a hope for repair. Since Attack operationalizes maximum disaffiliation in the SASB system, perceptions of such behavior from an interaction partner could arouse fear, and be less likely than Ignore or Blame to allow some remainder of positive feeling with a hope for repair. For both reasons of theory and reasons of ethics, replication was therefore in order. In addition to MIDIS and the control PAW stimulus, the new experiment included the SPA classic "mommy and I are one" (MIO).

Experiment 2

Method

Participants and Experimenters

Two male experimenters ran 97 male university student volunteers who were compensated with cinema vouchers and randomly allocated to one of three groups: MIDIS ($n = 35$), PAW ($n = 30$) and MIO ($n = 32$, "mommy and I are one" translated to the Swedish "mamma och jag är ett").

Design, Materials and Procedure

Participants were seen on two occasions with a 10 day interval. The experiment proceeded exactly as in Experiment 1, but one more questionnaire was added. Participants filled in this test last in Session 2, so as to not interfere with the replication.

The Hazan and Shaver retrospective attachment test. A modified version of the Hazan and Shaver (1986) questionnaire assessed memories about mother's attachment-related behavior toward participants in the past, using 5 items for Security, 3 items for Ambivalence and 5 items for Avoidance. Each item was scored from 1 to 6. Developed from the original Hazan and Shaver paragraphs by W. Friedlmeier, this version was translated to Swedish by P. Granqvist and B. Hagekull (Granqvist, 2002). Granqvist and Hagekull (2001) report reliabilities of .81 (Secure), .74 (Ambivalent), and .89 (Avoidant).

Statistical analysis

Significance tests were one-tailed due to the expectations generated by Experiment 1. Outliers were handled as before. The BDI and SASB ranges were somewhat smaller in MIDIS than in PAW, implying a likelihood for lower correlations in MIDIS on purely statistical grounds, not higher as expected after Experiment 1.

Results

Self–Mother Similarity vs. Depression

There was a Self–Mother Similarity vs. depression correlation difference between conditions (Table 2), qualitatively mimicking that in Experiment 1 but quantitatively even larger. A MIDIS $r = -.68$ vs. a PAW $r = .03$ produced a q of $-.86$ ($p < .005$). The MIO group fell between these two: $r = -.42$ for MIO yielded an effect size of $-.48$ ($p < .05$) compared to the PAW group, and $.38$ compared to MIDIS. Thus, both experimental groups rated their depression and their own and their mothers' personalities in such a way as to produce notable, negative, correlations between depression and Self–Mother Similarity. This was not true for the control group, and the differences were large and significant. Further, while not significant, the $q = .38$ difference indicating stronger association between depression and Self–Mother Similarity after MIDIS than after MIO was in the medium effect size range.

/ Insert Table 2 here /

Memories of How Mother Acted (SASB) vs. Depression

With respect to Memories of how mother acted (SASB) vs. depression, Table 2 demonstrates stronger correlations in MIDIS than in PAW. Furthermore, the correlation differences follow the same specific pattern as in Experiment 1. In the MIDIS group, BDI correlated markedly more strongly with Blame and Ignore than with Attack ($r_s = .54$ and $.36$ vs. $.11$). This pattern was not found in the PAW control group ($r_s = .23$ and $-.04$ vs. $.09$). The correlation difference effect sizes were in the medium range ($.30$ to $.50$). In the second experimental group, MIO, correlations were generally higher as compared to PAW, and the difference between MIO and PAW increased linearly across SASB clusters Blame, Attack and Ignore.

Attachment Styles (Hazan and Shaver) vs. Depression

The retrospective mother attachment data carried implications similar to those in the results described above (Table 2). Whereas depression ratings had 5 per cent or less variance in common with attachment styles in the control group, the minimum in the experimental groups was 16 per cent (mean 23.5 per cent, maximum 40 per cent).

In terms of q effect sizes, the differences between the experimental groups and PAW ranged from small–to–medium up to large. Two differences were significant in the MIDIS vs. PAW comparison (Avoidant $r = .44$ vs. $.11$, $p < .05$, Secure $r = -.63$ vs. $.02$, $p < .01$). One difference was significant in the MIO vs. PAW comparison (Secure $-.48$ vs. $.02$, $p < .05$). With respect to contrasts between the experimental groups there were no significant differences but two effect sizes in the small to medium range (Secure $q = -.22$; Avoidant $q = -.19$; no effect on Ambivalent, $q = -.01$).

Threshold task

The mean duration when participants reported noticing something structured was 144 ms (MIDIS $m = 134$, $sd = 182.8$; MIO $m = 138$, $sd = 342.4$; PAW $m = 163$, $sd = 368.0$, $F[2, 94] = .08$, $p = .92$).

Discussion

The kind of differences between correlations we saw previously between "mommy and I are dissimilar" and "people are walking" was repeated in Experiment 2. This replication undermines interpretations of Experiment 1 as due to chance only. Adding to the data obtained when Self–Mother Similarity was correlated with BDI depression, differences suggesting an

experimental effect on correlations were obtained also when SASB Disrupted Attachment Group variables and the Hazan & Shaver attachment variables were related to depression.

The "mommy and I are one" stimulus was included to investigate whether this stimulus can also result in persistent effects. Indications of such effects were obtained, strikingly at variance with the short duration estimates of Silverman (1977).

Notably, the data pattern linking depression much more to SASB Blame and Ignore than to SASB Attack was observed after "mommy and I are dissimilar" in this experiment too. It was not observed following "mommy and I are one" however.

The results of Experiments 1 and 2 were scientifically exciting but created an ethical dilemma. Neither the informed consent we obtained nor our debriefing procedures referred to persistent effects. However, if such effects do exist, they may arise only with uninformed participants who are unable to correctly attribute effects to the experimental manipulation (Bornstein, 1990, 1992). Thus, providing more information to potential participants might eliminate the very effect we believe present in the Experiment 1 and 2 data.

A solution was found in two experiments that were only partially reported or not reported at all. Also, we examined the data from yet another experiment partly carried out after we began to suspect there might be persistent effects of subliminal stimulation.

Called Experiment 3 here, the first additional experiment asked participants given MIO or PAW to fill in, 7 days after stimulations, the Self–Mother Similarity measure and the Hazan and Shaver questionnaire for attachment to mother. This experiment was partially reported in Sohlberg and Jansson (2002) but then with a focus on short-term data and different issues.

Experiment 3

Method

Participants, Experimenters, and Design

A male experimenter blind to condition ran 15 male and 25 female university students. Participants were compensated with a cinema voucher and randomized to an $n = 21$ "mommy and I are one" or an $n = 19$ "people are walking" group.

Materials and procedure

Session 1. This session included the tachistoscopic presentation of the stimuli as before. Following eight 5 ms exposures, participants were asked to imagine writing a short story. They were then given a list of topics as well as suggestions regarding possible traits of the main character in the story. For details see Sohlberg et al. (2000) and Sohlberg and Jansson (2002).

Session 2. The second, group, session 7 days later included three tasks. After the Self–Mother Similarity test, participants were given the Story Task items as given also in Session 1, but were now asked to indicate what selections they made 7 days earlier. The results were presented in Sohlberg and Jansson (2002), and included some evidence that could be interpreted as persistent memory effects, although not unequivocally so. Last in the session was given the Hazan and Shaver test as described above (Experiment 2).

Statistical analysis

Significance tests were one–tailed. Outliers were defined as before. There were four participants in PAW with scores on the Hazan & Shaver Secure attachment scale below the lowest score in MIO. Excluding them did not change results appreciably however (3 per cent variance in common between variables rather than 1 per cent). Few scored highly on Hazan & Shaver Ambivalent and Avoidant.

Results

As shown in Table 3, there was more variance in common between variables in "mommy and I are one" than in "people are walking". This was true not only with respect to the Self–Mother Similarity correlation with Secure attachment ($r = .36$ vs. $.08$), but with respect to Ambivalent ($r = -.32$ vs. $.05$) and Avoidant ($r = -.18$ vs. $.02$) too. Not significant, the differences on Secure and Ambivalent still corresponded to "medium" $q = .32$ and $q = .38$ effects.

/ Insert Table 3 here /

The first participant to report seeing anything structured did so at 13 ms. Typical values were much higher (MIO $m = 147$, $sd = 208.6$; PAW $m = 107$, $sd = 70.9$, $t[38] = .79$, $p = .44$. Using Mann–Whitney to control two univariate outliers in MIO $p = .45$).

Discussion

Although not significant, the results conveyed the same message as before: subliminal stimulation with a "mommy and I"–stimulus causes an increase in correlations between a measure of Self–Mother Similarity and other measures that theoretically relate to a self-with-mother relational schema.

In the following Experiment 4 we subjected this hypothesis to further consideration. Experimental participants were stimulated with "mommy and I are one". Along with "people are walking" we included two more control stimuli: "one are and mommy I" (OMI, in Swedish "ett är och mamma jag") and "mommy ndi era rn oae" (M, in Swedish "mamma orä cht tg jea"). The original rationale behind the OMI and M stimuli was to see if stimuli that contained one or all words from the MIO stimulus are sufficient to reproduce MIO results, even though they lack the syntax–dependent meaning of the original phrase. We report here that as expected after the previous experiments, Self–Mother Similarity had more variance in common with other variables after "mommy and I are one" than after the other stimuli. The other variable here was fear of intimacy in close relationships (Descutner & Thelen, 1991; Doi & Thelen, 1993).

We recorded not only Self–Mother Similarity, but Self–*Father* Similarity too. If the activation of a "self-with-mother" relational schema caused the increased correlations between Self–Mother Similarity and other measures, increased correlations between Self–Father Similarity and other measures would not necessarily be expected.

Experiment 4

Method

Participants, Experimenters, and Design

Two male experimenters led Session 1. Two others led Session 2. Fifty–nine male and 63 female university student volunteers were randomized to MIO ($n = 29$), PAW ($n = 31$), OMI ($n = 30$), or M ($n = 32$). No compensation was given. Session 1 proceeded as in Experiments 1 and 2. Session 2 was in groups.

Materials and procedure

After having rated in Session 2 self and mother for the Self–Mother Similarity test, participants rated father also. Thelen's Fear of Intimacy Scale (FIS, Descutner & Thelen, 1991; Doi & Thelen, 1993) was administered, and participants answered some background questions. On the FIS, participants judge on a 1 to 5 scale how well each of 35 items fit themselves. Doi and Thelen (1993) report .92 internal consistency, and note that FIS correlations were negative with Confidence in other's dependability and Comfort with closeness, but positive with Fear of abandonment.

Statistical analysis

Outliers were handled as before. Observed ranges were comparable.⁶ Three participants did not complete the Father part of the Similarity task so *N* there is 119.

Results

As shown in Table 4, Self–Mother Similarity and Fear of Intimacy were more closely associated in "mommy and I are one" than in "people are walking" ($r = -.62$ vs. $-.27$). The difference in favor of "mommy and I are one" was even greater compared with "one are and mommy I" and "mommy ndi era m oae" ($r_s = -.07$ and $-.10$).

/ Insert Table 4 here /

Suggesting a high degree of specificity in these findings, Self–Father Similarity did not have more variance in common with FIS in MIO than in the other conditions (Table 4, MIO $r = .09$, PAW $r = -.22$, OMI $r = .08$, and M $r = -.11$). The difference within the MIO condition between $-.62$ for Self–Mother Similarity vs. FIS ($n = 27$) and $.09$ for Self–Father Similarity vs. FIS ($n = 29$) was significant ($t[24] = 3.44$, $p < .01$, df based on the smallest number of observations).

Threshold task

Four participants did not meet Silverman's (1984) criteria for subliminality, but excluding them did not change much: MIO $r = -.62$, PAW $r = -.31$, OMI $r = -.12$, and M $r = -.10$. Also, there was a significant difference between conditions even using outlier resistant statistics (Kruskal–Wallis H corrected for ties = 13.22, $p = .0042$, MIO $m = 458$, $sd = 661.0$; PAW $m = 94$, $sd = 156.5$; OMI $m = 149$, $sd = 177.4$; M $m = 142$, $sd = 166.5$). Therefore we recomputed the Self–Mother Similarity vs. FIS correlations partialling thresholds. This changed very little compared with the original results (MIO $pr = -.62$, PAW $pr = -.27$, OMI $pr = -.06$, and M $pr = -.09$).

Discussion

Experiment 4 added further evidence suggesting that if participants are stimulated subliminally with a "mommy and I"–stimulus, a measure taken 7 to 14 days later of how similarly they rate themselves and mother correlates more strongly with other measures. The data also suggested that the particular effect seen here requires the syntax–dependent meaning of the entire "mommy and I are one"–phrase. Neither the single word "mommy" nor the same words in different order sufficed. Further, a high degree of specificity was implied. "Mommy and I are one" affected the correlation between fear of intimacy and how similarly participants rated themselves and mother. It did not affect the correlation between fear of intimacy and how similarly participants rated themselves and father.

A caveat is in order due to the significant difference between groups in terms of the stimulation duration at which participants reported noticing something structured at all. However, average thresholds in all groups were far above the critical exposure duration, and statistical correction implied that the main results did not depend on the difference between groups in report times. Significant differences in report times were not obtained in any of our previous experiments, so it cannot be ruled out that the present difference was due to chance and of little consequence for the outcome.

In the following Experiment 5 we were able to subject our hypothesis to final consideration. Experimental participants were stimulated with "mommy and I are one" while controls got "people are walking".

Although small in size, this experiment had several useful features. Allowing assessment of the pre-stimulation equivalence of groups, participants rated depression and memories of mother already before coming to our laboratory. Also, participants completed their 7 day questionnaires in the ecologically valid context of their own homes. This helped test the possibility that the effect we report is situationally specific, and can be observed only when participants return to our department.

Some evidence could also be collected to see if our self–mother similarity questionnaire is a necessary cue alluding to a comparison between self and mother; if no such restimulation cue is presented, previous subliminal exposure to “mommy and I”-stimuli might be of no demonstrable consequence. At one point in this four–stage experiment, participants first rated their attachment styles in relating to other adults, and then their current level of depression. There would be no reason to expect these variables to correlate more strongly in the experimental group, if the effect we saw in the previous experiments requires explicit refresher cues referring to “mother and I”.⁷

Unlike before, participants did not one but two tests already in the laboratory that might relate to an unconscious “self–with–mother” schema. Thus we were able to compare groups on effects occurring within minutes of the stimulation. Because this experiment was running just as we were becoming convinced there might be persistent effects, we also invited participants back for discussion of this possibility. This enabled us to compare groups four months after the stimulation. Because of small sample size and because the experimenter was no longer blind to group, these latter results must be viewed with caution.

Experiment 5

Method

Participants and Experimenters

Four experimenters ran this study. One male recruited participants and collected pre-stimulation data, one female conducted the laboratory procedures, another female collected the 7 day data while yet another male (AB) conducted the 4 months’ follow-up. Thirty-two male university students were randomized to MIO ($n = 16$) or PAW ($n = 16$), and were compensated with movie tickets. Thirteen in MIO (81 %) and ten in PAW (63 %) returned after 4 months.

Design

Data were collected on four separate occasions. For *Pre-Stimulation* data, participants filled in four questionnaires at home before coming to our laboratory. Two of these were employed in the previous experiments also, and were used now to examine the pre-stimulation equivalence of the groups.

In the laboratory *Session 1*, participants were first stimulated with MIO or PAW, and then completed two tests that we used to study immediate effects. They were also given questionnaires to fill in 7 to 10 days later at home, and be returned to us by mail. In keeping with the time intervals in the previous experiments, we refer to this 7 to 10 days' point of data collection as *Session 2*. In keeping with the average time interval in the previous experiments and as within the actual interval here, we refer to the data as the "ten day data" for short (actual time range 7 days to 4 weeks, see below). Finally, participants returned 4 months for individual testing and an interview (*Session 3*).

Materials and procedure

Pre-Stimulation. The measures completed before coming to our laboratory were the BDI and the SASB Intrex as described above. In addition, participants did the Internalized Shame Scale (Cook, 1996) and Blatt's Depressive Experiences Questionnaire (Blatt, Wein, Chevron, & Quinlan, 1979) for purposes unrelated to the present study.

Session 1. Following stimulation participants did the EMT Positivity of Childhood Memories task (Weinberger et al., 1997). They were allowed 4 min 30 s to write brief notes regarding childhood memories, and then rated these for emotional positivity on a scale from -7 to +7. We compute final scores on this task as the ratio between positive points and all points (e.g., someone scoring four memories +2, +2, +2 and -2 gets $6/8 = .75$).

Participants then did the Attachment Scripts Test (Gonzalez da Silva, Claesson, & Sohlberg, 1999; an English version can be obtained from Staffan Sohlberg). Participants completed 30 sentence stems. Each stem can be completed in a Secure, Insecure-Ambivalent or Insecure-Avoidant way, based on Baldwin's (1996) theory on the "If...then"-structure of attachment expectations. As an example, the stem "If I have an accident in the middle of the city ..." can be completed with "... someone will help me" (Secure), "... I have to get people's attention to get any help" (Insecure-Ambivalent), or "... people will come and look because they are curious, but they won't do anything" (Insecure-Avoidant). Scores are computed by counting the number of responses of each type. Item analysis based on participants having selected a Secure or Insecure reply led to 24 items being included in an internally consistent scale for Secure Attachments Scripts. Coefficient alpha based on tetrachoric correlations appropriate for binary response formats (StatSoft, 1994) was .87.

Participants then did the threshold task and were given a sealed envelope with questionnaires to complete at home. Instructions were to wait at least 7 days but no more than 10 days.

Session 2. The questionnaires completed at home after 7 to 10 days were the Self-Mother Similarity test and a simplified single-item version of the Hazan and Shaver test as described above (Experiment 2). In addition, participants completed a test for Adult Attachment created by Pehr Granqvist using the items in Collins and Read (1990). This test comprises 6-item subscales for Secure, Insecure-Ambivalent, and Insecure-Avoidant attachment. In the present data, reliability ranged from marginal (Secure, std. alpha .58, split-half .60) to good (.74 and above for Insecure-Ambivalent and Insecure-Avoidant).

We received the first completed sets 7 days after stimulations. After a reminder, the last participant mailed in his set 4 weeks after stimulation.

Session 3. Four months after Session 1 we invited participants back. When arriving they filled in the Adult Attachment scale. Reliabilities for the latter mimicked those at Session 2 (Secure, std. alpha .55 and split-half .70, Insecure-Ambivalent and Insecure-Avoidant .74 and above). The BDI and our Self-Mother Similarity test then followed. Last, participants were interviewed for ethical and hypothesis-generating purposes. Responses were not quantified. Debriefing included discussion of the possibility that effects might be considerably more persistent than was previously believed.

Statistical analysis

As noted above, correlations are materially affected by the range of data secured in a study. With modest sample size such as here they can be heavily influenced by single observations that are not extreme outliers but still deviant values with profound effect on estimates (StatSoft, 2001). Before searching for bivariate outliers we therefore recursively eliminated all observations that were one standard deviation or more away from the remainder of their respective distributions.

Computing three separate correlations in the analysis of the Pre-Stimulation data, we dropped a total of 4 MIO-data points (stemming from 2 persons) and 6 PAW-data points (stemming from 4 persons). In the analysis of the Session 1 data, no data points were eliminated. In the analysis of the Session 2 data, we dropped 1 MIO-data point and 2 PAW-data points (stemming from 2 persons). In the analysis of the Session 3 data finally, we eliminated 1 PAW-data point. A subsequent search for bivariate outliers according to our a priori criteria produced none.

There was little between-participant variation in the Session 2 single-item Hazan and Shaver scales. Creating a summary scale using all 3 items did not help so we dropped these data from further consideration.

Results

Pre-Stimulation Baseline

As shown in Table 5a, the baseline data do not suggest that the MIO and PAW groups were appreciably different already before stimulation.

Session 1: Ten Minutes Post-Stimulation

As shown in Table 5a and in contrast to the pre-stimulation data, the difference between MIO and PAW ten minutes after stimulation was more akin to that in the previous experiments. Positivity in Childhood Memories and Secure Attachments Scripts had more variance in common in MIO than in PAW. This difference was “small” however ($q = .10$ based on $r = .52$ vs. $.44$) and not significant.

Session 2: Ten Days Post-Stimulation

As shown in Table 5a, ten days after stimulation Self-Mother Similarity and the Adult Attachment scales had more variance in common in MIO than in PAW (mean 51 per cent variance vs. 2 per cent, $q = .70$). This “large” difference was comparable to the strongest effects recorded in the previous experiments. Computed as correlations and compared between groups, the difference between MIO $r = -.72$ and PAW $r = -.08$ on Self-Mother Similarity vs. Ambivalent was significant at $p = .03$, one-tailed. Significant results were obtained also on Self-Mother Similarity vs. Secure (MIO $r = .72$ vs. PAW $r = .16$, $p = .04$, one-tailed) and on Self-Mother Similarity vs. Avoidant (MIO $r = -.70$ vs. PAW $r = -.13$, $p = .04$, one-tailed).

Session 3: Four Months Post-Stimulation

As shown in Table 5b, four months after stimulation the overall result resembled that seen immediately in the laboratory. Variables on average still had more variance in common in MIO than in PAW, but the difference was now down to 9 per cent (vs. 8 per cent in the laboratory and 49 per cent after ten days). No comparisons were significant.

Session 3 allowed a comparison between groups based on tests that contained no references to “mother” (the measure of adult attachment and the BDI), and were administered before potential refresher cues. No comparisons were significant but two out of three comparisons (Table 5b) indicated more variance in common between adult attachment and depression in MIO vs. PAW (mean difference across all three 18 per cent).

/ Insert Tables 5a and 5b here /

Threshold task

The first participant to report seeing anything structured did so at 23 ms. Typical values were much higher (MIO $m = 70$, $sd = 32.5$; PAW $m = 83$, $sd = 55.8$, $t[30] = -.82$, $p = .42$).

Discussion

In Experiment 5, variables correlated more strongly in MIO than in PAW after ten minutes, after ten days, and after four months. They did not correlate more strongly in MIO than in PAW before stimulation. Combined with the fact that the ten day difference was $p < .05$ significant this implies that subliminal stimulation with “mommy and I are one” causes an increase in correlation between the variables we measured. This replicates Experiments 1 to 4.

Logically, the data weaken faith in the hypothesis that the effect we report is evident only when subliminal stimulation with a “mommy and I”-stimulus is combined with some general or specific cue. This important point is addressed more fully in the General Discussion.

There was a stronger effect after ten days than after ten minutes or four months, and the ten day effect was the only significant one. The smaller difference between groups after four months implies effects that may be long-term but not everlasting. Adding to caveats regarding any small sample experiment however, re-analysis of the ten day data using only participants who took part at four months revealed a smaller difference between conditions already at that point (data not shown). Thus, effects at four months may not have come out weaker if the entire original sample had taken part.

We collected the four months’ data during a procedure undertaken for ethical reasons. The experimenter was not blind to group. However, an assumption about experimenter bias favoring our hypotheses is not consistent with the observation that whereas five of the seven comparisons at four months produced supporting data, two did not.

General Discussion

Data from five experiments show that correlations between a measure of Self-Mother Similarity and other measures were higher in groups subliminally exposed to “mommy and I”-stimuli than in groups exposed to control stimuli. Because the most important measures were taken a week or more post stimulation, these results imply that complex effects of subliminal stimulation can persist much longer than was previously assumed.

Is higher correlations after “mommy and I”-stimuli a reliable finding?

We believe higher correlations after “mommy and I”-stimuli is a reliable finding. Chance was our own initial explanation, and each experiment produced at least one comparison that was not significant. It still strains credibility to argue that chance can account for a descriptively consistent data pattern that recurs in five experiments using different experimenters and participants.

A more serious objection might pertain to our assertion that we report data from conceptually streamlined experiments. Self-Mother Similarity data were collected in all experiments, but the other data with which they were correlated only in some cases pertained to the exact same variables. Also, we combined Experiment 1 using “mommy and I are dissimilar” with Experiments 3, 4 and 5 using “mommy and I are one”. Direct comparison

between these stimuli in Experiment 2 revealed differences in effect that, albeit not significant, were medium in size, so future experimentation might reveal reliable differences. However, at the independent variable end, all experiments had in common the subliminal administration of "mommy and I"-stimuli, vs. stimuli either not containing these words at all, or containing them but in an order that did not preserve any syntax-dependent meaning. Conceptually, effects of "mommy and I are dissimilar" and "mommy and I are one" may be understood as subclasses of a more general class of "mommy and I"-effects. While these two stimuli can be seen as opposite in meaning, they could still activate associations to the same issue of similarity with mother. Less speculatively, perhaps effects of "mommy and I are dissimilar" and "mommy and I are one" will be found largely similar until measurement precision is markedly improved; when that happens, associations to these two stimuli may be found to be reliably distinct, and, perhaps, with somewhat dissimilar implications for effect persistence. Until that happens however, all that comes through may be the generally similar effect of unconsciously associating to "mommy and I..." as opposed to associating to, say, stimuli alluding to non human entities, social categories, or adult peers.⁸

Accompanying this meaningful homogeneity at the independent variable end, at the dependent variable end we tested correlations between Self-Mother Similarity and variables pertaining to mood, personality, and mother in all experiments. Thus, it is reasonable to view our conclusions as based on, as stated in the Introduction, "five partly dissimilar but conceptually streamlined experiments totaling 365 participants".

What if similar results come out with supraliminal stimulation that allows conscious awareness?

A meta-analysis by Bornstein (1990) showed significantly stronger effects with our kind of stimuli under subliminal conditions rather than under supraliminal conditions, and this discouraged us from including supraliminal conditions here. One obvious research implication if effects arise also using supraliminal stimulation is that the ethical problems may not be solved completely merely by providing debriefing information to participants about what they saw, and the effects the stimuli might have on them.

From the viewpoint of theory, many important questions concerning the relationship between conscious and unconscious influences need answers (Wheeler & Petty, 2001). The presently most important observation nonetheless is that no outcome of a "mommy and I"-experiment allowing conscious awareness could modify the point we are trying to make here: subliminal stimulation can produce complex effects lasting at least a week, and perhaps much longer. Similarly persistent effects could arise with supraliminal stimulation without this being inconsistent with present models in cognition, emotion, and personality. If people are asked to read "mommy and I"- phrases this may for some time influence how they rate themselves, mother, and their mood, because of the increased availability of both specific episodic memories and, perhaps, more general relational schemas including models of the self and others (Baldwin, 1992). The exciting and problematic aspect of the present results, in contrast, is that they at all occur.⁹

Are similar environmental cues at stimulation and subsequent test necessary for higher correlations after "mommy and I"-stimuli?

Complex, persistent effects of subliminal stimulation have different implications if they arise in many situations or just a few. In Experiments 1, 2, 3 and 4, Session 2 was in a group setting

with a different experimenter. When completing the measures, participants had not seen them before, nor, with the exception of Experiment 5, been made aware that their mothers had anything to do with the study. Further, in Experiment 5 there was a significant difference between conditions ten days post stimulation, despite the fact that participants filled in the tests at home.¹⁰ The four months' follow-up produced no significant results, but small sample size competes with no real difference as the explanation; descriptively the difference between conditions was substantial when correlations were computed between the two first tests, neither of which made explicit reference to mother. It seems unlikely that a correlation difference between conditions on the kind of variables we used can be found just in situations containing cues closely resembling those at stimulation.

Do higher correlations after "mommy and I"—stimuli reflect activation of a relational schema?

We previously hypothesized that effects of “mommy and I are one” arise because the stimulation activates a complex and partly idiosyncratic associative network that includes emotion nodes (Sohlberg et al., 2000). Such a network can be subsumed under the relational schema concept described by Baldwin (1992). It is still tempting to explain our data by simple mood change, e.g. because current advances show that mere exposure may induce diffuse mood changes that influence preference not just for presented materials but for unrelated materials as well (Monahan et al., 2000). As a parallel to recent observations regarding behavioral effects of stereotype activation however (Wheeler & Petty, 2001), it is difficult to accommodate all data under a mood hypothesis. As noted, the particular BDI vs. SASB-pattern that Birgegard (1999) observed after Experiment 1 and that recurred in Experiment 2 speaks against such a possibility. If the stimulation affected participants' mood, and through this avenue affected their ratings, between-condition differences should be similar whichever SASB scale was correlated with BDI. However, they were much greater with respect to BDI – Ignore and BDI – Blame than with respect to BDI – Attack. That pattern occurred after “mommy and I are dissimilar” in both Experiments 1 and 2. Arguing against this result being an artefact of how the SASB scales are put together, the pattern did not occur after “mommy and I are one” (Experiment 2). Thus, it may be difficult to explain without assuming that some specific cognitive content was activated, perhaps so that "mommy and I are dissimilar" activated a relational schema in which dysphoric affect was associatively linked more to the perception of some maternal actions than to other maternal actions.

We note too that mood effects have proved insufficient in explaining short-term “mommy and I are one”-outcomes (e.g. Weinberger's TAT-type results, in Siegel & Weinberger 1998; see also Sohlberg & Jansson, 2002, Experiment 2, and especially the Experiment 3 false memory effect that directly points to the activation of a schema, see Baldwin, 1999).

Why persistent effects of subliminal stimulation?

We report serendipitous findings. To guide further experimentation some speculation about explanations is in order however. Merikle and Daneman (1998) assumed that personal relevance could increase the duration of subliminal effects. “Mommy and I ...”-stimuli should count here; though the word “mommy” in isolation could activate associations to a social category or role, it should evoke memories of a specific significant other when set in the “mommy and I”-context. Compare this with the kind of single word stimuli lacking personal relevance typically used in studies of memory in anesthetized patients (Merikle & Daneman,

1998). An anesthesia study by Levinsohn discussed by Merikle and Daneman (1998) suggested very long-lasting effects, and used a highly personally relevant experimental manipulation. Medical personnel made several ominous comments during surgery, e.g. "Just a moment! I don't like the patient's colour. Much too blue. [...] I'm going to give a little more oxygen". When questioned under hypnosis a month later, four out of ten patients could repeat these comments almost verbatim.

Assuming that our stimuli activated a self-with-mother relational schema, this by definition influenced the emotional state of the participant (Baldwin, 1992). This influence could be strong because to the great majority of humans "mommy and I" phrases refer to the relationship between the self and a fundamental attachment figure (cf. Baumeister & Leary, 1995; Fraley, 2002; Weinberger, 1992).

Assuming that our stimuli activated a self-with-mother relational schema, this also by definition influenced the motivational state of the participant (Baldwin, 1992). Bargh argued that unconsciously activated goals persist in the face of obstacles, and that unfulfilled motivation can increase over time (Bargh, 1997; Bargh & Ferguson, 2000). Attachment security goals might be parts of relational schemas activated by "mommy and I are dissimilar" and "mommy and I are one" (Sohlberg et al., 2000; Sohlberg & Jansson, 2002). Mikulincer, Orbach, and Iavneli (1998) showed that out-of-awareness changes in self-other similarity function to achieve such goals. People change in different directions depending on their attachment styles, so no overall decrease or increase would be expected in samples with a mix of attachment styles (like here, e.g. Experiment 2). However, an observable result might be a change in how self-(m)other similarity correlates with other variables. Any kind of goal-activation would help sustain the effects over time (cf. Bargh & Ferguson, 2000).

Second, duration and lighting settings in our lab ensure that stimulation conditions are strongly incompatible with conscious awareness (see Sohlberg, Billingham, et al., 1998, Expr. 1). In Bornstein's (1989) meta-analysis on mere exposure, results were much stronger under truly subliminal conditions than under brief but detectable conditions (1 s). With text stimuli, superficial aspects determine processing when stimulation is near the threshold for conscious awareness (e.g. word length; cf. Birgegard & Sohlberg, 1999; Klinger & Greenwald, 1995). With truly subliminal stimuli, meaning prevails and the participant cannot minimize impact by attributing the effects to an external source, in this case to brief phrases shown as part of a psychology experiment (Bornstein, 1990, 1992). We used 5 ms stimulation. During the ascending threshold task, 153 ms was needed on average to produce dawning conscious awareness (data not shown). Successful studies have employed durations less than 1 ms (Hansen, in Masling, 1992).

Third, the probability of persistent effects increases if the activation of a schema is indeed involved, rather than some single association or mood effect. Assuming that participants in their daily lives encountered some stimuli that supported whatever processes were activated by "mommy and I...", and other stimuli that counteracted them, an activated schema ensured that stimuli consistent with the schema were selectively attended to, and accorded greater emotional significance. Stimuli that were not consistent with the schema were filtered out, or distorted to fit. Indeed, mental representations of significant others may function as more powerful inference structures than most other representations (e.g. of nonsignificant others, stereotypes, and traits, Andersen & Cole, 1990). For example, if an activated self-with-mother relational schema involves insecure attachment expectations of rejection, this might cause the person to notice the passing glance from someone who frowns, but not from someone who smiles. Further, ambiguous events come to be perceived in terms of the activated schema, and provide confirming information. Expectations of rejection might cause the person to encode the passing glance from someone who has an ambiguous expression on

her/his face as the passing glance from someone who frowns. Behavioral confirmation processes may also supply realistically confirming evidence. For example, biased attention and encoding leading to the maintenance of expectations of rejection and a troubled face might cause others to reciprocate with a frown. A relevant example of such processes was reported by Chen and Bargh (1997, see also Berk & Andersen, 2000), who found people interacting with research participants who had been subliminally primed for hostility to increase their own hostile behavior.

Nothing forces the conclusion that complex persistent effects of subliminal stimulation can only occur with “mommy and I”-stimuli however. Speculatively, any stimulus could have the same effect if it is personally relevant, activates goals, involves emotion, and ensures a distortion of incoming information in a direction that sustains the activation.

Implications of persistent and complex subliminal effects for conceptions of human nature

None of our experiments tested whether subliminal activation causes persistent effects across all the domains included in Baldwin’s (1992) conception of a relational schema. Because the data can nonetheless be more easily understood by assuming such a process than by assuming mood or single-association effects, it is helpful to spell out some possible implications. Note that the stimulation did not allude to some exotic notion relevant only to groups with deviant personality or clinical problems. Nor was it individually adapted so as to influence one individual strongly but leave others unaffected. All humans have mothers.

Note also that while literally subliminal stimulation is believed by some to be an infrequent occurrence under everyday circumstances (Öhman, 1999), qualitatively similar effects from unattended stimuli cannot be ruled out. Merikle and coworkers argued that perception without awareness and perception without attention produces qualitatively similar results (Merikle & Joordens, 1997; Merikle et al., 2001).

Thus, if common stimuli that are not attended to can influence the impressive variety of areas implied in the relational schema concept (image of the self, patterns of interpersonal relatedness, motivation and emotion) for non-trivial lengths of time, the present research helps identify the causal agents that have us under their control, just as we believe we are the ones in control.

Implications of persistent and complex subliminal effects for the conduct of psychological research

Any study may have unmeasured effects, but the ethical relevance varies according to their nature. Our finding of increased correlations in the experimental groups does not imply that participants on average scored more or less similar to their mothers, more or less depressed, or more or less fearful of intimacy. Comparing depression across groups the maximum BDI difference was 3 points (data not previously shown), comfortably below the level noticeable for an individual.

The controversial nature of subliminal research nonetheless means a greater need to attend to ethics. Wilson and Brekke (1994) found that relative to their estimates of the likelihood it could occur, no possibility was seen as more unacceptable to their study participants than that of being influenced subliminally. Whatever the specific information and debriefing options chosen in future research, more attention to ethical issues is clearly necessary if effects last for days or weeks, rather than a few minutes.

Note finally that our study was concerned with university students, the great majority of whom were Caucasian and the majority of whom were men. "Mommy and I are one" effect differences between men and women tend to be small (Sohlberg & Jansson, 2002) or non-existent (Hardaway, 1990). Nonetheless, it would be helpful if future studies were done with more equal proportions of men and women, representing a broader range of age, ethnicity, and social background.

In conclusion, we now report what we believe to be the first observations of persistent complex effects of subliminal stimulation. These effects raise important ethical issues and have exciting scientific implications.

References

- Abrams, R. L., & Greenwald, A. G. (2000). Parts Outweigh the Whole (Word) in Unconscious Analysis of Meaning. *Psychological Science, 11*(2), 118–124.
- Andersen, S. M., & Cole, S. W. (1990). "Do I Know You ?" : The Role of Significant Others in General Social Perception. *Journal of Personality and Social Psychology, 59*(3), 384–399.
- Andersen, S.M, & Miranda, R. (2000). Transference: How past relationships emerge in the present. *The Psychologist, 12*(12), 608–609.
- Andersen, S. M., Reznik, I., & Manzella, L. M. (1996). Eliciting Facial Affect, Motivation, and Expectancies in Transference: Significant–Other Representation in Social Relations. *Journal of Personality and Social Psychology, 71*(6), 1108–1129.
- Balay, J., & Shevrin, H. (1988). The subliminal psychodynamic activation method: A critical review. *American Psychologist, 43*(3), 161–174.
- Baldwin, M. (1992). Relational schemas and the processing of social information. *Psychological Bulletin, 112*(3), 461–484.
- Baldwin, M. W. (1994). Primed relational schemas as a source of self–evaluative reactions. *Journal of Social and Clinical Psychology, 13*(4), 380–403.
- Baldwin, M., & Sinclair, L. (1996). Self-esteem and "if . . .then" contingencies of interpersonal acceptance. *Journal of Personality and Social Psychology, 71*(6), 1130–1141.
- Baldwin, M. W. (1999). Activation and accessibility paradigms in relational schemas research. In D. Cervone & Y. Shoda (Eds.), *Coherence in personality* (pp. 127–154). New York: Guilford.
- Bargh, J. A. (1994). The four horsemen of automaticity: Awareness, intention, efficiency, and control in social cognition. In R. S. Wyer & T. K. Srull (Eds.), *Handbook of social cognition* (pp. 1–41). Hillsdale, New Jersey: Lawrence Erlbaum.
- Bargh, J. A. (1997). The Automaticity of Everyday Life. In R. S. J. Wyer (Eds.), *The Automaticity of Everyday Life. Advances in Social Cognition, Vol X*. Mahwah, N.J.: Lawrence Erlbaum.
- Bargh, J. A., & Chartrand, T. L. (1999). The Unbearable Automaticity of Being. *American Psychologist, 54*(7), 462–479.
- Bargh, J. A., Chen, M., & Burrows, L. (1996). Automaticity and social behavior: Direct effects of trait construct and stereotype activation on action. *Journal of Personality and Social Psychology, 71*(2), 230–244.
- Bargh, J.A. & Ferguson, M.J. (2000). Beyond behaviorism: On the automaticity of higher mental processes. *Psychological Bulletin, 126*(6), 925–945.
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117*, 497–529.

- Beck, A. T., Steer, R. A., & Garbin, M. G. (1988). Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation. *Clinical Psychology Review, 8*, 77–100.
- Becker, S., Moscovitch, M., Behrman, M., & Joordens, S. (1997). Long-term semantic priming: A computational account and empirical evidence. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 23*(5), 1059–1082.
- Benjamin, L. (1974). Structural analysis of social behavior. *Psychological Review, 81*(5), 392–425.
- Benjamin, L. S. (1996a). *Interpersonal diagnosis and treatment of personality disorder, 2nd ed.* New York: Guilford.
- Benjamin, L. S. (1996b). Introduction to the Special Section on Structural Analysis of Social Behavior. *Journal of Consulting and Clinical Psychology, 64*(6), 1203–1212.
- Benjamin, L. S. (2000). *SASB Intrex user's manual for short, medium and long form questionnaires.* University of Utah, Department of Psychology, 380 South 1530 East, Salt Lake City, UT 84112-0251, USA.
- Berk, M. S., & Andersen, S. M. (2000). The impact of past relationships on interpersonal behavior: Behavioral confirmation in the social-cognitive process of transference. *Journal of Personality and Social Psychology, 79*(4), 546–562.
- Bernat, E., Bunce, S., & Shevrin, H. (2001). Event-related brain potentials differentiate positive and negative mood adjectives during both supraliminal and subliminal visual processing. *International Journal of Psychophysiology, 42*, 11–34.
- Birgegard, A. (1999). *Subliminal exposures of Mommy and I are Dissimilar ("mamma och jag är olika" in Swedish) activate shame.* Unpublished manuscript, Uppsala University, Sweden.
- Birgegard, A., & Sohlberg, S. (1999). New Methodological Advice for Research in Subliminal Psychodynamic Activation. *Perceptual and Motor Skills, 88*, 747–755.
- Blatt, S. J., Wein, S. J., Chevron, E., & Quinlan, D. M. (1979). Parental representations and depression in normal young adults. *Journal of Abnormal Psychology, 88*(4), 388–397.
- Bonebakker, A. E., Jellicic, K., Passchier, J., & Bonke, B. (1996). Memory During General Anaesthesia: Practical and Methodological Aspects. *Consciousness and Cognition, 5*, 542–561.
- Bornstein, R. F. (1989). Exposure and affect: Overview and meta-analysis of research 1968–1987. *Psychological Bulletin, 106*(2), 265–289.
- Bornstein, R. F. (1990). Critical importance of stimulus awareness for the production of subliminal psychodynamic activation effects: A meta-analytic review. *Journal of Clinical Psychology, 46*(2), 201–210.
- Bornstein, R. F. (1992). Critical importance of stimulus unawareness for the production of Subliminal Psychodynamic Activation effects : An attributional model. *Journal of Nervous and Mental Disease, 180*(2), 69–76.
- Bornstein, R. F., Leone, D. R., & Galley, D. J. (1987). The generalizability of subliminal mere exposure effects: Influence of stimuli perceived without awareness on social behavior. *Journal of Personality and Social Psychology, 53*(6), 1070–1079.
- Bowlby, J. (1980). *Attachment and loss (Vol. 3): Loss: Sadness and depression.* London: Hogarth Press and Institute of Psycho-Analysis.
- Bruchhauser, K. (2001) *Mommy and I are One or Daddy and I are One?: Gender Differences, Identification and the Effect of Subliminal Fantasies on Mood, Self-Esteem, and Oneness.* Unpublished doctoral dissertation, Adelphi University, New York.
- Cheesman, J., & Merikle, P. M. (1986). Distinguishing conscious from unconscious perceptual processes. *Canadian Journal of Psychology, 44*(4), 343–367.

- Chen, M., & Bargh, J. A. (1997). Nonconscious Behavioral Confirmation Processes: The Self-Fulfilling Consequences of Automatic Stereotype Activation. *Journal of Experimental Social Psychology, 33*, 541–560.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences (2nd. ed.)*. Hillsdale, NJ, US: Lawrence Erlbaum Associates, Inc.
- Collins, N. L., & Read, S. J. (1990). Adult attachment, working models, and relationship quality in dating couples. *Journal of Personality and Social Psychology, 58*, 644–663.
- Cook, D. R. (1996). Empirical studies of shame and guilt: The internalized shame scale. In D. L. Nathanson (Ed.), *Knowing feeling: Affect, script and psychotherapy*. New York: W. W. Norton & Company.
- Descutner, C. J., & Thelen, M. H. (1991). Development and validation of a Fear-of-Intimacy Scale. *Psychological Assessment, 3*(2), 218–225.
- DeSteno, D. A., & Salovey, P. (1997). The Effects of Mood on the Structure of the Self-Concept. *Cognition and Emotion, 11*(4), 351–372.
- Doi, S. C., & Thelen, M. H. (1993). The Fear-of-Intimacy Scale: Replication and extension. *Psychological Assessment, 5*(3), 377–383.
- Erdelyi, M. H. (1992). Psychodynamics and the Unconscious. *American Psychologist, 47*(6), 784–787.
- Fraley, R. C. (2002). Attachment stability from infancy to adulthood: Meta-analysis and dynamic modeling of developmental mechanisms. *Personality and Social Psychology Review, 6*(2), 123–151.
- Florsheim, P., Henry, W. P., & Benjamin, L. S. (1996). Integrating individual and interpersonal approaches to diagnosis: The Structural Analysis of Social Behavior and Attachment Theory. In F. W. Kaslow (Ed.), *Handbook of Relational Diagnosis and Dysfunctional Family Patterns* (pp. 81–101). New York: Wiley.
- Frolund, L. (1997). Early Shame and Mirroring. *Scandinavian Psychoanalytic Review, 20*, 35–57.
- Fudin, R. (1986). Subliminal Psychodynamic Activation : Mommy and I are not yet One. *Perceptual and Motor Skills, 63*, 1159–1179.
- Glassman, N. S., & Andersen, S. M. (1999). Activating transference without consciousness: Using significant-other representations to go beyond what is subliminally given. *Journal of Personality and Social Psychology, 77*(6), 1146–1162.
- Gonzalez da Silva, C., Claesson, K., & Sohlberg, S. (1999). *The Attachment Scripts Test*. (Available from Staffan Sohlberg, Ph.D., Department of Psychology, Uppsala University, PO Box 1225, SE-75142, Sweden).
- Granqvist, P. (2002). Attachment and religiosity in adolescence: Cross-sectional and longitudinal evaluations. *Personality and Social Psychology Bulletin, 28*(2), 260–270.
- Granqvist, P., & Hagekull, B. (2001). Seeking security in the New Age: On attachment and emotional compensation. *Journal for the Scientific Study of Religion, 40*(3), 527–545.
- Greenwald, A. G. (1992). New Look 3 : Unconscious cognition reclaimed. *American Psychologist, 47*(6), 766–779.
- Hardaway, R. A. (1990). Subliminally activated symbiotic fantasies: Facts and artifacts. *Psychological Bulletin, 107*(2), 177–195.
- Hazan, C. S., & Shaver, P. R. (1986). *Parental caregiving style questionnaire*. Unpublished manuscript.
- Joordens, S., & Becker, S. (1997). The long and short of semantic priming effects in lexical decision. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 23*(5), 1083–1105.

- Klinger, M. R., & Greenwald, A. G. (1995). Unconscious priming of association judgments. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 21(3), 569–581.
- Masling, J. M. (1992). What does it all mean? In R. F. Bornstein & T. S. Pittman (Eds.), *Perception without awareness : Cognitive, clinical, and social perspectives* (pp. 259–276). New York: Guilford.
- Masling, J., Bornstein, R. F., Poynton, F. G., Reed, S., & Katkin, E. S. (1991). Perception without awareness and electrodermal responding: A strong test of Subliminal Psychodynamic Activation effects. *The Journal of Mind and Behavior*, 12(1), 33–48.
- Merikle, P. M. (1992). Perception without awareness: Critical issues. *American Psychologist*, 47(6), 792–795.
- Merikle, P. M., & Daneman, M. (1996). Memory for Unconsciously Perceived Events. *Consciousness and Cognition*, 5, 525–541.
- Merikle, P. M., & Daneman, M. (1998). Psychological Investigations of Unconscious Perception. *Journal of Consciousness Studies*, 5(1), 5–18.
- Merikle, P. M., & Joordens, S. (1997). Parallels between perception without attention and perception without awareness. *Consciousness and Cognition*, 6, 219–236.
- Merikle, P. M., Smilek, D., & Eastwood, J. D. (2001). Perception without awareness: perspectives from cognitive psychology. *Cognition*, 79, 115–134.
- Mikulincer, M., Orbach, I., & Iavnieli, D. (1998). Adult attachment style and affect regulation: Strategic variation in subjective self–other similarity. *Journal of Personality and Social Psychology*, 75(2), 436–447.
- Monahan, J.L., Murphy, S.T., & Zajonc, R.B. (2000). Subliminal mere exposure: Specific, general, and diffuse effects. *Psychological Science*, 11(6), 462–466.
- Nathanson, D. L. (Ed.). (1987). *The Many Faces of Shame*. New York: Guilford.
- Öhman, A. (1999). Distinguishing Unconscious from Conscious Emotional Processes: Methodological Considerations and Theoretical Implications. In T. Dalgleish & M. Power (Eds.), *Handbook of Cognition and Emotion* (pp. 321–352). Chichester: Wiley.
- Orbach, I., Shopen–Kofman, R., & Mikulincer, M. (1994). The impact of subliminal symbiotic vs. identification messages in reducing anxiety. *Journal of Research in Personality*, 28, 492–504.
- Pincus, A. L., Gurtman, M. B., & Ruiz, M. A. (1998). Structural Analysis of Social Behavior (SASB): Circumplex Analyses and Structural Relations With the Interpersonal Circle and the Five–Factor Model of Personality. *Journal of Personality and Social Psychology*, 74(6), 1629–1645.
- Roisman, G. I., Madsen, S. D., Henninghausen, K. H., Sroufe, L. A., & Collins, W. A. (2001). The coherence of dyadic behavior across parent–child and romantic relationships as mediated by the internalized representation of experience. *Attachment and Human Development*, 3(2), 156–172.
- Siegel, P., & Weinberger, J. (1998). Capturing the MOMMY AND I ARE ONE Merger Fantasy: The Oneness Motive. In J. M. Masling & R. F. Bornstein (Eds.), *Empirical perspectives on the psychoanalytic unconscious*. (pp. 71–97). Washington, DC, USA: American Psychological Association.
- Silverman, L. H. (1970). Further experimental studies of dynamic propositions in psychoanalysis. *Journal of the American Psychoanalytic Association*, 18, 102–115.
- Silverman, L. H. (1977). *Ethical Considerations and Guidelines In The Use of Subliminal Psychodynamic Activation*. Unpublished manuscript, New York University.
- Silverman, L. H. (1984). *Further comments on Subliminal Psychodynamic Activation studies*. Unpublished manuscript, New York University.

- Silverman, L. H., Lachman, F. M., & Milich, R. H. (1982). *The Search for Oneness*. New York: Int'l Univ. Press.
- Silverman, L. H., Martin, A., Ungaro, R., & Mendelsohn, E. (1978). Effect of subliminal stimulation of symbiotic fantasies on behavior modification treatment of obesity. *Journal of Clinical and Consulting Psychology*, *46*(3), 432–441.
- Silverman, L. H., & Weinberger, J. (1985). Mommy and I are one: Implications for psychotherapy. *American Psychologist*, *40*(12), 1296–1308.
- Snodgrass, M., Shevrin, H., & Kopka, M. (1993). Absolute inhibition is incompatible with conscious perception. *Consciousness and Cognition*, *2*, 204–209.
- Sohlberg, S., Arvidsson, M., & Birgegård, A. (1997). Stroop and Mood/Memory Measures in the Study of Unconscious "Oneness". *Perceptual and Motor Skills*, *85*, 81–82.
- Sohlberg, S., Billinghamurst, A., & Nylén, S. (1998). Moderation of Mood Change After Subliminal Symbiotic Stimulation. Four Experiments Contributing to the Further Demystification of Silverman's "Mommy And I Are One" Findings. *Journal of Research in Personality*, *32*, 33–54.
- Sohlberg, S., Birgegård, A., Czartoryski, W., Ovefelt, K., & Strömbom, Y. (2000). Symbiotic Oneness and Defensive Autonomy: Yet Another Experiment Demystifying Silverman's Findings Using "Mommy And I Are One". *Journal of Research in Personality*, *34*, 108–126, doi: 10.1006/jrpe.1999.2264.
- Sohlberg, S., Claesson, K., & Birgegård, A. (in press). Memories of Mother, Complementarity, and Shame: Predicting Response to Subliminal Stimulation with "Mommy and I are One". *Scandinavian Journal of Psychology*.
- Sohlberg, S., & Jansson, B. (2002). Unconscious Response to "Mommy and I are One": Does Gender Matter? In R. F. Bornstein & J. Masling (Eds.), *The Psychodynamics of Gender and Gender Roles*. Washington, D.C.: APA Books.
- Sohlberg, S., Samuelberg, P., Sidén, Y., & Thörn, C. (1998). Caveat Medicus — Let the Subliminal Healer Beware. Two Experiments Suggesting Conditions When the Effects of Silverman's "Mommy and I Are One"-Phrase Are Negative. *Psychoanalytic Psychology*, *15*(1), 93–114.
- Sohlberg, S., Stahlheuer, P., & Tell, P. (1997). Depression, Gender and Identification. *British Journal of Clinical Psychology*, *36*, 453–455.
- StatSoft (1994). *Statistica for the Macintosh*. Tulsa OK: Author.
- StatSoft, Inc. (2001). *STATISTICA for Windows [Computer program manual]*. Tulsa, OK: StatSoft, Inc., 2300 East 14th Street, Tulsa, OK, 74104-4442, (918) 749-1119, fax: (918) 749-2217, e-mail: info@statsoft.com, WEB: <http://www.statsoft.com>.
- Thörn, C. (1997) *En kognitiv eller en psykoanalytisk förklaringsmodell: Vilken ger bäst förståelse för effekten av ett subliminalt budskap? [A cognitive or a psychoanalytic account: Which gives the best understanding of the effects of a subliminal message?]*. Unpublished Master's Thesis, Uppsala University, Sweden.
- Weinberger, J. (1989). Response to Balay & Shevrin: Constructive critique or misguided attack? *American Psychologist*, *44*, 1417–1419.
- Weinberger, J. (1992). Validating and demystifying Subliminal Psychodynamic Activation. In R. F. Bornstein & T. S. Pittman (Eds.), *Perception without awareness* (pp. 170–190). New York: Guilford.
- Weinberger, J., & Hardaway, R. (1990). Separating science from myth in subliminal psychodynamic activation. *Clinical Psychology Review*, *10*(6), 727–756.
- Weinberger, J., Kelner, S., & McClelland, D. (1997). The Effects of Subliminal Symbiotic Stimulation on Free-response and Self-Report Mood. *Journal of Nervous and Mental Disease*, *185*(10), 599–605.

- Wheeler, S.C. & Petty, R.E. (2001). The effects of stereotype activation on behavior: A review of possible mechanisms. *Psychological Bulletin*, 127(6), 797-826.
- Wilson, T., & Brekke, N. (1994). Mental contamination and mental correction: Unwanted influences on judgments and evaluations. *Psychological Bulletin*, 116(1), 117-142.

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Footnotes

¹ Partially reported as a Master's thesis by Thörn (1997).

² In addition, 84 % of research psychologists surveyed by Greenwald (1992) did not believe SPA effects were established. There were reasons to believe these scientists were mistaken (Hardaway, 1990; Silverman, Martin, Ungaro, & Mendelsohn, 1978; Weinberger & Hardaway, 1990), but their skepticism discouraged lengthy speculation as to the longevity of these purportedly non-existent effects. Other arguments too indicated that we were on safe ground measuring Self-Mother Similarity seven days after the subliminal stimulation, and then using the data just as if they had been collected before stimulation, rather than after.

³ Since no long-term effects were expected in Experiment 1, the exact interval between the sessions was not recorded for each participant beyond observing the lower 7 day limit and an approximate 14 day upper limit.

⁴ Except for the memory data that were reported in Thörn (1997).

⁵ Outliers and deviant values were sought recursively to improve chances of retaining homogeneous samples for analysis. Because this method eliminates also observations that appear to be outliers only when the obvious ones are eliminated, it can be misleading if extreme observations are more numerous in one condition. There were 12 outliers or deviant values in the total N = 171 "mommy and I"-groups and 10 in the total N = 194 control groups ($p = .42$).

⁶ With the possible exception of a relative absence of participants with very low Self-Mother Similarity scores in the M condition. Reanalysis with all participants below the lowest

score in that condition excluded reduced the size of all correlations, but preserved the pattern (Table 4), with the MIO correlation still ten times larger than the next largest correlation.

⁷ Stronger correlations in the experimental group would be expected however, if the effect arose on account of an activated self-with-mother relational schema, and if early interactions with significant others shape working models / relational schemas that influence later relationships. For recent supportive data see Roisman, Madsen, Henninghausen, Sroufe, and Collins (2001; also Fraley, 2002).

⁸ Balay and Shevrin (1988) asserted that some conclusions drawn by researchers in Subliminal Psychodynamic Activation might be in error, because evidence taken to show an effect of the experimental stimulus might really show an effect of the control stimulus. Logically compelling data on that issue require experiments that include a no-stimulation condition, and the practical need for such a condition depends on the neutrality of the assumedly neutral control stimulus. It is interesting to note that although not all correlations in our control groups were low, many were. However, robust naturally occurring correlations between the measures we employed may require samples that well represent the entire score range in the general population, i.e. including also clinically disordered persons. The more parsimonious interpretation would seem to be that the higher correlations in the experimental groups reflect experimentally increased correlation in these groups, not reduced correlations in the control group.

⁹ From a methodological perspective, a qualitative difference in results has been suggested as a useful way of showing that the procedural difference between stimulation called subliminal and stimulation called supraliminal is valid (Merikle & Daneman, 1998). Defining subliminality that way is not the only alternative, however. Methods for ensuring unawareness are various, and include forced-choice awareness checks (e.g. Glassman & Andersen, 1999), post-experimental interviews (e.g. Chen & Bargh, 1997), and our participant reports of unawareness and the threshold task.

¹⁰ A caveat regarding Session 2 is that the experimenter did not literally accompany participants to the lab building exit. However, this building contains no waiting rooms or other similar spaces. The only way for participants to fill in their questionnaires there would have been to actually sit down in outdoor clothes in a dimly lit stairway and reply to the 101 items. We do not regard this as likely to have happened.

Table 1.

Experiment 1: Table shows per cent variance common to variables when correlations were computed separately for the experimental vs. control groups. Self-Mother Similarity and Memories of how mother acted (SASB) were both correlated with depression (BDI).

	MOMMY AND I ARE DISSIMILAR	PEOPLE ARE WALKING
Self-Mother Similarity and BDI	13	0
SASB Blame and BDI	57	13
SASB Attack and BDI	2	2
SASB Ignore and BDI	11	4

Table 2.

Experiment 2: Table shows per cent variance common to variables when correlations were computed separately for the experimental vs. control groups. Self-Mother Similarity, Memories of how mother acted (SASB), and the Hazan and Shaver attachment measure were all correlated with depression (BDI).

	MOMMY AND I ARE DISSIMILAR	MOMMY AND I ARE ONE	PEOPLE ARE WALKING
Self-Mother Similarity and BDI	46	18	0
SASB Blame and BDI	30	15	5
SASB Attack and BDI	1	13	1
SASB Ignore and BDI	13	16	0
Hazan & Shaver Secure Attachment and BDI	40	23	0
Hazan & Shaver Ambivalent Attachment and BDI	17	18	5
Hazan & Shaver Avoidant Attachment and BDI	27	16	1

Table 3.

Experiment 3: Table shows per cent variance common to variables when correlations were computed separately for the experimental vs. control groups. Self-Mother Similarity was correlated with the Hazan and Shaver attachment measure.

	MOMMY AND I ARE ONE	PEOPLE ARE WALKING
Self-Mother Similarity and Hazan & Shaver Secure Attachment	13	1
Self-Mother Similarity and Hazan & Shaver Ambivalent Attachment	10	0
Self-Mother Similarity and Hazan & Shaver Avoidant Attachment	3	0

Table 4.

Experiment 4, Self-Mother and Self-Father Similarity: Table shows per cent variance common to variables when correlations were computed separately for the experimental vs. control groups. Self-Mother Similarity and Self-Father Similarity were correlated with Fear of Intimacy (FIS).

	MOMMY AND I ARE ONE	PEOPLE ARE WALKING	ONE ARE AND MOMMY I	MOMMY NDI ERA RN OAE
Self- Mother Similarity and FIS	38	7	0	1
Self- Father Similarity and FIS	1	5	1	1

Table 5a.

Experiment 5, Baseline pre-stimulation results using questionnaires completed by participants in their homes, Post-stimulation results using questionnaires completed in our laboratory 10 minutes after subliminal stimulation, and Post-stimulation results using questionnaires completed at home 10 days after subliminal stimulation: Table shows per cent variance common to variables when correlations were computed separately for the experimental and control group.

	MOMMY AND I ARE ONE	PEOPLE ARE WALKING
Baseline (at home)		
SASB Blame and BDI	1	1
SASB Attack and BDI	3	1
SASB Ignore and BDI	0	4
10 minutes Post stimulation (laboratory)		
EMT Positivity in childhood memories and Secure adult attachment scripts	27	19
10 days Post stimulation (at home)		
Self-Mother Similarity and Secure Adult Attachment (Collins & Read)	52	2
Self-Mother Similarity and Ambivalent Adult Attachment (Collins & Read)	52	1
Self-Mother Similarity and Avoidant Adult Attachment (Collins & Read)	49	2

Table 5b.

Experiment 5, Post-stimulation results using questionnaires completed by participants in our department 4 months after subliminal stimulation: Table shows per cent variance common to variables when correlations were computed separately for the experimental and control group.

	MOMMY AND I ARE ONE	PEOPLE ARE WALKING
4 months Post stimulation (laboratory)		
Secure Adult Attachment (Collins & Read) and BDI	48	5
Ambivalent Adult Attachment (Collins & Read) and BDI	4	4
Avoidant Adult Attachment (Collins & Read) and BDI	45	35
Self-Mother Similarity and BDI	23	40
Self-Mother Similarity and Secure Adult Attachment (Collins & Read)	26	1
Self-Mother Similarity and Ambivalent Adult Attachment (Collins & Read)	0	11
Self-Mother Similarity and Avoidant Adult Attachment (Collins & Read)	12	2