Research Article

A PSYCHOPHYSIOLOGICAL EXAMINATION OF COGNITIVE PROCESSING OF AND AFFECTIVE RESPONSES TO SOCIAL EXPECTANCY VIOLATIONS

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Abstract—*Several models of person perception predict that expectancy violations have both affective and cognitive consequences for the perceiver. Although extant evidence generally supports these claims, the temporal resolution of traditional self-report measures has limited researchers' ability to convincingly link underlying physiological processes with observed outcomes. In this study, we examined these issues by measuring brain (event-related brain potentials) and peripheral (facial electromyogram) electrophysiological activity while participants read positive and negative expectancy-consistent, expectancy-violating, expectancy-irrelevant, and semantically incongruent behavioral sentences about fictitious characters. The electromyogram results indicated that negative (but not positive) expectancy-violating behaviors elicited enhanced negative affect as early as 100 to 300 ms poststimulus. The event-related potentials showed enhanced positivities with latency exceeding 300 ms in response to expectancy violations and negative behaviors. Semantically incongruent sentence endings influenced a separate negative component (N400), suggesting fundamental differences between semantic- and behavior-consistency processing. This difference also was evident in participants' recall. Implications for theoretical models of expectancy violation are discussed.*

Expectations about other people's behavior (i.e., expectancies) are a cornerstone of person perception (e.g., Jones, 1990). Utilizing expectancies in forming impressions is both efficient and adaptive. Expectancies encourage an individual to avoid others who seem threatening and approach those who appear trustworthy. Therefore, the basic cognitive and affective processes that underlie person perception should be sensitive to expectancy-relevant information (e.g., see Olson, Roese, & Zanna, 1996).

Several theoretical models predict that expectancies determine both cognitive processing of and affective responses to observed behavior (e.g., Bettencourt, 1998; Kernahan, Bartholow, & Bettencourt, 2000; Jones, 1990; Olson et al., 1996), and extant research generally supports these predictions. For example, when members of social groups (e.g., ethnic groups) behave in ways that violate rather than confirm common stereotypes, perceivers tend to experience greater affective arousal (Bettencourt, Eubanks, & Ernst, 1999) and render more extreme affect-related evaluations of those group members (e.g., Bettencourt, Dill, Greathouse, Charlton, & Mulholland, 1997; Jackson, Sullivan, & Hodge, 1993; Jussim, Coleman, & Lerch, 1987; Kernahan et al., 2000). Furthermore, some theoretical models (Mandler, 1990; Olson et al., 1996) predict that expectancy violations always elicit an initially negative affective response, regardless of the valence of the violation, because unpredictability and uncertainty are unpleasant. In contrast, a model proposed by Bettencourt (e.g., 1998; Bettencourt et al., 1997) predicts that the initial affective response depends on the valence of the violation. Physiological evidence bearing on these predicted effects, however, is scarce.

In addition to generating affect, unexpected information receives more cognitive processing than expected information (e.g., Bargh & Thein, 1985; Hastie, 1984; Stern, Marrs, Millar, & Cole, 1984; see also Hamilton & Sherman, 1996). For example, behavior that is inconsistent with person impressions (i.e., target-based expectancies; Jones, 1990) or stereotypes often is recalled better than consistent behavior (Stangor & McMillan, 1992), and expectancy-violating behavior triggers more effortful causal explanations than expectancy-consistent behavior (e.g., Hamilton, 1988; Hastie, 1984; Jackson et al., 1993; Pyszczynski & Greenberg, 1981). However, here, too, physiological evidence of these processing differences is limited.

PSYCHOPHYSIOLOGICAL MEASURES OF COGNITIVE PROCESSING AND AFFECTIVE REACTIONS

Limitations in the temporal specificity of traditional self-report measures have not allowed researchers to address whether processing differences related to expectancy violation occur at the initial categorization stage or at some later outcome stage. In addition, such measures are not well suited for assessing perceivers' immediate affective reactions to expectancy violation. Recently, issues related to the engagement and time course of cognitive and affective processes in social perception have been examined using psychophysiological measures such as event-related potentials (ERPs) and facial electromyogram (EMG).

ERPs in Social Perception

ERPs are aspects of the electrical activity of the brain occurring in response to discrete events and are regarded as manifestations of information processing activities (see Fabiani, Gratton, & Coles, 2000). In general, ERP components are thought to reflect information processing transactions, and changes in the amplitude of ERP components correspond to variations in the extent to which these transactions are engaged (see Rugg & Coles, 1995).

Previous research suggests a relationship between ERP amplitude and the processing of anomalous social information. Cacioppo and his colleagues (e.g., Cacioppo, Crites, Berntson, & Coles, 1993; Cacioppo, Crites, & Gardner, 1996) showed that evaluative inconsistency between a primed category and a stimulus word (e.g., a positive attitude word in the context of negative words) elicits a large late positive ERP component approximately 300 to 600 ms poststimulus. In addition, Osterhout, Bersick, and McLaughlin (1997) found that sentences with pronouns implying violations of gender stereotypes (e.g., "The

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doctor prepared *herself* for the operation") elicited a larger positive potential than sentences with stereotype-consistent pronouns. Both of these lines of work demonstrate that inconsistency between a primed social category and a target stimulus affects ERP amplitudes. However, these studies do not directly address information processing in person perception (nor were they intended to do so), and they do not address the differential influence of expectancy and valence on this kind of processing.

Research in person perception generally indicates that negative information has a greater impact on the perceiver than positive information (see Peeters & Czapinski, 1990), and some recent ERP evidence shows that negative stimuli elicit more information processing than positive stimuli. Ito, Larsen, Smith, and Cacioppo (1998) found larger-amplitude late positive ERPs during evaluative categorization of negative photographs than during categorization of positive photographs, despite the fact that both classes of stimuli were equally probable and evaluatively extreme. Moreover, these effects occurred within a few hundred milliseconds following stimulus presentation. Nevertheless, it is unclear whether the perception of specific behaviors evokes similar responses in the ERP.

Affect and Facial EMG Activity

It is well known that movement in the *corrugator supercilii* muscle (brow) is associated with negative affect (frowning), whereas movement in the *zygomaticus major* muscle (cheek) is associated with positive affect (smiling; e.g., Buck, Savin, Miller, & Caul, 1972; Ekman, Friesen, & Ancoli, 1980; Tassinary & Cacioppo, 1992). Recent evidence indicates that facial EMG effects may begin as early as the first 100 to 300 ms following stimulation (Dimberg, Thunberg, & Elmehed, 2000).

Despite a theoretical claim linking expectancy violation and affect in person perception, and despite the utility of facial EMG for detecting affective responses, relatively little work has been done in this area. Only two previous studies have used facial EMG to examine affect in a person-perception paradigm. First, Vanman, Paul, Ito, and Miller (1997) found patterns of facial EMG activity indicating negative affect among white students who viewed photographs and written descriptions of blacks. However, stereotype violations were not manipulated in this study. Second, Bettencourt et al. (1999) measured facial EMG while participants formed impressions of members of stereotyped groups. As predicted, *corrugator* activity was elevated when positively stereotyped group members were depicted negatively, but *zygomatic* activity increased when negatively stereotyped group members were depicted positively. Although both of these studies demonstrate the utility of facial EMG in measuring affect in person perception, neither one related EMG to other indicators of information processing such as ERPs, and neither specified a time course for EMG effects.

OVERVIEW AND HYPOTHESES

The present study was designed to examine physiological indicators of information processing activities and affective responses associated with target-based expectancy violations and behavior valence in person perception at the initial processing stage. ERPs and facial EMG were measured while participants read descriptions of positive and negative behaviors that violated, were consistent with, or were irrelevant to previously established expectancies. Prior research suggested four main hypotheses. First, we predicted that expectancy violations would elicit larger-amplitude ERPs than expectancy confirmations. Second, we predicted that negative behaviors would elicit larger ERPs than positive behaviors. Previous research (e.g., Cacioppo et al., 1993; Ito et al., 1998; Osterhout et al., 1997) suggested that these effects would appear in the late positive components of the ERP. Third, we expected that negative behaviors would elicit EMG activity in the *corrugator* muscle, whereas positive behaviors would elicit *zygomaticus* activation. However, it was unclear whether expectancy violations would consistently elevate *corrugator* activity (as posited by Olson et al., 1996) or whether EMG activity would depend on the valence of violating behavior (as posited by Bettencourt, 1998). Finally, in order to facilitate comparison of our results with previous findings (e.g., Stangor & McMillan, 1992), we included a recall measure of target information. Our prediction for recall was consistent with the ERP predictions and previous research: We expected recall to be better for expectancy violations and negative behaviors than for expectancy confirmations and positive behaviors.

In addition, a large body of literature indicates that sentences containing semantically incongruent words (e.g., "I like my coffee with cream and *dog*") influence a negative ERP component peaking approximately 400 ms poststimulus (N400; e.g., Kutas, 1997; Kutas & Hillyard, 1980). The N400 is thought to relate to the relative ease with which meaning can be integrated into a context, especially in sentence processing. To date, the literature on the N400 and work on social expectancy violations have developed largely independently, so the relationship between social and semantic violations is unclear (but see Osterhout et al., 1997). To address this issue, we included some sentences ending in semantically incongruent words, and hypothesized that these words would produce a large N400 in the ERP waveform.

METHOD[1]

Participants

Sixteen right-handed, healthy university students (7 men; age range: 18–32) signed informed consent and participated in exchange for credit toward a course requirement or $18. Data from 1 male participant were not usable because of a high proportion of artifacts. Thus, the final sample included 15 participants.

Stimuli

Establishing expectancies

Participants read 20 randomly ordered paragraphs, each describing an individual target person and displayed via computer for 30 s. Each paragraph described the target's general behavior in such a way as to lead to a strong trait inference (e.g., "always opens the door for strangers"). Ten of the target individuals were described with positive traits and 10 with negative traits. All descriptions were pretested ($N = 28$) to ensure that they conveyed the intended trait inferences.

1. A fuller description of the stimuli and methods used in this study may be obtained from the authors.

Presenting specific target behaviors

Individual target behaviors were described via sentences (all six words in length) presented one word at a time in the center of the computer monitor. Words were presented at a rate of 1 every 350 ms and were displayed for 300 ms (see Osterhout et al., 1997). For each target person, four types of sentences were presented. The final word of each sentence determined whether it described an expectancy-consistent behavior, an expectancy-violating behavior, or an expectancy-irrelevant behavior, or whether the sentence was semantically incongruent. Twelve sentences (trials) were presented for each target. Of these, the first four were filler trials, and always ended with an expectancy-consistent behavior. The remaining eight trials consisted of two each of expectancy-consistent, expectancy-violating, expectancy-irrelevant, and semantically incongruent sentences; the order of these sentences was randomized within each block of trials.

Electrophysiological Recording

The electroencephalogram (EEG) was recorded from 20 standard scalp locations (10-20 system). Vertical and horizontal electro-oculogram (EOG) was recorded bipolarly, and ocular artifacts were corrected off-line (Gratton, Coles, & Donchin, 1983). EMG was recorded bipolarly with electrodes placed above the respective muscle regions (see Fridlund & Cacioppo, 1986). The EEG, EOG, and EMG were recorded continuously for the duration of each sentence with a digitizing rate of 100 Hz. The last 100 ms prior to the presentation of the final word in each sentence served as a prestimulus baseline. The recording continued for 1,150 ms after the presentation of the last (critical) word in each sentence. A 0.01- to 30-Hz bandpass was used for the EEG and EOG recording, and a 10- to 100-Hz bandpass was used for the EMG recording. EMG data were rectified and low-pass filtered at 12 Hz off-line.

Procedure

Participants were seated in a small, sound-attenuated room in front of a computer monitor, and were informed that they would be reading paragraphs describing individuals, and were to form impressions of them; following each paragraph, sentences depicting the individual's behavior would be presented one word at a time. The participants were told that they should read each sentence silently, keeping their initial impression in mind while doing so, and they would be given a recall test at the end of the experiment.

Following the final trial block, participants were given a sentence-completion task that consisted of a random presentation of each of the 240 sentences used in the study, each missing the final word. Participants were asked to complete each sentence according to the way it had appeared earlier (no time limit was imposed).

RESULTS

Psychophysiological Data

Analytic strategy

Examination of all effects was limited to the last word of each sentence and was separated into four time intervals (100–300, 300–450, 450–650, and 650–1,150 ms poststimulus) to allow for analysis of the time course of cognitive activity. Analyses of the effects of expectancy and behavior valence were carried out on mean ERP amplitudes (relative to the prestimulus baseline) in response to expectancy-relevant (consistent and violating) behaviors using a 2 (consistent behavior, violation) $\times$ 2 (positive behavior, negative behavior) $\times$ 19 (electrode site) analysis of variance (ANOVA). Effects of semantic incongruity were examined by analyzing the ERPs elicited by expectancy-irrelevant (semantically congruent and semantically incongruent) behaviors using a similar 2 (semantically congruent, semantically incongruent) $\times$ 2 (positive target person, negative target person) $\times$ 19 (electrode site) ANOVA. *Corrugator* EMG activity was examined using a 2 (consistent behavior, violation) $\times$ 2 (positive behavior, negative behavior) ANOVA.[2] Because of substantial overlap between the EMG response and vertical EOG (i.e., eye blinks) in later intervals, EMG analysis was limited to the 100- to 300-ms interval. EMG data are expressed as amplitudes relative to baseline activity. *F* values for all main analyses are presented in Table 1.

Effects of expectancy violation in the ERP

Expectancy-violating behaviors elicited somewhat larger ERP positivity (M = 1.23 μV) than expectancy-consistent behaviors (M = 0.02 μV) during the 300- to 450-ms interval. The difference between expectancy-violating and expectancy-consistent behaviors was significant between 450 and 650 ms (*M*s = 1.73 and 0.26 μV, respectively), but was not reliable in the 650- to 1,150-ms interval, indicating a rapid time course for the effects of expectancy violation. Note that expectancy violation did not increase the amplitude of the N400 component. Figure 1 presents ERP waveforms measured at the Pz scalp location. The top panel of this figure shows that expectancy violations (dark line) generally elicited larger positive ERPs than expectancy-consistent behaviors (light line). The time course of this effect also can be seen in this panel, which shows that differences in positivity due to expectancy violation began to emerge approximately 300 to 400 ms poststimulus, peaked at around 500 to 600 ms poststimulus, and were no longer apparent by 800 ms.

Effects of behavior valence in the ERP

Negative behaviors generated larger ERP positivity than positive behaviors during the 450- to 650-ms interval (*M*s = 1.45 μV and 0.54 μV, respectively) and during the 650- to 1,150-ms interval (*M*s = 2.31 and 0.98 μV, respectively).[3] The difference waveforms presented in the middle panel of Figure 1 show the time course and magnitude of the behavior-valence effect at the Pz scalp location. Note that although the expectancy-violation and behavior-valence effects have different time courses, all of these waveforms (i.e., for expectancy-consistent

2. Analyses of *zygomaticus major* EMG activity are not included in this report. Inspection of the waveforms obtained from this electrode location suggested a recording problem with these data, in that no responses were evident in any of the time intervals we examined (i.e., mean amplitudes for all conditions were approximately zero).

3. Ancillary analyses revealed a Consistency $\times$ Valence $\times$ Scalp Location interaction in both the 300- to 450-ms and the 450- to 650-ms intervals. Negative expectancy-violating behaviors elicited larger amplitudes than positive expectancy-violating behaviors at frontal sites, $F(1, 14) = 6.93$, $p < .01$, but not at posterior sites, $F(1, 14) = 0.85$, n.s. In contrast, positive expectancy-violating behaviors elicited larger amplitudes than negative expectancy-violating behaviors at posterior sites, $F(1, 14) = 5.23$ $p < .05$, but not at frontal sites, $F(1, 14) = 1.56$, n.s. Because this effect was not predicted and is not theoretically relevant to the current report, we do not discuss it further.

Table 1. F *values (and significance levels) for expectancy, valence, and semantic-congruence effects*

Effect	Poststimulus time window: 100–300 ms	300–450 ms	450–650 ms	650–1,150 ms
Event-related potentials				
Consistency	1.84	3.72*	4.75**	2.92
Valence	2.01	2.72	5.93**	27.77**
Consistency × Valence	0.51	0.04	0.09	0.16
Semantic congruence	0.05	9.09**	0.05	1.20
Corrugator electromyograms				
Consistency	13.12**	—	—	—
Valence	5.77**	—	—	—
Consistency × Valence	13.55**	—	—	—

Note. For all F tests, numerator $df = 1$, denominator $df = 14$. The electromyogram data were not analyzed in the intervals between 300 and 1,150 ms.
*$p = .07$. **$p < .05$.

and expectancy-violating behaviors and for positive and negative behaviors) showed a positive deflection between 300 and 800 ms, indicating that all expectancy-relevant behaviors were processed in a similar manner, regardless of the specific type of information they conveyed.

Effects of semantic incongruity in the ERP

The observed effects of semantic incongruity in the ERP were consistent with previous research findings (see Kutas, 1997). Analyses restricted to midline sites (Fz, Cz, and Pz) showed that semantically incongruent sentence endings elicited larger N400 effects ($M = -4.17$ μV) than semantically congruent sentence endings ($M = -1.47$ μV) during the 300- to 450-ms interval. The bottom panel of Figure 1 illustrates this effect. Note that semantic violations did not influence P300 amplitude. However, a later positivity (approximately 800–1,000 ms poststimulus) following semantic violations is evident, and is likely attributable to the relatively low frequency of these trials (see Kutas, 1997).

Effects of consistency and valence on corrugator *EMG activity*

Waveforms depicting *corrugator* (and vertical EOG) activity during the 100- to 300-ms interval are displayed in Figure 2. Analysis of *corrugator* activity showed that negative behaviors elicited more activity ($M = 1.58$ μV) than positive behaviors ($M = -0.62$ μV). In addition, expectancy-violating behaviors elicited greater activation of the *corrugator* ($M = 1.07$ μV) than expectancy-consistent behaviors ($M = -0.10$ μV). These main effects were qualified by a Consistency × Valence interaction: Negative expectancy-violating behavior elicited greater *corrugator* activity than negative expectancy-consistent behavior, $F(1, 14) = 15.25$, $p < .001$, whereas positive behavior elicited similar *corrugator* activation in the two expectancy conditions ($F = 1.43$, n.s.). Note that the onset of vertical EOG (eye blink) activity did not occur until after 400 ms in this study, and therefore the current EMG findings are not likely attributable to eye blinks (see Fig. 2).

Recall Data

Prior to analyses, responses to the sentence-completion task were coded for accuracy. Sentences completed with the correct word or a synonym were coded as accurate. A separate proportion was calculated for each condition. Figure 3 displays the mean proportion of words recalled as a function of sentence type.

Recall of expectancy-relevant behaviors was examined using a 2 (consistent behavior, violation) × 2 (positive behavior, negative behavior) ANOVA. This analysis showed that expectancy-violating behaviors were recalled better ($M = .37$) than expectancy-consistent behaviors ($M = .27$), $F(1, 14) = 8.90$, $p < .01$. Negative behaviors ($M = .34$) were recalled slightly better than positive behaviors ($M = .30$), although this trend was not reliable ($F < 1$). Also, the interaction involving consistency and valence was not significant ($F < 1$; see Fig. 3).

Recall proportions for expectancy-irrelevant behaviors were analyzed using a similar 2 (semantically congruent, semantically incongruent) × 2 (positive target, negative target) ANOVA. Semantically congruent words were recalled much better ($M = .13$) than semantically incongruent words ($M = .005$), $F(1, 14) = 64.02$, $p < .001$, a finding consistent with previous work showing a recall advantage for semantically congruent words (Besson, Kutas, & Van Petten, 1992; Neville, Kutas, Chesney, & Schmidt, 1986).

It is noteworthy that expectancy-relevant behaviors, regardless of specific experimental conditions, were recalled much better than all types of expectancy-irrelevant behaviors (see Fig. 3), a finding consistent with previous research showing a recall advantage for expectancy-relevant information (e.g., Higgins & Bargh, 1987; Stangor & McMillan, 1992). We can extend this reasoning to include predictions about valence: Negative expectancy violations should be recalled best, then positive expectancy violations, negative expectancy confirmations, positive expectancy confirmations, negative expectancy-irrele-

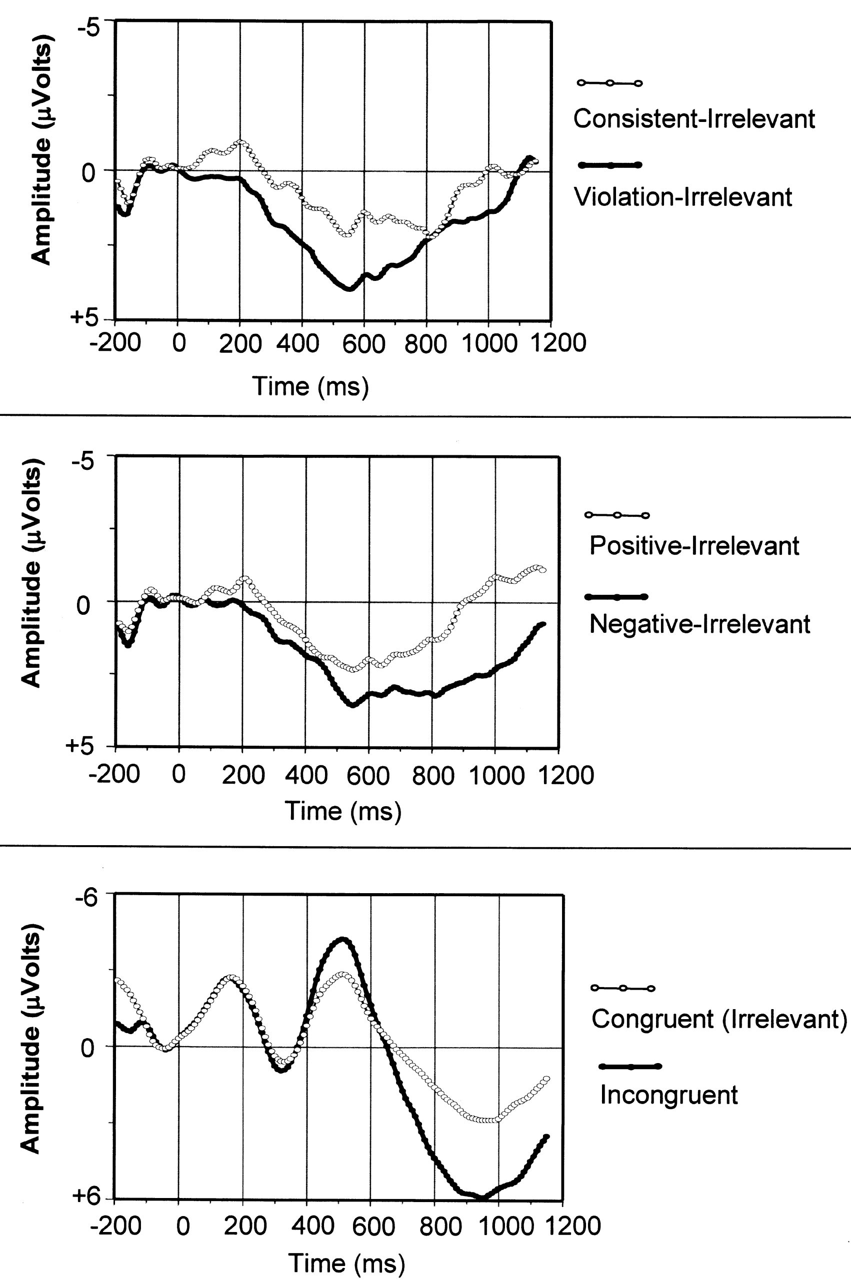

Fig. 1. Effects of expectancy violation (top panel), behavior valence (middle panel), and semantic incongruity (bottom panel) on grand-average event-related potential (ERP) waveforms at the Pz (midline parietal) electrode site. Difference waveforms are shown to highlight the differential effects of expectancy and valence; amplitudes elicited by expectancy-irrelevant behaviors were subtracted from amplitudes elicited by expectancy-violating and expectancy-consistent behaviors (top panel) and from amplitudes elicited by positive and negative behaviors (middle panel).

vant behaviors, and finally positive expectancy-irrelevant behaviors. An additional 2 (relevant, irrelevant) × 2 (consistent behavior, violation) × 2 (positive, negative) ANOVA revealed that this linear trend was significant, $F(1, 14) = 43.18$, $p < .001$. No other trends were significant (Fs < 1). The significant linear trend in our recall data is consistent with the findings from ERPs and EMGs, which showed that expectancy-violating and negative information elicits more processing, and that irrelevant information is processed differently than relevant information.

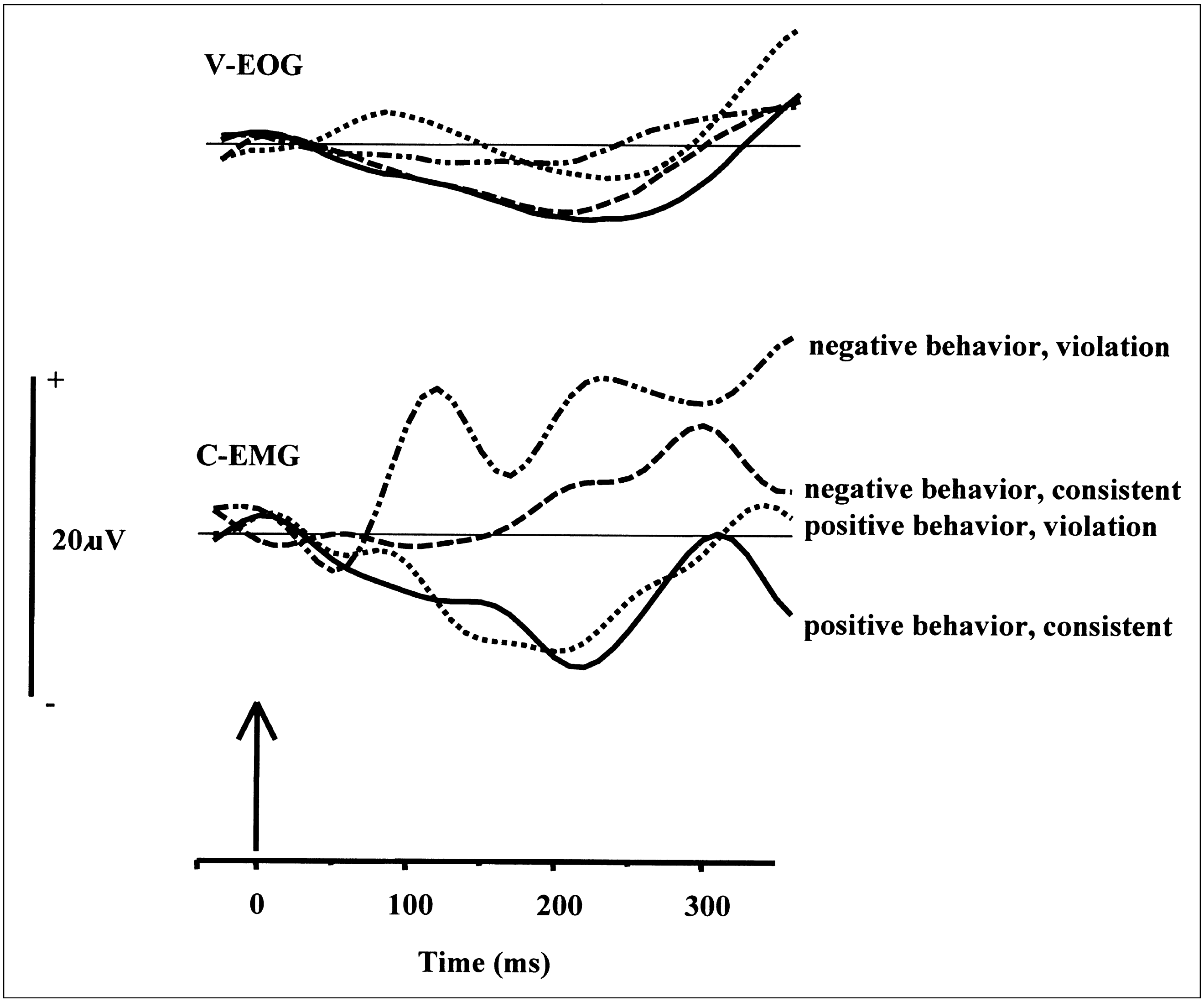

Fig. 2. Waveforms depicting *corrugator* electromyogram (C-EMG) activity and vertical electro-oculogram (V-EOG) activity 100 to 300 ms poststimulus as a function of expectancy and valence factors. Waveforms are expressed relative to baseline activity.

DISCUSSION

The primary goals of this study were to examine the effects of social expectancy violation and behavior valence on psychophysiological and self-report indices of cognitive processing and affective responses. Also, we were interested in comparing social and semantic violations. Several findings related to these goals emerged from our analyses. *Corrugator* EMG activity indicated a very rapid affective response that differentiated not only between positive and negative behaviors but also between expectancy-consistent and expectancy-violating behaviors. Our results are consistent with those of Bettencourt et al. (1999), who found EMG differentiation of valence and expectancy information in person perception. However, a time course for the effect was not shown in that study. Other recent evidence (Dimberg et al., 2000) indicated generalized *corrugator* activation in response to valenced photographs within 100 to 200 ms poststimulus, but no differentiation between positive and negative stimuli. The fact that negative but not positive expectancy violations activated the *corrugator* in the present study (see Fig. 2) is largely inconsistent with the position that all expectancy violations elicit initial negative affect (e.g., Olson et al., 1996). On the contrary, and consistent with Bettencourt's (e.g., 1998) model of expectancy violation, our data indicate that valence is an important determinant of affective responses to expectancy violation (see also Kernahan et al., 2000). The rapid time course of expectancy-violation effects in the EMG supports previous work indicating that social perceivers may automatically evaluate other people and their behavior (e.g., Bargh, 1996).

The current findings also suggest that social information processing is different at initial stages depending on whether or not information is relevant to expectancies. Expectancy-relevant behaviors (both consistent and violating) elicited positivity in the ERP, whereas expectancy-irrelevant behaviors elicited negativity. Recall also was better for expectancy-relevant than for expectancy-irrelevant information. Similar distinctions have been made in previous research based on recall data (e.g., Higgins & Bargh, 1987; Srull & Wyer, 1989; Stangor &

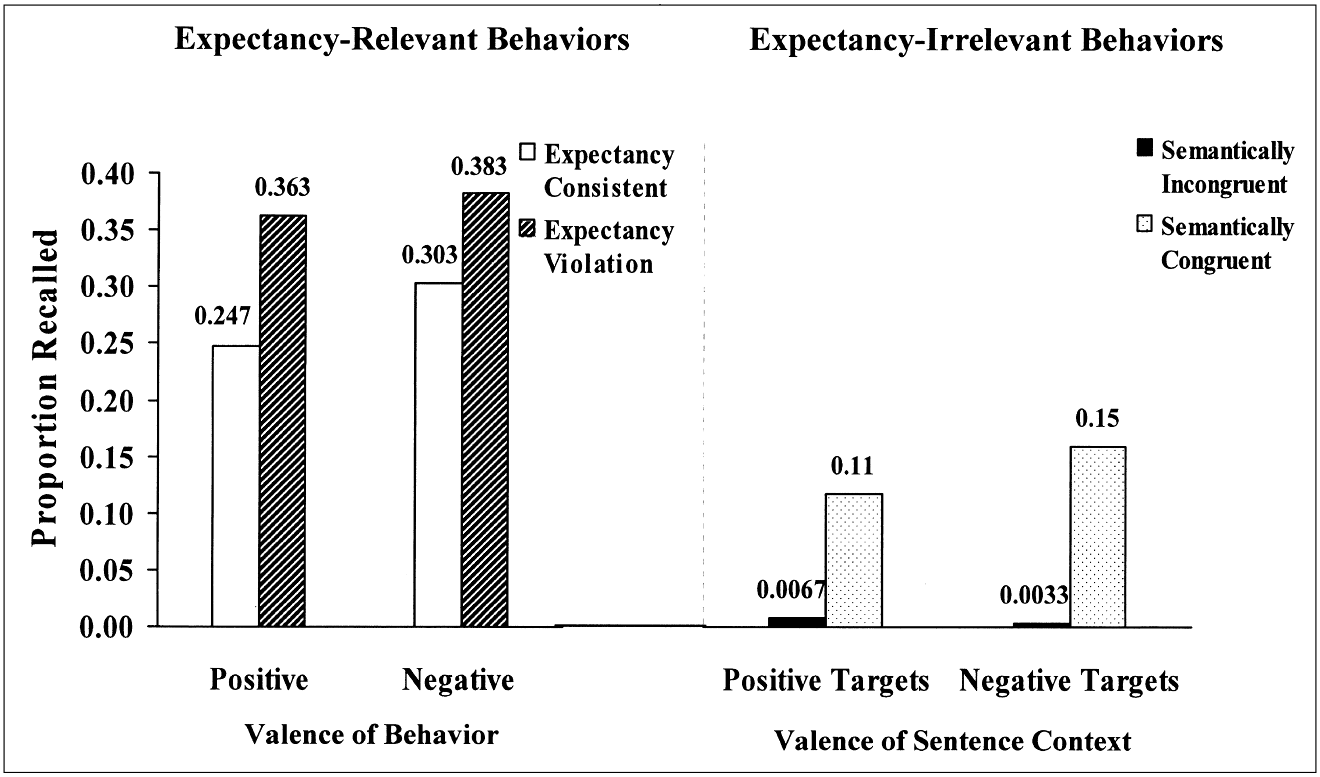

Fig. 3. Proportion of expectancy-relevant and -irrelevant behaviors correctly recalled as a function of expectancy, valence, and semantic-congruence factors.

McMillan, 1992), but such work has not clearly addressed ways in which underlying neural activation differs. The current findings suggest that the recall advantage for expectancy-relevant information may stem from fundamental differences in early engagement of information processing mechanisms, and that processing marked by initial positivity in the ERP is likely to involve elaboration, explanation, or other operations that result in the transfer of information to long-term memory (Fabiani, Karis, & Donchin, 1990). In contrast, processing marked by initial N400 components does not appear to result in the transfer of information into long-term memory, as evidenced by the poor recall of expectancy-irrelevant behavior.

This early processing distinction may help explain the functional significance of positivity in the ERP in person perception. Previous research indicates a relationship between the amplitude of late positivity in the ERP (i.e., P300) and recall (see Fabiani et al., 2000). Donchin and his colleagues (e.g., Donchin, 1981; Donchin & Coles, 1988) posited that the P300 marks a context-updating process by which models of the environment are updated in working memory. Models of person memory (e.g., Srull & Wyer, 1989) indicate that encountering expectancy-inconsistent information leads to elaboration via comparison of the information with currently activated templates or “person concepts.” Hence, the P300 in person perception may reflect the brain’s utilization of salient cues signaling the need to change or update templates related to ongoing interactions or future behavior with other individuals. In contrast, semantic incongruities that produce N400 effects do not implicate any change in strategy for dealing with the social environment, in that they are irrelevant to currently activated expectancies and person-perception goals.

Behavior valence also influenced ERP amplitude and latency. Late positive ERPs were larger on average following negative behaviors than positive behaviors. This finding may be best understood in the context of behavioral adaptive theory (e.g., Peeters & Czapinski, 1990) and other motivational theories (e.g., Cacioppo, Gardner, & Berntson, 1997, 1999) positing that the effects of negative valence result from a heightened sensitivity to negative outcomes of attending to stimuli. Our results are similar to those of Ito et al. (1998), who found that negative valence had an effect at the initial categorization stage for valenced photographs. Several theorists (e.g., Schwarz, 1990; Taylor, 1991) have suggested that negative experiences signal a need to take action, whereas positive experiences may not. If P300 amplitude reflects the brain’s attempt to update current models of the environment (Donchin & Coles, 1988), potentially threatening people or situations that signal a need to prepare for action (i.e., fight or flight; Cannon, 1932) should evoke more cognitive elaboration (and elicit larger ERPs) than less threatening people or situations.

An advantage of the current paradigm is the possibility of directly comparing how the unexpectedness of behavior and its valence may differentially influence the initial stages of processing. In general terms, our ERP data indicate that the effects of expectancy violation occur earlier and are shorter in duration than the effects of valence (see Fig. 1). Latency differences in ERP positivity are thought to relate to stimulus evaluation time, with longer latencies indicating more effortful evaluation (Coles, 1989; Fabiani et al., 2000; Kutas, McCarthy, & Donchin, 1977). Hence, the ERP data seem to suggest that the expectancy-violating implications of behavior are processed somewhat more quickly or easily than implications related to valence. However, caution is needed in interpreting this finding given that the expectancy-violation effect did not achieve the conventional level of significance in the 300- to 450-ms window (see Table 1), and given that expectancy and valence both had significant effects on EMG amplitude during the 100- to 300-ms window (see Fig. 2).

The current findings have implications for models of expectancy violation (e.g., Bettencourt et al., 1999; Olson et al., 1996) and person perception more generally. Specifically, our data are consistent with the position that expectancy and valence effects interact in determining cognitive processing and affective responses in person perception (e.g., Bettencourt, 1998; Bettencourt et al., 1999), but are largely inconsistent with models positing that positive and negative violations have an equivalent influence on processing (e.g., Hamilton, Driscoll, & Worth, 1989; Srull & Wyer, 1989) and affective responses (Olson et al., 1996). Our findings also suggest the need to consider more specific models of information processing that can account for differences related to expectancy violation and valence at the initial processing stage as well as later stages, as measured by self-reported evaluations and recall. Finally, future models should attempt to incorporate initial processing differences between expectancy-relevant and -irrelevant information and how the two types of information may differentially influence approach and avoidance tendencies.

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