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Journal of Experimental Social Psychology 40 (2004) 225–232
Journal of Experimental Social Psychology
www.elsevier.com/locate/jesp

Implicit regulatory focus associated with asymmetrical frontal cortical activity☆

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Received 20 February 2003; revised 10 June 2003

Abstract

Regulatory focus theory identifies two separate motivational systems, promotion and prevention, that fulfill different regulatory needs and are differentially related to approach and avoidance. In the psychophysiological literature, approach- and avoidance-related emotions and motivational orientations have been linked to asymmetries in frontal cortical activity. In an effort to synthesize these literatures, we examined the relationship between an implicit assessment of chronic regulatory focus and an electroencephalographic (EEG) index of resting frontal cortical asymmetry. Results supported the hypothesis that promotion regulatory focus would be associated with greater left frontal activity, and prevention regulatory focus would be associated with greater right frontal activity. Discussion highlights how this synthesis may benefit theorizing of the relationship between regulatory focus, motivation, and emotion, and of the function of asymmetrical frontal cortical activity.

Introduction

Psychologists have long recognized that goals play a vital role in both mobilizing and organizing behavior toward the fulfillment of needs and desires (Gollwitzer, 1990; Kuhl, 1994). Indeed, the empirical literature has demonstrated that individuals who adopt specific goals are more likely to achieve desired personal outcomes than those who do not (Bargh & Gollwitzer, 1994; Gollwitzer & Schaal, 2001). Although goals provide an impetus for fulfilling needs and desires, early theorizing suggests that the strategy one adopts in pursuing a goal may vary in its association with approach- versus avoidance-related behaviors (Atkinson, 1957; Murray, 1938). Whereas some goals may be associated with *approaching* a desired outcome, others may be associated with *avoiding* an undesired outcome. The centrality of approach and avoidance to goal processes has been echoed and elaborated on in contemporary theorizing (e.g., Elliot, 1999; Higgins, 1997), and research has supported the idea that individuals possess trait-like dispositions, referred to as regulatory foci, for employing approach or avoidance behavioral strategies in goal pursuit (Shah, Higgins, & Friedman, 1998).

The roles of approach and avoidance in guiding behavior have received much attention outside the goal literature, as well. Several theorists have identified the constructs of approach and avoidance as playing an integral role in basic forms of emotion and motivation in humans as well as many in non-human species (e.g., Gray, 1982; Lang, Bradley, & Cuthbert, 1990). Research on humans has demonstrated that individual differences in approach- versus avoidance-related emotions are associated with asymmetries in frontal cortical activity, as

☆ The research presented in this paper was funded in part by a grant from NSF (BCS-9910702) awarded to E.H.-J., and grants from NIMH (MH63280-02) and the University of Wisconsin–Madison Graduate School Research Committee for J.S. Portions of this research were presented at the 2002 meeting for the Society of Psychophysiological Research in Washington, DC. We gratefully acknowledge the technical and mechanical support provided by Dirk Wilker, Ziggy Bialzik, Andy Mulder, and Greg Kant. The physiological portion of this experiment was run using the DMDX software developed at Monash University and at the University of Arizona by K.I. Forster and J.C. Forster.

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0022-1031/$ - see front matter © 2003 Elsevier Inc. All rights reserved.
doi:10.1016/S0022-1031(03)00100-8

measured using electroencephalography (EEG; Harmon-Jones & Allen, 1997, 1998; Sutton & Davidson, 1997). However, little research has explored the social-cognitive correlates of frontal cortical asymmetry in the context of approach and avoidance orientations. Although the conceptual link between regulatory focus and frontal cortical asymmetry has been noted previously (e.g., Carver, 2001), this association has not yet been tested empirically. As such, the present study was designed to examine the relationship between individual differences in chronic regulatory focus and baseline asymmetry in frontal cortical activity.

Regulatory focus theory

Regulatory focus theory identifies two separate motivational systems that fulfill different regulatory needs and are differentially involved in approach and avoidance (Higgins, Shah, & Friedman, 1997; Shah et al., 1998). The *promotion* system is associated with approach motivation and involves a focus on ideal goals, such as a person's hopes and aspirations. Attainment of goals associated with a promotion focus leads to feelings of cheerfulness and joy, whereas failure leads to feelings of dejection and sadness. Importantly, promotion focus has been shown to predict approach-related behaviors, e.g., movement toward a desired state. The *prevention* system, alternatively, is associated with avoidance motivation and involves a focus on ought goals, such as a person's duties and responsibilities. The attainment of goals associated with prevention focus leads to feelings of quiescence and relaxation, whereas failure to attain such goals leads to feelings of agitation (e.g., nervousness). Prevention focus has been shown to predict avoidance-related behaviors, e.g., avoiding goal-inconsistent outcomes.

The theorized association between promotion and prevention foci and approach and avoidance, respectively, has received support in a growing empirical literature. For instance, Higgins, Roney, Crowe, and Hymes (1994) demonstrated that participants primed with a promotion focus recalled more life episodes that involved approaching a match to a desired endstate (e.g., supporting a friend), whereas individuals primed to adopt a prevention focus recalled more life episodes that involved avoiding a mismatch to a desired goal (e.g., avoid losing touch with a friend). Similarly, Shah et al. (1998) found that when pursuing a task goal of solving a series of anagrams, individuals with a promotion focus tended to dwell on trials in which success would bring them closer to the task goal, whereas individuals with a prevention focus tended to dwell on trials in which failure would set them back from goal attainment (see also Förster, Higgins, & Idson, 1998). Across studies, peoples' use of approach- or avoidance-related behavioral strategies in goal pursuit was predicted by their levels of promotion and prevention regulatory focus. These studies suggest that regulatory focus and approach/avoidance motivation function together to facilitate goal pursuit, such that promotion and prevention foci function to identify particular goals (e.g., ideal vs. ought goals), whereas approach/avoidance motivations serve to propel behavior in service of the goal (Förster et al., 1998). According to this reasoning, individual differences in promotion and prevention focus should be related to individual differences in the tendency to adopt an approach or avoidance motivational orientation.

Frontal EEG asymmetry and approach vs. avoidance

In the psychophysiological literature, approach and avoidance processes have been associated with asymmetrical activity of the frontal cortex, with approach being associated with greater left activity and avoidance being associated with greater right activity (see Coan & Allen, 2003, for a review).[1] For example, depression, theorized to represent a diminution of approach motivation, has been linked to lower levels of relative left frontal cortical activity (Henriques & Davidson, 1990). Other research has shown that trait anger, a negatively valenced but approach-oriented motivational predisposition, is associated with increased left frontal activity and decreased right frontal activity (Harmon-Jones & Allen, 1998). In addition, greater relative left frontal activity has been associated with increased approach-related positive affect and decreased avoidance-related negative affect (Tomarken, Davidson, Wheeler, & Doss, 1992) and with increased trait levels of behavioral activation (Harmon-Jones & Allen, 1997; Sutton & Davidson, 1997), as measured using Carver and White's (1994) behavioral activation scale. Furthermore, individual differences in baseline resting EEG asymmetry have been demonstrated to be stable (e.g., retest $r = .72$ for F8–F7, $r = .66$ for F4–F3, measured 3 weeks apart, Tomarken, Davidson, Wheeler, & Kinney, 1992), and to be observable from infancy (Davidson & Fox, 1989).

Research has also demonstrated asymmetrical frontal cortical activity to be related to state-like levels of approach and avoidance, in response to emotional inductions (e.g., Davidson, Ekman, Saron, Senulis, & Friesen, 1990; Harmon-Jones & Sigelman, 2001; Harmon-Jones, Sigelman, Bohlig, & Harmon-Jones, 2003). These findings have been corroborated by research using different

[1] Two models of asymmetrical frontal EEG have been proposed, with one positing an association with approach vs. avoidance motivation orientation (motivational direction model) and the other positing an association with positive vs. negative affect (the affective valence model). Although motivational direction and affective valence have been confounded in much research, recent critical tests of these models favor the motivational direction explanation (e.g., Harmon-Jones & Allen, 1998).

methods of inferring neural activity, such as positron emission tomography and neurological studies of prefrontal lesion patients (Pizzagalli, Shackman, & Davidson, 2003).

Overview and hypotheses

Research from the regulatory focus literature suggests that promotion and prevention focus are associated with approach and avoidance behavioral responses, respectively. Other research has linked approach and avoidance motivations, and their associated emotional responses, to asymmetrical frontal cortical activity. The present study was designed to examine the relationship between chronic levels of regulatory focus and resting frontal cortical activity, in an effort to link the social-cognitive and psychophysiological literatures on goals, motivation, and emotion. On the basis of past research, we expected promotion focus to be associated with greater left frontal cortical activity, and prevention focus to be associated with greater right frontal cortical activity. We used an implicit measure of regulatory focus because it was relatively resistant to response biases and social desirability concerns, such as the desire to report goal orientations that portray the self more positively. Moreover, we surmised that the use of an implicit measure of regulatory focus afforded greater correspondence with the conceptually implicit measure of resting cortical activity.

Method

Participants

Nineteen right-handed students (12 female, 7 male) from an introductory psychology class participated for extra course credit. As in past research, right-handed participants were selected to avoid physiological differences due to brain laterality (Davidson et al., 1990).

Procedure

Assessments of participants' regulatory focus strength and resting EEG were obtained in separate experimental sessions, scheduled within a single semester. At each session, participants provided informed consent, and, following the procedure, received a general debriefing regarding the measures.

Regulatory focus assessment

Our measure of regulatory strength was conceptually similar to the that used by Higgins et al. (1997), as it assessed the strength of participants' promotion and prevention regulatory styles (their ideal and ought strengths, respectively) using a reaction time task involving lexical decisions. In completing the task, participants were first asked to list four words representing ideals (attributes to which they aspire), and four words representing oughts (attributes they feel they ought to possess). In addition, participants were asked to list ideal and ought attributes for a firefighter, doctor, athlete, and teacher; these were used as filler items. Next, participants were told that a stimulus would appear in the middle of the screen and that they would have to determine, as quickly and accurately as possible, whether the stimulus formed a word. Participants categorized stimuli by pressing one of two keys, labeled "word" and "non-word." The task began with 10 practice trials, followed by eight blocks of 32 experimental trials, for a total of 256 trials. The eight ideal/ought words and eight filler words listed by participants were presented in random order within each block. An equal number of non-words (16) were included in each block. Response latencies to each trial were recorded in the computer.

Resting EEG assessment

Upon arrival to the EEG experimental session, each participant was given a brief explanation of the EEG recording procedure and was then prepared for physiological recording. Next, eight minutes of EEG were recorded while the participant sat in a comfortable chair, in a dimly lit, sound-attenuated room. Participants were asked to relax with their eyes closed or open in one of two alternating orders of 1-min intervals. Participants were asked to keep their head and body still during the recording. Instructions were given via intercom by the experimenter from an adjacent room containing the amplifiers and computers.

To record EEG, 27 (22 homologous and 5 midline) electrodes mounted in a stretch-lycra electrode cap (Electro-Cap, Eaton, OH) were placed on the participant's head using known anatomical landmarks. EEG was recorded from the frontal (F3, F4, F7, F8), central (C3, C4), temporal (T3, T4), parietal (P3, P4), and occipital (O1, O2) scalp regions, along the midline (Fz, Fcz, Cz, Pz, Oz), and from 10 additional sites, placed using the 10% electrode system (Chatrain, Lettich, & Nelson, 1985). The ground electrode was mounted in the cap on the mid-line between the frontal pole and the frontal site. The reference electrode was placed on the left ear (A1). Data were also acquired from an electrode placed on the right ear (A2) so that a digitally derived, averaged ears' reference could be computed offline.

Eye movements (EOG) were also recorded to facilitate artifact scoring of the EEG. EOG was recorded from the supra- and sub-orbit of the left eye, to assess vertical eye movements, and from the left and right outer canthi, to assess horizontal eye movements. All electrode impedances were under $5000\,\Omega$, and impedances at homologous sites (e.g., F3, F4) were within 1000 Ω of each other. Electro-Gel (Eaton, OH) was used as the conducting medium. EEG and EOG were amplified using Neuroscan Synamps (Herndon, VA), bandpass filtered (0.1–100 Hz; 60 Hz notch filter enabled), digitized at 500 Hz, and stored to computer. Prior to each session, the technical integrity of the recording system was evaluated by inspecting calibration signals (400 μV at 20 Hz) applied to the amplifiers.

Data reduction

Regulatory focus

Latencies for correct responses occurring between 300 and 3000 ms after target onset were selected for analysis and submitted to a natural log transformation to reduce skew (Fazio, 1990). The log-transformed latencies were then averaged within their respective ideal, ought, and filler conditions. To obtain independent indices of promotion and prevention, residualized scores were calculated (Higgins et al., 1997). Promotion scores consisted of the residual variance for ideal responses after the variance for "ought" responses had been removed using linear regression. Similarly, prevention scores consisted of the residual variance for "ought" responses after the variance for "ideal" responses had been removed. Hence, a lower residualized latency score reflected greater regulatory strength on measures of promotion and prevention (Higgins et al., 1997; Shah & Higgins, 2001).[2]

EEG

The EEG and EOG signals were visually scored, and portions of the data that contained eye or muscle movement, or other sources of artifact, were removed. The derived averaged-ears reference was used for further data reduction. All artifact-free epochs that were 2.048 s in duration were extracted through a Hamming window to prevent spurious estimates of spectral power. Contiguous epochs were overlapped by 75% to minimize loss of data due to Hamming window extraction, and power spectra were calculated via fast Fourier transform. These power values were averaged across the 2.048-s epochs within each 1-min resting trial. Because α power is inversely related to cortical activity (Lindsley & Wicke, 1974), total power within the α frequency range (8–13 Hz) was obtained for analysis. The power values at each site were submitted to a natural log transformation to normalize the distributions, and data were averaged across eyes-open and eyes-closed epochs.

To examine EEG at each scalp location, it was necessary to control for individual differences in skull thickness and volume conduction. Hence, indices of α power at each scalp site were obtained by statistically controlling for α power from each site's homologous channel and whole head α power (Wheeler, Davidson, & Tomarken, 1993). Indices of left and right activity were calculated for frontal, temporal, central, parietal, and occipital regions of the scalp.

Results

Correlations between measures of regulatory focus and cortical activity were examined to test our hypotheses. We predicted that stronger promotion focus would be associated with greater left frontal activity, whereas stronger prevention focus would be associated with greater right frontal activity. It was also predicted that regulatory focus would not be associated with activity at temporal, central, parietal, or occipital scalp sites.

Our hypotheses were supported by the pattern of correlations observed between measures of regulatory focus and cortical activity (see Table 1).[3] As predicted, promotion focus was positively correlated with left frontal activity, $r = .51$, $p < .03$, and negatively correlated with right frontal activity, $r = -.46$, $p < .05$, indicating that greater promotion focus was associated with increased left and decreased right frontal activity.

[2] Shah and Brazy (2002) have found evidence for the internal consistency, construct validity, and temporal reliability of this measure. To examine the internal consistency of the measure, a factor analysis was conducted on participants' transformed reaction time averages for each of the participants' four ideal attributes and four ought attributes. Thus, eight separate reaction time averages were included in this analysis, which revealed only two factors with eigenvalues above 1.00. Participants' four ought attributes loaded most highly on the first factor (loadings > .60), whereas participants' four ideal attributes loaded most highly on the second factor (loadings > .60). Combined, these two factors accounted for 74.9% of the variance. Analyses designed to asses the construct validity of the regulatory focus measure revealed that participants' promotion strength (as measured by the average reaction time to own ideals) predicted their dejection-related responses to ideal self-discrepancies. Alternatively, participants' prevention focus strength predicted their agitation-related responses to ought self-discrepancies. The test–retest reliability of the reaction time measure has also been demonstrated ($r = .47$, $p < .002$, for promotion; $r = .52$, $p < .001$, for prevention). Regression analyses revealed that these correlations remained significant even when controlling for participants' "other" regulatory focus strength (at both time 1 and time 2), as well as participants' average reaction times to control items at both times.

[3] An additional set of analyses were conducted to test the simultaneous effect of promotion and prevention focus, and of their interaction, on each index of cortical activity. In these regressions, log-transformed reaction time indices for promotion and prevention were standardized, and entered in the first step of the model. The product of these standardized indices was entered in a second step to test for the interaction. This set of analyses replicated the pattern of results obtained using the residualized promotion and prevention scores, and no interactions were obtained.

Table 1
Pearson correlations between indices of regulatory focus strength and cortical activity

Scalp site	Regulatory focus index	
	Promotion	Prevention
Frontal		
Left	.51*	−.60**
Right	−.46*	.52*
Central		
Left	−.40	.13
Right	.44	−.30
Temporal		
Left	.16	−.31
Right	−.05	.17
Parietal		
Left	−.03	.11
Right	.10	−.15
Occipital		
Left	−.12	.20
Right	.03	−.07

Note. Promotion and prevention scores are represented by response latencies, such that lower scores reflect greater strength. Cortical activity is assessed via alpha, which is inversely related to cortical activity, and thus lower scores reflect greater cortical activity. $*p < .05$, $**p < .01$. All tests were two-tailed.

In contrast, prevention focus with positively correlated with right frontal activity, $r = .52$, $p < .03$, and negatively correlated with left frontal activity, $r = -.60$, $p < .005$, indicating that greater prevention focus was associated with increased right and decreased left frontal activity. Neither promotion nor prevention focus was significantly correlated with activity at temporal, central, parietal, or occipital scalp sites. Furthermore, response latencies on filler trials were not significantly correlated with any indices of cortical activity.[4]

Discussion

Our results supported the hypothesized relationship between chronic levels of implicit regulatory focus and asymmetries in resting frontal cortical activity. Specifically, promotion focus was associated with greater left frontal activity, and prevention focus was associated with greater right frontal activity.[5] Consistent with past research on the relationship between cortical activity and approach and avoidance, regulatory focus was not significantly correlated with activity in other cortical regions. These findings represent an initial effort to synthesize two literatures concerned with the regulation of behavior as organized by approach and avoidance. In the following sections, we highlight some implications for theory and future research as suggested by the synthesis of the regulatory focus and frontal cortical asymmetry literatures.

Regulatory focus and approach vs. avoidance

Our finding that frontal cortical asymmetry was related to regulatory focus is consistent with previous research and theorizing suggesting that promotion and prevention focus are associated with behavioral inclinations toward approach and avoidance, respectively (Carver, 2001; Shah et al., 1998). Although our findings demonstrate the relation between regulatory focus and motivational orientation, past evidence suggests that these processes do not simply represent the same construct (e.g., Förster et al., 1998). Rather, regulatory focus theory distinguishes approach and avoidance processes at the strategic (or *means*) level from approach and avoidance processes at the more abstract goal level. Although promotion and prevention foci may both involve the approach of desired endstates (i.e., ideals and oughts), they may nevertheless differentially invoke approach and avoidance behaviors or strategies for reaching the goal. Consistent with this reasoning, Förster et al. (1998) observed that both ideals and oughts "loom larger" as one moves closer to attaining them, suggesting that both types of goals are represented as positive endstates. The manner in which these goals "loom larger," however, was found to be distinguished at the behavioral level in terms of approach and avoidance. For example, when pursuing an ideal goal with a promotion focus, participants increased approach behavior as they moved closer to goal attainment. In contrast, when pursuing an ought goal with a prevention

[4] To examine the association of frontal cortical *asymmetry* with regulatory focus, an asymmetry score was computed by subtracting the average α obtained at F3 and F7 from the average α obtained at F4 and F8. Because α is inversely correlated with cortical activity, higher asymmetry scores indicate greater left-sided cortical activity. Here, higher asymmetry scores were associated with greater promotion focus (i.e., shorter *ideal* latencies), $r(17) = -.45$, $p = .05$, and with lower prevention focus, $r(17) = .52$, $p < .03$, replicating the pattern of results obtained using independent indices of left and right frontal cortical activity.

[5] It is noteworthy that, although greater promotion was associated with increased left frontal activity, it was also associated with decreased right activity. Similarly, prevention focus was associated with both increased right and decreased left frontal activity. These findings are consistent with a model of dynamic interaction between frontal cortices in the context of regulatory focus (Fox, 1994), which suggests that lateralized frontal cortical activity associated with emotion may have a regulatory effect (e.g., inhibitory) on activity in the contralateral cortex. Indeed, indices of left and right frontal EEG were negatively correlated in the present sample, $r(17) = -.69$, $p = .001$, supporting the hypothesis for dynamic interaction in resting levels of cortical activity. Although this finding is suggestive, additional research is needed to address the process of dynamic interaction in resting cortical activity more specifically.

focus, participants increased avoidance behavior as they moved closer to goal attainment. The work of Förster et al. (1998) suggests that regulatory focus and motivational orientation (i.e., approach vs. avoidance) pertain to separate, interacting processes, such that regulatory focus serves to identify goals differentially associated with ideals and oughts, whereas approach and avoidance tendencies influence the means by which a goal is pursued. Although the intent of the present work was to demonstrate a relationship between chronic levels of regulatory focus and motivational orientation, future research will be needed to test the hypothesis that chronic levels of regulatory focus interact with trait-like motivational dispositions of approach and avoidance to predict goal pursuit strategies and goal outcomes.

The hypothesis that approach and avoidance states pertain primarily to strategies of goal pursuit suggests that the association between regulatory focus and approach/avoidance orientation pertains primarily to pre-goal states, during which efforts are mobilized in pursuit of a goal. Indeed, our measure of regulatory focus consisted of responses to ideal and ought goals that participants were currently pursuing. Therefore, our findings may be characterized as demonstrating a relationship between baseline approach/avoidance tendencies and chronic regulatory focus in the context of goal pursuit (i.e., pre-goal processes). In contrast, post-goal attainment states would not be expected to relate as strongly to specific motivational tendencies because mechanisms of goal pursuit are not needed once a goal has been attained. Similarly, this analysis suggests that asymmetrical frontal EEG activity should be more strongly associated with emotions related to pre-goal states compared with post-goal states.

Regulatory focus and emotion

In previous theorizing and research on regulatory focus, emotion has been treated primarily as a *consequence* of goal pursuit. For example, the successful acquisition of ideal goals has been shown to result in cheerfulness-related emotions, whereas failure results in dejection-related emotions (Higgins et al., 1997). On the other hand, emotion researchers have hypothesized that emotions often serve to propel behavior (e.g., Brehm, 1999), and, hence, that many emotions have important implications for the *process* of goal pursuit. For example, Harmon-Jones and Sigelman (2001) showed that greater left-sided frontal cortical activity was associated with the experience of anger prior to aggression. Although previous research has examined the relationship between regulatory focus and the *behavioral* correlates of approach and avoidance, additional research is needed to explore the association of regulatory focus with the *emotional* correlates of approach and avoidance in pre-goal states.

Emotion theorists have identified anger as an emotion that is often associated with approach motivation (e.g., Harmon-Jones & Sigelman, 2001); however, past research has not examined the association of anger with individual differences in chronic regulatory focus. Given the link between left-frontal cortical activity and anger in previous research (Harmon-Jones & Allen, 1998; Harmon-Jones & Sigelman, 2001), our results suggest the novel hypothesis that anger would be associated with promotion focus, such that individuals with higher levels of promotion focus should possess greater trait anger, compared with people with lower levels of promotion focus. Furthermore, individuals with high promotion focus may experience greater state-induced anger, compared with low promotion focus individuals. Future research is needed to test these hypotheses, and to examine the implications of regulatory focus theory for other emotions related to the process of goal pursuit.

Our findings suggest that regulatory focus theory may also have implications for research on affective disorders. In past research, individual differences in frontal asymmetry have been associated with affective disorders involving depression and anger (e.g., Harmon-Jones & Allen, 1998; Henriques & Davidson, 1990). However, the role that regulatory focus plays in affective disorders has received less research attention. The link between chronic regulatory focus and resting frontal cortical asymmetry suggests that differences in regulatory focus may represent an additional facet of an individual's affective style (Davidson, 1992), and that extreme levels of promotion or prevention focus may be associated with affective disorders, such as such as depression, anxiety, or bipolar disorder (cf. Strauman, 1992). Thus, through research linking promotion and prevention foci to affective styles via patterns of cortical asymmetry, the regulatory focus framework may provide insight into some forms of psychopathology.

Elucidating the role of frontal cortical asymmetry in motivation

Advances in research on the function of frontal cortical asymmetry have been gleaned largely from studies of emotion. Generally, research in this domain has assessed asymmetry effects associated with trait measures of emotion and with responses to emotional inductions. Recently, the purview of asymmetrical frontal cortical effects has expanded to include motivations, e.g., the motivation to reduce cognitive dissonance (Harmon-Jones, in press), to retaliate against an aggressor (Harmon-Jones & Sigelman, 2001), and to take action to rectify an anger-producing situation (Harmon-Jones et al., 2003). The present research builds on this work by associating frontal asymmetry with chronic dispositions toward personal goals. Some theorists have suggested that areas of the prefrontal cortex are involved in the representation of goals and the organization of behavior in support of these goals (Davidson & Irwin, 1999), although this hypothesis has not been examined directly. Our findings, which associate frontal cortical activity with goal dispositions, are consistent with this hypothesis and suggest further that goal-related frontal activity may be associated primarily with behavioral aspects of goal pursuit, e.g., the approach- or avoidance-related means by which goals are obtained. Future research is needed to investigate this hypothesis more directly, however, by examining the relationship between frontal cortical asymmetry, regulatory focus, and the types of behavioral strategies people adopt in goal pursuit. Through this work, the regulatory focus framework may provide a useful context for probing the behavioral functions of asymmetrical frontal activity.

Conclusion

The research on regulatory focus and frontal cortical asymmetry has, to date, developed along parallel, yet separate paths. Both literatures have identified approach and avoidance tendencies as integral to motivation and behavior, but through the use of different methodologies, each with their respective empirical traditions. The present work presents an opportunity to synthesize the approaches of social cognition and psychophysiology to advance the understanding of basic processes of emotion, motivation, and goals.

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