CHAPTER 4

Feeling Without Thinking: Affective Primacy and the Nonconscious Processing of Emotion

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In 1980, as a freshman at the University of Michigan, I walked into an undergraduate honors class in psychology. During the very first meeting of the class, the professor did two things: First, he corrected the pronunciation of his name—noting that it was Zajonc, which rhymes with *science*. Second, he distributed a draft of a paper he was working on titled "Feeling and Thinking: Preferences Need No Inferences." In reading the manuscript, I became entranced. I distinctly remember thinking that this paper contained some of the most insightful and provocative ideas I had ever read.

The paper proposed that perhaps the simple emotional or affective qualities of stimuli, such as good/bad, are processed extremely quickly and efficiently without extensive perceptual and cognitive processing. It further argued that some sort of primitive positive/negative affective reaction may occur very early on in the information-processing chain, even prior to the sorts of cognitive operations such as categorization that are commonly assumed to be the basis of these affective reactions. In other words, affect may be primary.

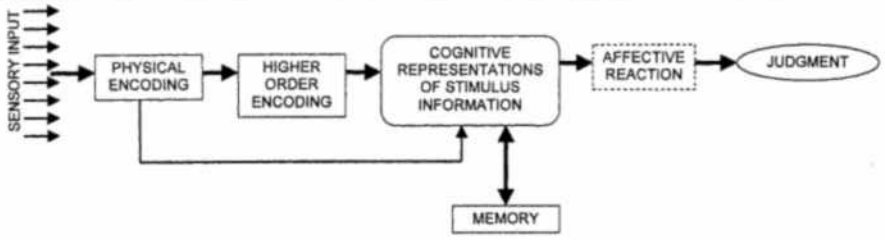
From a theoretical perspective, the notion of affective primacy was nothing short of heresy. The current consensus was clear: Affect was postcognitive, elicited only after considerable cognitive processing. Zajonc (1980) summarized this position as follows:

> An affective reaction, such as liking, disliking, preference, evaluation, or the experience of pleasure or displeasure, is based on a prior cognitive process in which a variety of content discriminations are made and features are identified, examined for their value, and weighted for their contributions. Once this analytic task has been completed, a computation of the components can generate an overall affective judgment. (p. 151)

As depicted in Figure 4.1, if affect was incorporated in information-processing models at all, it tended to be begrudgingly appended to the end of the process, almost as an afterthought.

FIGURE 4.1

Typical information-processing model of affect. Reprinted with permission from Zajonc, 1980.



In his "Feeling and Thinking" article, Zajonc contested this temporal order. He asserted that the notion that people go through life in a rational manner, objectively weighing the pros and cons of various alternatives prior to taking a position as suggested by extant information-processing models, might be little more than wishful thinking. Instead, he argued that the affective qualities of stimuli such as good/bad, like/dislike, or approach/avoid might be processed extremely quickly and efficiently and, consequently, could be among the very first reactions of an organism to its environment. But moving affect to the front of the information-processing chain as Zajonc was proposing drastically alters one's conception of human behavior. Within an affective primacy framework, individuals gather information about various alternatives, not to make more informed choices, but to corroborate their initial preferences and desires. For example, an individual seeks out favorable statistics on gas mileage and resale value to justify purchasing the very car he or she coveted in the first place. Thus, from an affective primacy perspective, man is not so much a rational being as a rationalizing one.

The notion of affective primacy struck me as true. But if true, there were at least two issues left unresolved. First, the evidence presented in "Feeling and Thinking" drew heavily on the mere-exposure phenomenon in which liking increases as a function of repeated exposures, even when stimuli are presented at exposures so brief that they cannot be consciously recognized (Moreland & Zajonc, 1979). But while suggestive, the mere-exposure effect does not directly test the notion that affective reactions enjoy a privileged position in the information-processing chain, perhaps preceding even rudimentary cognitive processes such as recognition and categorization. The second unresolved issue involved the precise mechanism that would allow for such an early affective reaction. In other words, what mechanism would permit an individual to affectively evaluate an object even prior to knowing what the object is? This question harkens back to the perceptual defense studies of the New Look in which participants seemed to take longer to recognize "dirty words" such as *Kotex*, *penis*, and so on (see Erdelyi, 1974, for a review). The theoretical

explanation offered for this slower response time was that some unspecified part of the brain was protecting participants from these potentially threatening words. Critics of perceptual defense pointed out that this was tantamount to proposing that humans have a homunculus or "little man" in their heads who, in essence, previews content and acts as an internal censor by attempting to shield them from perceiving anything sordid.

Over the past 18 years, Bob Zajonc and I have attempted to address the issues of whether affect is, indeed, primary in the information-processing chain and, if so, what mechanisms might make this possible. In the remainder of this chapter, I briefly sketch some of the ways Zajonc, I, and our collaborators have approached these questions. I have included some of the highlights of our endeavors and some of our less well-known unpublished efforts that may prove even more illuminating. My hope is that our 20-year search for evidence of affective primacy will provide a unique insight into how expansive and inventive a methodologist Robert Zajonc truly is for those who have never had the privilege of collaborating with him.

The Role of Nonverbal Channels in the Production and Transmission of Emotion

In "Feeling and Thinking," Zajonc (1980) proposed that the communication of affect relies heavily on nonverbal channels and that perhaps an affective reaction such as approach/avoid is

> not always transformed into semantic content but is instead often encoded in, for example, visceral or muscular symbols, we would expect information contained in feelings to be acquired, organized, categorized, represented, and retrieved somewhat differently than information having direct verbal referents. . . . In light of these intuitions, it is not unreasonable to speculate that the processing of affect is closer to the acquisition and retention of motor skills than of word lists. (p. 158)

Following this logic, Zajonc noted that the term typically used to describe a preference or opinion, namely *attitude*, had as its origin the literal "arrangement of the parts of a body or figure" (Webster's Ninth Collegiate Dictionary, 1983). Clearly, this was more than mere coincidence. We set out to determine if there was a correlation between the literal meaning of attitude, namely, the physical leaning toward or away from a stimulus, and its more figurative or psychological meaning. To do so, Zajonc had what, at first blush, appeared to be an ingenious idea. We would place bathroom scales under each of the four legs of a chair and monitor how individuals redistributed their weight when presented with various positive and negative stimuli. We would then correlate these physical movements with participants' self-reported attitudes.

The logistical flaw in our design did not become apparent until I had the apparatus assembled in the lab. Simply put, bathroom scales are designed to be read from above. This meant that the only way someone could simultaneously read

all four scales was to locate himself or herself physically underneath the chair. Unfortunately, when participants discovered me lying in wait beneath their chair they tended to sit abnormally still, thus defeating the purpose of the study. I attempted to salvage the study by making my presence under the chair covert by enshrouding the entire chair with a blanket. Unfortunately, this meant that I was crouched beneath a chair for up to 45 minutes at a time in pitch darkness trying to simultaneously read four bathroom scales with a flashlight. Needless to say, you will not find this study gracing the pages of the *Journal of Personality and Social Psychology*.

Convergence in the Physical Appearance of Spouses

Shortly thereafter, Zajonc decided to restrict his focus of attention from movement of the entire body to movement of the face. More specifically, he became fixated on the fact that the face seems to have a disproportionate number of muscles. He contended that these facial muscles must have evolved to serve some purpose, and went on to speculate that perhaps the function they serve is the production and transmission of emotion (Zajonc, 1985). One evening at a cocktail party, Robert Zajonc, Paula Niedenthal, Pam Adelmann, and I became embroiled in a discussion of the implications of this position. For instance, wouldn't two people who interact frequently tend to involuntarily mimic each other's expressions and consequently build and atrophy the same muscles? In other words, wouldn't couples who interact on a daily basis grow to look more alike over time?

To test whether or not couples do, in fact, increase in resemblance to one another over time, we gathered photographs of married couples from roughly the same age cohort who had recently celebrated their 25th wedding anniversary. We asked each couple to provide individual photographs of themselves from the year prior to their wedding (Time 1) and current photos (Time 2), as well as answer some questions about their relationship. Participants were then presented with various arrays of photographs and were asked to rank order the probability that a given woman was married to each of six men and vice versa. Our participants were, in fact, better able to match spouses at Time 2 after 25 years of marriage, supporting the conjecture that couples may indeed grow to look more alike over time (Zajonc, Adelmann, Murphy, & Niedenthal, 1987).[1] It is interesting to note that couples

[1]Andy Warhol once observed that everyone at some point in their lives will have 15 minutes of fame. I often lie in bed at night and worry that I expended my 15 minutes on this study. After our findings became public, we were hounded by every major talk show and tabloid. My personal favorite was a summary of our findings in that bastion of fine journalism, *STAR* magazine, where our results were juxtaposed between "DOG DRIVES TRUCK" and "WOMAN GIVES SELF CESAREAN WITH CAN OPENER."

who spent more time together were not only more likely to resemble one another but also self-reported a higher level of marital satisfaction.

The Vascular Theory of Emotional Efference

I suspect that one reason that our finding that couples grow to look more alike over time was embraced by the popular press was that it confirmed something that many already believed to be true. Related research involving the Vascular Theory of Emotional Efference (VTEE) did not enjoy similar critical acclaim, I believe, in part because it actively contradicted the common wisdom. The VTEE reexamined William James's contention that emotional expression is not merely a passive signal but that facial movement—which we referred to as *emotional efference*—might be capable of both producing and proceeding subjective feeling. In short, while it is undoubtedly the case that we smile because we are happy, the VTEE proposed that it may also be possible that we are happy because we smile. By reversing the temporal order of the emotional sequence, the vascular theory provided a potential mechanism whereby affect or emotion could influence judgments with very little cognitive mediation.

This line of research was also inspired by a book Zajonc had unearthed written in 1907 by an obscure French physician named Israel Waynbaum. Waynbaum speculated that the reason that the face has more than its fair share of muscles is that facial gestures in general, and emotional expressions in particular, have regulatory and restorative functions for the vascular system of the head. Although some of Waynbaum's assumptions, which were based on conceptions of physiology at the turn of the century, were clearly in error, Zajonc maintained that at least one central tenet may still be true:

> Facial action may alter the temperature of blood entering the brain by interfering with or facilitating the cooling process. These changes, in turn, may have subjective consequences through the release and synthesis of various neurotransmitters. (Zajonc, Murphy, & McIntosh, 1993, p. 212)

But how might one go about testing the relationship of facial movement, blood flow, temperature, and emotional state? Previous researchers had brought individuals into their lab, asked them to smile, and then proceeded to interrogate them about their subjective state. Not only is such an approach rife with demand characteristics, in and of itself such data would not provide a direct test of the relationship between brain temperature and affective state.

Never one to be constrained by traditional methodologies or logistical considerations, Zajonc convinced the U.S. military to sell us a used thermographic camera. This thermographic camera could detect and record heat changes as small as a fraction of a degree from a considerable distance. All we had to do was lure participants into the lab, induce them to make facial movements consistent with emotional expres-

sions, and monitor changes in their facial temperature and mood. And this is precisely what we did. In one such study, under the guise of conducting a study in phonetics, individuals were instructed to repeat various vowel sounds—*ah*, *e*, *i*, *o*, *a*, *u*, and *ü*—20 times each at approximately 3-s intervals. We were particularly interested in the vowels *e*, which forces the face into an approximation of a smile; the sound *ah*, which mimics delight; and the vowels *u* and *ü*, which produce facial expressions similar to those seen in anger and disgust.

As can be noted in Figures 4.2a and 4.2b (reprinted from Zajonc, Murphy, & Inglehart, 1989), the vowel sounds *u* and *ü* were associated with a significant increase in forehead temperature as well as a significantly more negative subjective state as predicted by VTEE. Of course, one could argue that individuals were in a negative mood following the *ü* sound simply because it was relatively unfamiliar. To eliminate this alternative explanation, Zajonc, Marita Inglehart, and I subsequently replicated this finding using only native German speakers, for whom the *ü* sound was quite familiar.

Bolstered by these and similar results, Zajonc began to search for the precise mechanism whereby the blood flow to the brain is heated and cooled. He focused on a structure known as the cavernous sinus, which appears to act much like the radiator of a car by diffusing heat and thus keeping the brain relatively cool. Zajonc conjectured that if the cavernous sinus does, in fact, operate like a radiator to diffuse heat, it must do so, in part, by taking advantage of its proximity to the nasal cavity. In other words, breathing through the nose must help cool the brain. Such a mechanism would account for a range of phenomena, including why people feel so miserable when they have sinus congestion to why Lamaze and Yoga reduce pain.

All things being equal, then, people should prefer to breathe through their nose as opposed to their mouth. This line of reasoning gave rise to Project SNORT. Along with Steve Emerick from the University of Michigan Dental School, Zajonc devised an astronautlike apparatus that could be put over an individual's head and sealed to make it airtight. Air could then be pumped out of the helmetlike chamber, and one could calibrate precisely how much effort the participant expended struggling for oxygen through a small tube that had been placed in their nostril.[2] Our findings were conclusive: Individuals found not breathing in general and not breathing through the nasal passages in particular to be aversive. This provided further support for the role of the cavernous sinus in the regulation of emotion.

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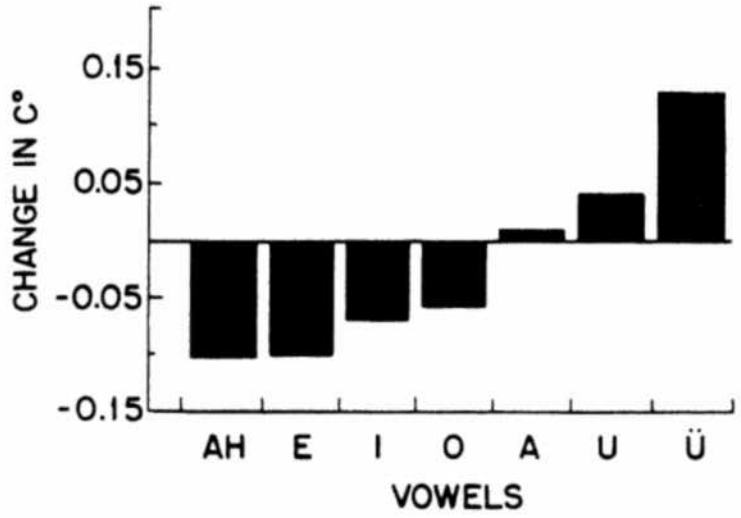
[2]As you may well imagine, we had difficulty recruiting individuals to participate in this study. Steve Emerick, who was actually running participants for us at the Dental School, soon determined that I was an "almost 100% nasal breather," which means I rarely, if ever, breathe through my mouth and, moreover, that I had exceptional lung capacity, making me a perfect candidate for SNORT. During the course of the next several months, I voluntarily allowed myself to be systematically suffocated a total of 23 times in the name of science.

FIGURE 4.2

(a) Changes in forehead temperature (in Celsius) for vowel phonemes. (b) Pleasantness ratings (from 1 = bad to 7 = good) of vowel phonemes. From "Feeling and Facial Efference: Implications of the Vascular Theory of Emotion," by R. B. Zajonc, S. T. Murphy, and M. Inglehart, 1989, Psychological Review, 96, p. 406. Copyright 1989 by the American Psychological Association. Reprinted with permission.

(a)



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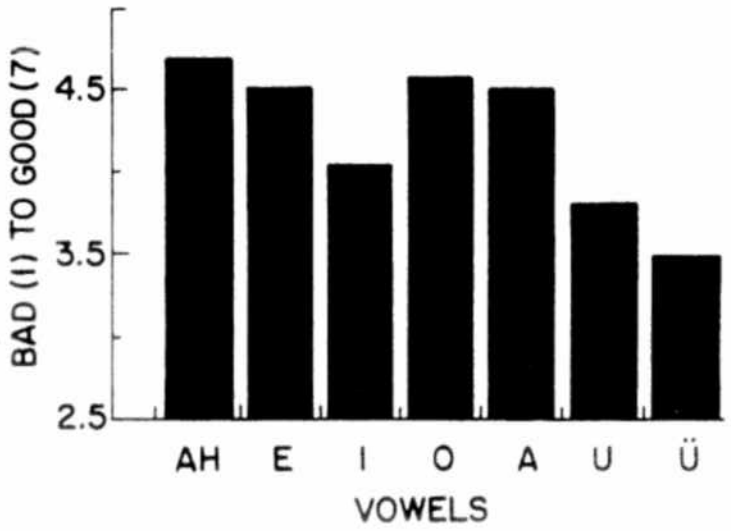

Priming and the Primacy of Affect

In the late 1980s, I began to collect data for my dissertation (part of which was later published as Murphy & Zajonc, 1993), which, in essence, attempted to gather more direct evidence for the affective primacy hypothesis. To test the notion that simple positive and negative emotional reactions can occur even without such basic cognitive processes as conscious identification, I conducted a study in which participants evaluated neutral stimuli (Chinese ideographs) that were preceded by 4-ms suboptimal exposures to positive or negative affective primes: smiling or angry faces. I selected smiling and angry faces as affective primes because I wanted primes that did not necessitate cognitive or semantic processing, as may have been the case with emotionally charged words like those used in the original perceptual defense studies of the New Look.

The cover story for a series of five experiments was that we were interested in snap judgments of novel stimuli. Participants were told that they would be presented with an assortment of Chinese characters which they were to rate on a scale from 1 to 5, on some dimension where 1 = *not at all* and 5 = *quite a bit*. They were then shown slides of 45 target ideographs. Within this series of 45 ideographs, 10 of the target ideographs in each study were shown twice, preceded by opposing primes. For instance, in Study 1, the 10 key Chinese ideographs appeared once primed with positive affect (in other words, preceded by a slide of an individual smiling) and once primed with negative affect (a slide of the same individual scowling). Because participants were unfamiliar with the ideographs, they were unaware that 10 of the 45, in fact, repeated. In each of five studies, ratings of these 10 repeating ideographs served as the dependent measure.

As is evident in Table 4.1, affective primes presented outside of conscious awareness had a significant influence on perceptions of the 10 repeating ideographs.

TABLE 4.1

Summary of Suboptimal Priming Conditions in Murphy and Zajonc (1993).

STUDY	SUBOPTIMAL PRIME	JUDGMENT OF TARGET IDEOGRAPH	STATISTICAL SIGNIFICANCE
1	Smiling and angry faces	Liking of ideographs	Yes
2	Smiling and angry faces	Is object represented by ideograph good or bad	Yes
3	Symmetrical and asymmetrical shapes	Symmetry of ideograph	No
4	Big and small shapes	Size of object represented	No
5	Male and female faces	Masculinity/femininity of object represented	No

For instance, in Study 1, the same target stimuli were rated significantly higher in likability when preceded by positive suboptimal primes (smiling faces) than when preceded by negative suboptimal primes (angry faces of the same individuals). Study 2 replicated this procedure of presenting affective suboptimal primes at 4-ms durations immediately prior to the target ideographs but now asked participants whether they thought the ideographs represented something good or bad. Once again, these affective primes presented outside of conscious awareness produced a significant shift in good/bad judgments of the target ideographs.

While the findings of these first two studies confirmed the expectation that emotional stimuli of which we are unaware can color our judgments, they leave unanswered the question of whether nonconscious affect is unique in its ability to sway subsequent judgments. After all, it may be the case that *any* relevant prime, regardless of whether it is emotional in nature or not, is more potent when presented suboptimally. On the other hand, if, as Zajonc's Primacy of Affect Hypothesis suggests, affective information is processed faster and more efficiently than other types of information, then we would expect very weak or nonexistent effects at the suboptimal level for simple affectively bland primes.

To test whether nonconscious affect was indeed unique in its ability to sway subsequent judgments, I conducted a series of replications using a variety of priming stimuli and judgments. For example, in Study 3, which again ostensibly dealt with judgments of novel stimuli, participants were presented with symmetrical and asymmetrical shapes as primes and were asked to rate the symmetry of the actual target ideographs. Participants in Study 4 were asked to rate the same 45 ideographs with respect to the size of the object each represented, where a 1 implied that a particular ideograph represented a relatively small object and a 5 implied that the ideograph represented a relatively large object. (The ideographs themselves were all roughly equal in size.) And finally, to eliminate the possibility that faces represent some sort of unique, socially significant stimuli to which our emotional reactions are "hard-wired" (Ekman, 1972), Study 5 used male and female faces as primes but asked participants whether each target ideograph represented a masculine object or a feminine object.

In summary, affective priming, using positive and negative facial expressions as primes, produced effects under very brief suboptimal exposures, whereas primes varying on such dimensions as size, symmetry, and gender did not. Affective information, therefore, at least within the constraints of this series of experiments, seemed to be processed earlier than equally simple information that was not affective in nature. These data, then, corroborated Zajonc's contention that emotional reactions can occur with minimal stimulation and they can therefore precede and alter subsequent cognitions.

Neurological Evidence for the Primacy of Affect

But how is it that we are somehow able to assess the emotional significance of stimuli presented at exposures so brief that they are not available to conscious

awareness? How can individuals like or dislike something even before knowing what it is? It is on precisely these points that the physiological literature may be the most illuminating. Until fairly recently, the common wisdom has been that after registering stimuli, the sensory apparatus sends signals to the thalamus which, in turn, relays them to the sensory areas of the neocortex for integration and the analysis of meaning. This view is consistent with a strict cognitive appraisal view such as that espoused by Lazarus (1982, 1984) and others which would require all emotional reactions to be mediated by neocortical activity.

On the basis of Zajonc's concept of affective primacy, however, LeDoux and his colleagues have located a direct pathway between the thalamus and the amygdala that is just one synapse long (LeDoux, 1994, 1995). This direct access from the thalamus to the amygdala allows the amygdala to respond faster to a stimulus event than the hippocampus, which is separated from the thalamus by several synapses. According to LeDoux, the amygdala can respond to a stimulus as much as 40 ms faster. If LeDoux is correct, this neuroanatomical architecture would then allow for an affective evaluation even prior to conscious awareness. Thus, although the question is far from resolved, there is at least one plausible neurological account of how affective reactions can be rapidly initiated on the basis of crude stimulus properties prior to and perhaps independent of more complex stimulus appraisals.

The Additivity of Nonconscious Affect

In 1990, I accepted an assistant professor position at the Annenberg School for Communication at the University of Southern California (USC). This did not, however, mark the end of my collaboration with Zajonc. For the past several years, he and I have had the distinct pleasure of working with Jennifer Monahan, who was my graduate student at USC and is currently an assistant professor at the University of Georgia. Our first joint collaboration was published in 1995 (Murphy, Monahan, & Zajonc, 1995) and addressed the issue of whether affect generated from a source of which one is unaware may be distinct from affect whose source is known.

To examine this issue, we ran four parallel studies in which participants were first shown a series of 72 Chinese ideographs. Of these 72, 24 were filler ideographs, each of which was shown only once and was not included in the subsequent priming/evaluation phase. For the remaining 48 exposures, we attempted to generate differential levels of liking among the ideographs by varying frequency of presentation. More specifically, 12 key ideographs were presented only once, whereas 12 others appeared three times.

Following this initial exposure phase, participants were asked to indicate how much they liked and whether they recognized each of 48 ideographs—24 of which were completely novel (zero exposure), 12 of which they had been exposed to once previously (single exposure), and 12 others which had been presented three times previously (multiple exposure). During this subsequent evaluation phase, the ideo-

graphs were preceded by a positive affective prime (a smiling face), a negative affective prime (an angry face), or no prime. Each of the four studies, therefore, included an initial exposure phase followed by an priming/evaluation phase. The four studies differed, however, in that the exposure duration in both the initial mere-exposure phase and the subsequent priming/evaluation phase was orthogonally varied such that both were either at optimal 1-s exposures, both were at suboptimal 4-ms exposures, or one was presented at an optimal exposure duration whereas the other was presented suboptimally.

Our results suggest that when two sources of affect are unavailable to conscious awareness, the affect generated from one source (repeated exposures) may be able to combine with nonconscious affect generated from a second unrelated source (suboptimal priming of smiling and angry faces). Indeed, positive suboptimal priming roughly added a constant, whereas negative suboptimal priming subtracted a constant from the positive affect induced through repeated exposures. It is interesting that this effect occurred regardless of whether the ideographs in the initial exposure phase were presented suboptimally for 4 ms or optimally for 1 s. Table 4.2 summarizes the change in liking scores on a 5-point scale from a baseline control (no previous exposures, no affective primes) for those ideographs preceded by three prior repetitions and a positive affective prime as a function of the exposure duration.

As evident in Table 4.2, whereas affective priming only produced effects suboptimally, the growth in preference associated with repeated exposures proceeded regardless of the stimulus duration in the initial exposure phase. This finding highlights the inadequacy of relying solely on exposure duration as an indicator of subjective awareness. During debriefing, participants in the optimal priming conditions reported being suspicious of the smiling and angry faces presented immediately prior to the ideographs they were asked to judge. In contrast, under conditions involving optimally repeated exposures, participants—although aware of the repetition as revealed in their elevated recognition rate—did not attribute any sinister

TABLE 4.2

Increase in Liking Ratings Following Three Prior Exposures and Positive Affective Prime as a Function of Exposure Duration.

Exposure duration of positive affective prime during subsequent evaluation phase	EXPOSURE DURATION OF IDEOGRAPH IN INITIAL EXPOSURE PHASE	
	SUBOPTIMAL (4 MS)	OPTIMAL (1 S)
Suboptimal	0.94_b	1.09_b
Optimal	0.39_a	0.31_a

Note. Table entries that share the same letter subscript are not significantly different from one another.

intent to the repetition. In fact, when requested during debriefing to speculate as to what impact multiple repetitions may have had on their ratings, the majority of respondents predicted that repetition would lead to boredom and decreased liking.[3] We concluded that it was this lack of awareness regarding the actual source of the affect, namely, that repeated exposures results in increased liking, that allowed the affect generated to remain diffuse. In contrast, when a source of affect is obvious and readily available to conscious awareness—as was clearly the case with the optimally presented smiling and angry facial primes—it becomes dedicated and, consequently, is no longer able to merge with affect from other unrelated sources.[4]

The Mere-Exposure Effect: Dedicated or Diffuse?

But these 1995 results contain an intriguing paradox. There have been more than 200 empirical demonstrations of the mere-exposure phenomenon whereby as long as one starts out feeling at least neutral toward an object, repeated exposures tend to increase liking for that specific object (for reviews, see Bornstein, 1989; Harrison, 1977). Typically, these studies take the following form: There is an initial exposure phase in which an individual is presented with an array of stimuli, some of which are shown only once whereas others are included multiple times. This initial exposure phase is followed by an evaluation phase during which individuals are exposed to a range of stimuli including both "old" or previously presented stimuli and "new" or novel stimuli and are asked both how much they like each item and whether they recognize it from the initial exposure phase. The classic result is that the greater the number of repetitions in the initial exposure phase the more participants report liking a particular stimuli. For example, an item that was shown 25 times is typically favored over one that is shown 5 times, which, in turn, is preferred to a completely novel item. Recognition, in contrast, is generally unrelated to liking. The finding that liking increases as a function of prior exposure has been shown to hold regardless of whether the stimuli are presented at levels above or below conscious awareness (Moreland & Zajonc, 1979).

In Murphy et al. (1995), we stated that nonconscious affect whose source is unknown is diffuse and able to spill over or attach itself to even unrelated stimuli. Furthermore, we present data demonstrating that by and large people are unaware of the relationship between repeated exposure and liking. Which brings us to the paradox: Is the affect generated by repeated exposures outside of conscious awareness

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[3]A study by Snell, Gibbs, and Varey (1995) likewise demonstrated that people do not believe that repeated exposure alone could increase liking.

[4]This is somewhat analogous to Schwarz and Clore's (1983) finding that the weather has a profound effect on all manner of seemingly unconnected judgments until its influence is pointed out, at which point individuals are able to discount its impact.

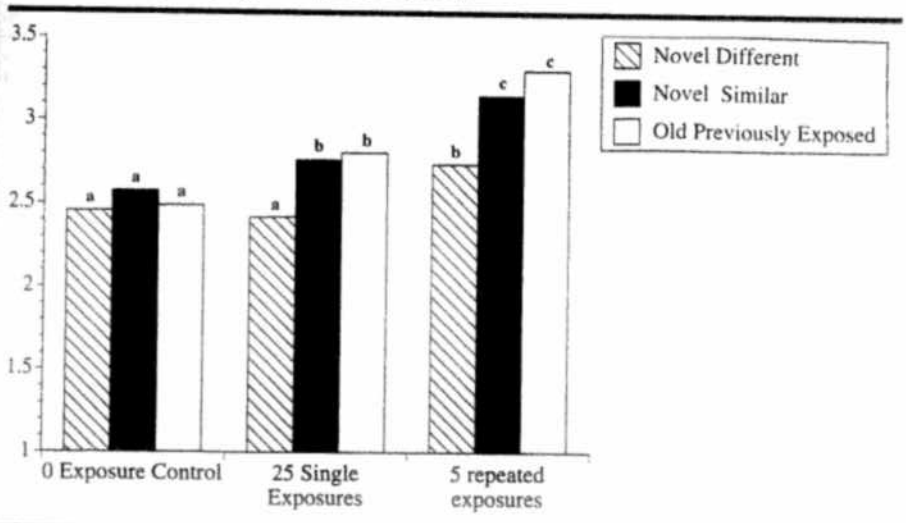
dedicated to the specific stimuli involved, or is it nonconscious and therefore diffuse and capable of coloring other unrelated objects and events?

To answer this question, we recently ran a study in which participants were randomly assigned to one of three initial exposure conditions: They were presented suboptimally for 4 ms with five repetitions of 5 stimuli (i.e., Chinese ideographs or random polygons), they were suboptimally presented with 25 different stimuli, or they were assigned to a no-exposure control condition. Following this initial suboptimal exposure phase, they were asked to indicate how much they liked each of 15 stimuli on a scale ranging from 1 to 5, where 1 = *not at all* and 5 = *quite a bit*. There were three distinct types of stimuli included in this evaluation phase: 5 "old" or previously shown stimuli, 5 new but structurally similar stimuli ("novel similar"), and 5 stimuli that were both new and structurally dissimilar to those presented in the initial exposure phase ("novel different").

If one looks within each exposure condition in Figure 4.3, one can readily see that these results are consistent with those of prior studies in that there is a direct relation between number of prior exposures and preference. This suggests that the mere-exposure effect is due, at least in part, to affect that is dedicated to the specific generating stimuli. But looking across the exposure conditions reveals a second, somewhat unexpected, trend. Although prior repeated exposure does, in fact, increase liking of the *specific* "old" stimuli presented, repeated exposures also appears to increase ratings of novel stimuli as well.

FIGURE 4.3

Liking ratings as a function of number of prior exposures and stimulus type (Monahan, Murphy, & Zajonc, in press).



One could argue that this is simply an "anchoring artifact" whereby higher ratings of "old" stimuli produce an overall inflation of liking ratings across stimuli. However, although such an explanation might account for the higher ratings across all stimuli shown, it does not explain why participants in the multiple exposure condition (who were presented with five repetitions of five stimuli) also reported themselves to be in a significantly better mood on multiple measures than their counterparts in the other two exposure conditions (25 single exposures and the zero exposure control).

Thus, it appears that repetition of even seemingly innocuous stimuli such as Chinese ideographs and random polygons may be sufficient to temporarily enhance an individual's affective state. This elevation in mood might, in turn, influence subsequent evaluations of both the specific stimuli that elicited the positive affect as well as other stimuli in the immediate environment. Such a process would predict that previously presented or "old" stimuli should receive the greatest boost in ratings, similar but novel stimuli the second highest boost, and novel and dissimilar objects the least. This is precisely the pattern we found. While we are still exploring the implications of these findings, it seems quite possible that repeated exposures may generate positive affect that is in part dedicated to the specific stimuli and partly diffuse and thus able to "spill over" and influence a range of judgments including one's own subjective state.

Conclusion

It is rare that one can point to a single article or even a single theory as having a profound impact on the direction of a field. But one need only contrast the frequency with which the words *affect* and *emotion* appear in the psychological literature in the years preceding and following 1980 to underscore how Zajonc's notion that perhaps the simple emotional or affective qualities of stimuli, such as good/bad, are processed extremely quickly and efficiently without extensive perceptual and cognitive processing has indelibly altered models of information processing. Affect is no longer an unwanted appendage but is now understood to play an early and integral part in how individuals interact in their world.

In closing, I would like to provide one final piece of evidence for Zajonc's theory of affective primacy. In preparing this chapter, I recently reread his "Feeling and Thinking" article. I remain more convinced than ever that this work contains some of the most insightful and provocative ideas I have ever read.

References

Bornstein, R. F. (1989). Exposure and affect: Overview and meta-analysis of research, 1968–1987. *Psychological Bulletin, 106*, 265–289.

Ekman, P. (1972). Universals and cultural differences in the facial expression of emotion. In J. Cole (Ed.), *Nebraska symposium of motivation, 1971* (Vol. 19, pp. 207–283). Lincoln: University of Nebraska Press.

Erdelyi, M. H. (1974). A new look at the New Look: Perceptual defense and vigilance. *Psychological Review, 81*, 1–25.

Harrison, A. A. (1977). Mere exposure. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 10, pp. 39–83). San Diego, CA: Academic Press.

Lazarus, R. S. (1982). Thoughts on the relationship between emotion and cognition. *American Psychologist, 37*, 1019–1024.

Lazarus, R. S. (1984). On the primacy of cognition. *American Psychologist, 37*, 124–129.

LeDoux, J. E. (1994). Emotion, memory and the brain. *Scientific American, 270*(6), 50–57.

LeDoux, J. E. (1995). Emotion: Clues from the brain. *Annual Review of Psychology, 46*, 209–235.

Monahan, J. L., Murphy, S. T., & Zajonc, R. B. (In press). Mere exposure: Specific, general and diffuse effects. *Psychological Science*.

Moreland, R. L., & Zajonc, R. B. (1979). Exposure effects may not depend on stimulus recognition. *Journal of Personality and Social Psychology, 37*, 1085–1089.

Murphy, S. T., Monahan, J., & Zajonc, R. B. (1995). Additivity of nonconscious affect: The combined effects of priming and exposure. *Journal of Personality and Social Psychology, 69*, 589–602.

Murphy, S. T., & Zajonc, R. B. (1993). Affect, cognition, and awareness: Affective priming with suboptimal and optimal stimulus. *Journal of Personality and Social Psychology, 64*, 723–739.

Schwarz, N., & Clore, G. L. (1983). Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. *Journal of Personality and Social Psychology, 45*, 513–523.

Snell, A., Gibbs, B. J., & Varey, C. (1995). Intuitive hedonics: Consumer beliefs about the dynamics of liking. *Journal of Consumer Psychology, 4*, 33–60.

Waynbaum, I. (1907). La physionomie humaine: Son mechanisme et son role social. [The human face: Its mechanism and social function]. Paris: Alcon.

Webster's Ninth New Collegiate Dictionary. (1983). Springfield, MA: Merriam-Webster.

Zajonc, R. B. (1980). Feeling and thinking: Preferences need no inferences. *American Psychologist, 35*, 151–175.

Zajonc, R. B. (1985). Emotion and facial efference: A theory reclaimed. *Science, 228*, 15–21.

Zajonc, R. B., Adelmann, P. K., Murphy, S. T., & Niedenthal, P. M. (1987). Convergence in the physical appearance of spouses. *Motivation and Emotion, 11*, 335–346.

Zajonc, R. B., Murphy, S. T., & Inglehart, M. (1989). Feelings and facial efference: Implications of the vascular theory of emotion. *Psychological Review, 96*, 395–416.

Zajonc, R. B., Murphy, S. T., & McIntosh, D. N. (1993). Brain temperature and subjective emotional experience. In M. Lewis & J. M. Haviland (Eds.), *The handbook of emotions* (pp. 209–220). New York: Guilford Press.