PSYCHOLOGICAL SCIENCE

Research Article

Emotion as Motion

Asymmetries in Approach and Avoidant Actions

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ABSTRACT—*To emote literally means to move or prepare for action. A large body of research indicates that flexor and extensor movements are conditionally associated with approach- and avoidance-related motivations. It has also been widely argued that approach and avoidant motivations are asymmetrically instantiated in the left and right hemispheres, respectively. Nevertheless, to date, these literatures remain largely separate. In the present investigation, flexor and extensor movements that were visuospatially contextualized as being directed toward the self and away from the self were observed to be asymmetrically represented in the "approach" and "avoidance" hemispheres. Moreover, this pattern of hemispheric specialization was manifested to a greater degree the higher participants' self-reported level of daily positive affect and the lower their self-reported level of dispositional anxiety. Collectively, these findings have direct implications for models of embodied emotional and perceptual processing, as well as for investigations of individual differences in emotional disposition.*

> It is obvious that the affections of soul are enmattered formulable essences. Consequently their definitions ought to correspond, e.g. anger should be defined as a certain mode of movement of such and such a body (or part or faculty of a body) by this or that cause and for this or that end. (Aristotle, ca. 350 B.C.E./trans. n.d.)

Emotion derives from the Latin *emovere*, "to shake, displace, or agitate"; *affect* (14th century) from the Latin *affectus*, "of completed action"; and *feeling* (cf. Old English *fēlan*, "to touch") from the Latin *palma*, which denotes the "hand"-ling of objects (*American Heritage Dictionary of the English Language*, 2000; *Oxford English Dictionary*, 1989). Each of these terms is directly rooted in the dynamic interactions that transpire between entities or the potential for change that exists because of their attitudinal (i.e., postural, dispositional) relation toward one another. Stated differently, to emote literally means to move, touch, or prepare for action.

Many emotion-related behaviors can be categorized as approach-appetitive, aimed at increasing favorable input, or avoidant-withdrawal, directed at minimizing unfavorable input (Lang, Bradley, & Cuthbert, 1990). In one of the first psychological investigations to study approach and avoidant processes in the form of physical movements, Cacioppo, Priester, and Berntson (1993) tendered the *motor-processes hypothesis*, proposing that certain types of nonfacial "motor biases or their sensory consequences may subtly influence a person's attitude, such that the attitude would have different manifestations had the motor component been absent" (p. 5). Specifically, these researchers suggested that over the course of one's lifetime, arm flexion and arm extension become conditionally associated with approach- and avoidance-related motivations, respectively, by virtue of their repeated pairing with specific somatic reactions and affective evaluations.

Flexion, according to this account, is most often associated with the retrieval or ingestion of something desired or the positively reinforcing termination of aversive stimulation. In contrast, at least in many unpleasant encounters, extension is temporally coupled with the onset of an unconditioned aversive stimulus or catalyzed by the desire to evict a noxious agent from one's presence. Furthermore, in most circumstances that involve reaching toward a desired object (cf. appetitive extension), extension is actually performed as part of a larger motor sequence designed to ultimately enable the retrieval of that desired object via grasping and flexor contraction. Therefore, in many instances, flexion can be conceptualized as an approach-related (appetitive) movement and, albeit to a lesser degree, extension can be conceptualized as an avoidant (rejecting) maneuver.

Substantial evidence has now been marshaled in support of this idea, demonstrating that flexor and extensor movements differentially modulate the categorization of positive and negative emotional words (Neumann & Strack, 2000), participants' preferences toward novel pictorial (Cacioppo et al., 1993) and semantic (Priester, Cacioppo, & Petty, 1996) stimuli, the pro-

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duction of liked and disliked celebrity names (Förster & Strack, 1997, 1998), and several distinct aspects of cognitive processing (e.g., analytical reasoning, creative insight; Friedman & Förster, 2000, 2002) that systematically vary with more transparent emotional manipulations (Ashby, Isen, & Turken, 1999). The link between flexion/extension and affective processing also operates in the reverse direction, such that flexion is potentiated by positive stimuli and extension by negative stimuli (Chen & Bargh, 1999; Duckworth, Bargh, Garcia, & Chaiken, 2002; Solarz, 1960).

However, one additional observation of interest is that the meaning of these movements is not rigid, but rather is partially determined by the context in which they are engaged. For instance, Markman and Brendl (2005) observed that participants were faster to move positive words toward than away from nonphysical representations of themselves, regardless of whether the required arm movement entailed pushing a lever away from or pulling it toward their physical bodies. That is, the specific context in which a flexor or extensor movement is initiated (e.g., for the purpose of moving oneself closer to or further away) appears to play a key role in defining that particular action's affective-motivational significance (Puca, Rinkenauer, & Breidenstein, 2006).

Collectively, these experiments contribute to a growing appreciation of the situated (cf. embodied) nature of many psychological processes and provide evidence that certain nonfacial motor processes, or their sensory consequences, can both arise from and directly influence emotional processing. Moreover, they demonstrate that the affective-motivational significance of a given flexor or extensor action is determined, in part, by whether that action is aimed at attaining a positive outcome or avoiding a negative one, and by whether or not that action is performed in the presence of an emotional stimulus. At present, however, virtually nothing is understood concerning the biological instantiation of such putatively approach- and avoidant-related movements.

In a separate and widely cited literature, researchers have argued that approach and avoidant motivations are asymmetrically instantiated in the left hemisphere (LH) and right hemisphere (RH), respectively (e.g., Davidson, 1998). In related work, hemispheric processing asymmetries in humans have now been linked to a variety of emotional processes, including resilience, self-reported positive affect, depression, and anxiety (Allen, Urry, Hitt, & Coan, 2004; Heller & Nitschke, 1997; Shackman et al., 2006). This literature is complemented by a rich set of ecological observations demonstrating asymmetries in appetitive and agonistic behaviors in a variety of nonhuman species (e.g., Rogers, 2000).

However, although the theoretical literature concerning the lateralization of approach and avoidant motivations has had a pronounced impact in the domains of clinical and affective neuroscience, researchers have rarely attempted to demonstrate hemispheric processing asymmetries in approach (flexor) and avoidant (extensor) behaviors per se.[1] Moreover, because all flexor/extensor investigations to date have included emotional stimuli or attitudinal evaluations, it remains unclear whether the actions were grounded in approach and avoidance motivations or, alternatively, in the positively and negatively valenced emotional processes (e.g., feelings, attitudes, evaluations) that so often accompany these motivations.

Our first aim in the present investigation was to address these critical gaps in the literature by examining whether self-directed flexor movements (i.e., approach actions) and extensor movements directed away from the self (i.e., avoidant actions), performed in the absence of overt emotional manipulations, are asymmetrically represented across the cerebral hemispheres. Specifically, if flexor (approach) and extensor (avoidant) actions map onto the same underlying neural circuitry that is involved in approach and avoidant motivations, a strong theoretical prediction follows: Even when engaged in the absence of overt affective manipulations, flexor and extensor movements that are contextualized as being directed toward and away from the self (see Fig. 1) will be asymmetrically represented in the LH and RH, respectively.

Our second aim was to assess whether the differential lateralization of approach and avoidant actions is related to individual differences in emotional well-being. In animals, perceptual and behavioral asymmetries have been linked to appetitive behaviors (e.g., foraging, exploration) and avoidant-antagonistic behaviors (e.g., violence, predator monitoring, escape behaviors) in species ranging from great apes and reptiles (Deckel, Lillaney, Ronan, & Summers, 1998; Hopkins, Bennett, Bales, Lee, & Ward, 1993) to chicks (Güntürkün et al., 2000), amphibians (Rogers, 2002), and spiders (Ades & Ramires, 2002). Such asymmetries can even be observed in patterns of predation scarring in the trilobite fossil record (Babcock, 1993). The sheer ecological breadth and temporal scope of such asymmetries suggests that segregating consummatory from threat-related drives confers certain functional advantages and is a fundamental component of adaptive inter-organism and organism-environment interactions. More specifically, asymmetrically segregating approach and avoidant processes might confer a benefit by facilitating the simultaneous representation of multiple goal states, reducing internal conflict and confusion, and ultimately enhancing one's sense of security and self-efficacy.

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[1] The investigations most closely related to this topic combined use of both the nondominant (left) and the dominant (right) hand with overt emotional manipulations (Cretenet & Dru, 2004; Dru & Cretenet, 2005; Schiff & Bassel, 1996). However, because experimental emotional manipulations and use of the nondominant hand have both been linked to lateralized neural processes in their own right, multiple interacting sources might account for these prior studies' observations concerning flexor/extensor lateralization. Nevertheless, the findings of these studies were largely consistent with the theory and observations reported in this article. In an early study, Sobotka, Davidson, and Senulis (1992) examined the effects of finger lift versus finger press on measures of electroencephalographic (EEG) asymmetry. Although manipulations of monetary reward and punishment systematically influenced EEG asymmetry in a direction consistent with findings in this article, the motor manipulation per se had no systematic effect.

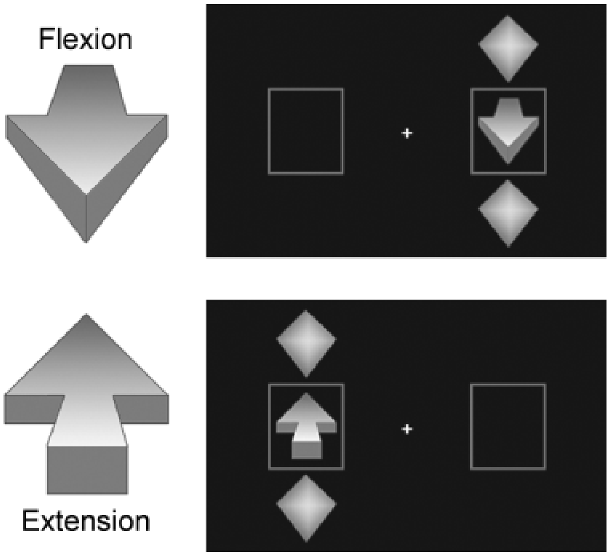

Fig. 1. Examples of target arrows linked to flexor/extensor movements in Experiments 1 and 3. On each trial, a single target arrow appeared in either the left or the right target zone (box outline). These target arrows were always flanked by either two diamond distractors or two arrow distractors that fell outside the target zone. Down target arrows pointed both downward and toward the participant. Up target arrows pointed both upward and away from the participant. Down arrows were responded to via finger flexion (i.e., self-directed movements) and up arrows via finger extension (i.e., movements directed away from the self).

We predicted that to the extent that this is indeed the case, individuals exhibiting stronger hemispheric segregation of approach- and avoidance-related processes would report higher daily levels of positive affect and lower levels of anxiety. However, because of the lack of relevant research, we were more agnostic about whether emotional well-being would be better predicted by the absolute strength of approach-avoidance segregation or by the strength of the specific combinations of strength and directionality (i.e., approach and avoidance processes being differentially biased toward the LH and RH, respectively). Addressing these questions was a primary objective of the final experiment.

EXPERIMENT 1

Method

Participants ($N = 35$, 34 right-handed, 25 female, 18–30 years of age) performed alternating blocks of two conventional continuous-performance tasks (spatial cuing paradigm and target discrimination task with distractors). In both tasks, participants responded to peripherally presented upward- and downward-pointing target arrows using a numeric keypad. In the cuing task, each target arrow was immediately preceded by a brief flickering of one, both, or neither of the peripheral target zones (Fig. 1) and was always accompanied by a pair of diamond flankers that fell outside the target zone. In the distractor task, the peripheral target zones never flickered prior to a target's arrow's appearance, and each target arrow was accompanied by either a pair of diamond flankers or a pair of distractor arrows that fell outside the target zone. The distractor arrows could be either congruent with the target arrow, pointing in the same direction, or incongruent with the target arrow, pointing in the opposite direction and creating visual-motor conflict.

The target arrows (100 ms) subtended 2.4° of visual angle in each direction and were randomly presented 5.7° lateral to fixation in either the left visual field (LVF) or the right visual field (RVF). Stimulus onset asynchrony (SOA) was 1,600 to 3,250 ms; approximately 500 trials were presented for each task. In humans, because of the cross-wiring of the optic chiasm, visual input from the LVF (i.e., the right side of the retinas) projects to visual cortex in the RH, and visual input from the RVF (i.e., the left side of the retinas) projects to visual cortex in the LH. On every trial, a single target arrow was presented in either the LVF or the RVF, to specifically probe processing in the RH or LH, respectively.

Downward target arrows had the appearance of pointing both downward and toward the participant, and upward target arrows had the appearance of pointing both upward and away from the participant (see Fig. 1). In all cases, participants were simply instructed to press the up arrow ("8" key) in response to upward target arrows and the down arrow ("2" key) in response to downward target arrows. The center ("5") key served as the starting point from which each movement commenced. That is, on each trial, participants released the center key and moved their finger toward themselves (i.e., flexion) in response to a downward, inward-pointing target arrow or away from themselves (i.e., extension) in response to an upward, outward-pointing target arrow. Participants were completely naive with respect to the purpose of this investigation.

Results

The reaction time data[2] were consistent with approach/avoidance models of hemispheric lateralization in showing a significant interaction between response movement and hemisphere. Facilitation of flexor (cf. approach) responses relative to extensor (cf. avoidant) responses was greater in the LH (i.e., RVF targets) than in the RH (i.e., LVF targets), $F(1, 34) = 26.83$, $p_{\text{rep}} = 1.00, d = 1.27$, and $F(1, 34) = 7.32, p_{\text{rep}} = .97, d = 0.67$, for the cuing and distractor tasks, respectively.[3] Specifically, 74% of participants showed this interaction in the predicted direction, binomial $p = .002$. Moreover, the interaction was in the predicted direction in all subconditions of the cuing and flanker tasks, and was statistically reliable in all subconditions with the single exception of the incongruent-distractor condi-

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[2] In all three experiments reported here, response accuracy was too near ceiling to use as an informative measure (average accuracy = 96%, with some participants making no errors in certain conditions).

[3] The single left-handed individual exhibited a reversal of the typical movement-by-hemisphere interaction.

tion, which entailed the simultaneous presentation of conflicting visual information (i.e., both up/away and down/toward arrows) on every trial. Considered together, these data suggest that, in the majority of individuals, flexor and extensor responses are differentially represented relative to one another across the LH and RH—at least when elicited by spatially meaningful visual targets that imply action directed toward and away from the self.

Additionally, marked individual differences were observed in the direction and strength of this movement-by-hemisphere interaction, with a minority of participants (~26%) exhibiting a reversed pattern. The degree to which any particular participant showed the expected pattern of flexor/extensor lateralization, did not show a reliable pattern, or exhibited the reverse pattern was reliable both across the two cognitive tasks, $r = .59$, $p_{\text{rep}} = 1.00$, and across individual conditions within the tasks (rs = .35–.66, p_{rep}s > .98).

EXPERIMENT 2

As mentioned, the in vivo associative mapping of flexion and approach motivations, and extension and avoidant motivations, is not one-to-one. For example, one can avoid touching a disgusting object via flexor contraction, just as one can approach a desired object using extensor contraction. Therefore, Experiment 2 was designed to follow up on the first experiment's results by assessing whether the same flexion and extension movements are asymmetrically represented in the LH and RH even when divorced from visuospatial information concerning movement toward or away from one's body. Experiment 2 was secondarily designed to determine whether the same downward, inward-pointing and upward, outward-pointing arrows used in Experiment 1 are sufficient to asymmetrically engage the LH and RH when viewed in the absence of flexion and extension movements.

Method

Experiment 2 employed the cuing paradigm from Experiment 1. In alternating blocks, 32 naive right-handed participants (25 female, 18–30 years of age) made finger flexion and extension responses to spheres and cubes (*isolated motor blocks*), and rightward and leftward finger movements to indicate the color (green or orange) of downward, inward-pointing and upward, outward-pointing arrows (*isolated perceptual blocks*). The SOA was 2,100 to 3,200 ms. In the motor blocks, participants were instructed to press the up arrow ("8" key) and down arrow ("2" key) to indicate the shape (sphere or cube) shown on each trial; in the perceptual blocks, participants were instructed to press the left arrow ("4" key) and right arrow ("6" key) to indicate the color (green or orange) of the arrow targets. Each task consisted of 560 trials. Shape/color-response mappings were counterbalanced across participants.

Results

Unlike in Experiment 1, there were no reliable interactions. The interaction between hemisphere and movement (toward vs. away) was absent in the isolated motor blocks overall, $F(1, 31) = 0.04$, $p_{\text{rep}} = .56$, and the interaction between hemisphere and arrow direction (toward vs. away) was absent in the isolated perceptual blocks overall, $F(1, 31) = 1.82$, $p_{\text{rep}} = .82$. Neither were the interactions reliable in any of the individual cuing conditions within either type of block, all p_{rep}s < .82. Moreover, on the individual level, there was no reliable relation between the strength of the interaction between hemisphere and movement in motor blocks and the strength of the interaction between hemisphere and arrow direction in perceptual blocks, $r = .10$.

One notable finding emerged in this experiment, however. Within isolated motor blocks, just as in Experiment 1, the degree to which any particular participant did or did not exhibit flexor/extensor lateralization was reliable across individual cuing conditions, average $r = .44$, all p_{rep}s between .85 and 1.00. This finding suggests that although, at a group level, flexor/extensor movements may not be strongly asymmetrically segregated in the absence of visuospatial or approach/avoidance-related affective cues, the degree to which any individual spontaneously shows or fails to show a segregation of these movements is internally consistent.

EXPERIMENT 3

Experiment 3, which was conducted in the context of a separate investigation, reintroduced the pairing of flexion and extension movements with downward, inward-pointing and upward, outward-pointing arrows in order to assess the degree to which the findings of Experiment 1 would be replicated in a separate subset of individuals. In addition, Experiment 3 was designed to extend Experiment 1 by assessing whether the asymmetries, if they were replicated, were related to individual differences in self-reported measures of emotional well-being.

Method

Prior to the session, participants ($n = 35$, 17 female, 18–30 years of age) completed the Positive and Negative Affect Scales (PANAS; Watson, Clark, & Tellegen, 1988) and the Spielberger Trait Anxiety Inventory (STAI_X2; Spielberger & Diaz-Guerrero, 1983). Upon their visit to the laboratory, participants performed a cognitive distractor paradigm nearly identical to that used in Experiment 1, making flexion responses to downward, inward-pointing target arrows and extension responses to upward, outward-pointing target arrows (100 ms in duration; SOA: 1,400–2,600 ms; 1,040 trials total).[4]

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[4] The larger context of this experiment also included an affect-induction procedure that was completely unrelated to the aims of the present investigation and therefore is not discussed here. Note that all self-report measures included in this experiment were gathered prior to any manipulation of affect, and all data presented here were collected exclusively during baseline or control (nonaffective) conditions.

Results

As in Experiment 1, the reaction time data showed a significant interaction, such that facilitation of flexor (cf. approach) responses relative to extensor (cf. avoidant) responses was greater in the LH (i.e., RVF targets) than in the RH (i.e., LVF targets), $F(1, 34) = 6.5$, $p_{\text{rep}} = .96$, $d = 0.61$ ($d = 0.67$ in Experiment 1). Specifically, 69% of participants showed this interaction in the predicted direction, binomial $p = .02$ (in Experiment 1, 74% of participants showed the interaction in the predicted direction). Moreover, as in Experiment 1, this interaction between hemisphere and movement was statistically reliable in all task conditions except for the incongruent-distractor condition, $t(34) = -0.27$, $p_{\text{rep}} = .58$, $d = -0.06$, which entailed the simultaneous presentation of conflicting visuospatial information.

Also as in Experiment 1, reliable individual differences were observed, and the degree to which any particular participant exhibited the predicted pattern or the reverse pattern of flexor/extensor lateralization was internally consistent across the individual distractor conditions, rs = .31–.51 (cf. Experiment 1), ds = 0.65–1.19, p_{rep}s = .97–1.00. Moreover, these individual differences in flexor/extensor lateralization were directly related to self-report indices of emotional disposition.[5] In particular, high positive-affect scores (PANAS) were positively related to differential segregation of flexor and extensor movements into the LH and RH, $r = .50$ overall, $p_{\text{rep}} = 1.00$ (Fig. 2). And high levels of self-reported anxiety (STAI_X2) were predictive of less, and in some individuals reversed, hemispheric segregation of these movements, $r = -.46$ overall, $p_{\text{rep}} > .99$ (Fig. 2). Representative questionnaire items that were strongly tied to flexor/extensor lateralization included the endorsement of self-descriptors such as "inspired," "strong," and "I feel secure" (rs = .39–.49) and "I feel blue," "I lack self confidence," and "I . . . can't put [disappointments] out of my mind" (rs = −.34–−.43).

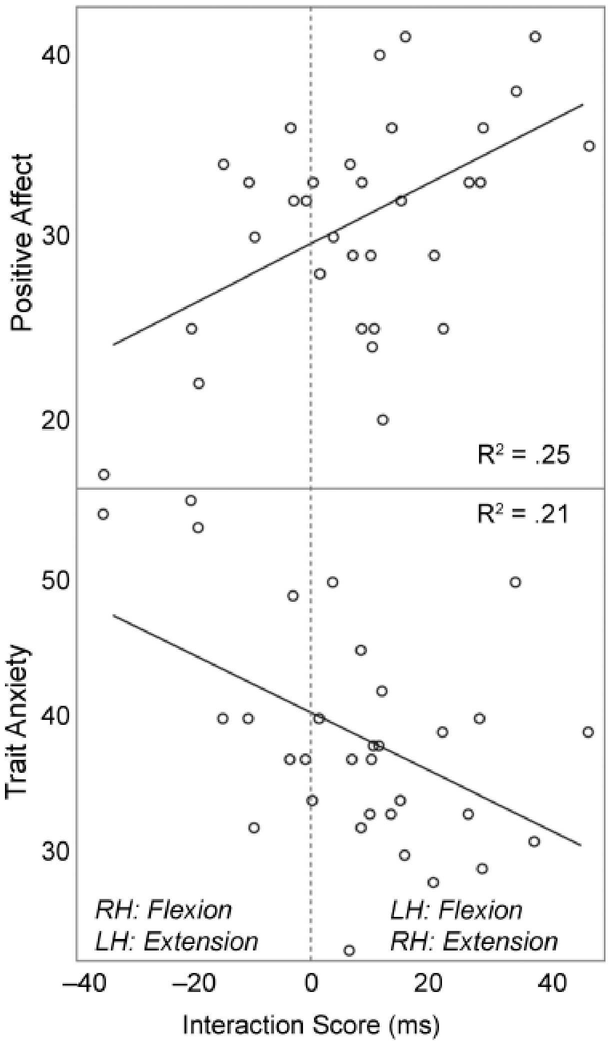

Fig. 2. Positive trait affect and trait anxiety as a function of differential segregation of flexor and extensor movements into the left hemisphere (LH) and right hemisphere (RH), respectively. Values on the x-axis are scores denoting the interaction between type of movement (flexor vs. extensor) and processing hemisphere (LH vs. RH). Positive abscissa values correspond to a pattern of lateralization of these movements in the predicted direction (i.e., flexion in the LH and extension in the RH). Data for individual participants are denoted by circles, and regression lines are shown.

DISCUSSION

The findings of these experiments are consistent with asymmetric theories of approach- and avoidance-related processing. Flexor and extensor movements that were visuospatially contextualized as being directed toward the self (cf. approach) and as being directed away from the self (cf. avoidant) were differentially biased across the LH and RH, respectively (Experiments 1 and 3). Underscoring the reliability of these observations, the degree to which any particular participant exhibited this pattern of hemispheric specialization was reliable across different cognitive tasks (Experiment 1) and across individual task conditions (Experiments 1–3). Moreover, within individuals, a greater degree of this differential mapping of flexor and extensor movements was predictive of higher self-reported levels of daily positive affect and lower self-reported levels of dispositional anxiety (Experiment 3).

These data are the first to bring together, in the absence of overt emotional manipulations, the literatures concerning flexor/extensor movements and hemispheric asymmetries in approach- and avoidance-related processing. Moreover, they provide support for the hypothesis that differentially organizing behavior along an approach-appetitive dimension, instantiated in the LH, and an avoidant-defensive dimension, instantiated in the RH, may confer an emotional advantage to the organism. Further research will be required to determine whether spontaneous (e.g., noncontextualized; cf. Experiment 2) asymmetries

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[5] Three subjects' data were omitted from the correlation analyses because of outlying responses or omitted items on the questionnaires.

in flexor and extensor movements are similarly related to individual differences in emotional temperament.

One interesting and largely unexplored issue raised by these data concerns whether, as in the case of other lateralized processes, a minority of individuals show a reversal of emotion-related asymmetries. That is, are there "emotional left-handers?" The present findings provide initial support for this hypothesis, suggesting that the differential lateralization of approach and avoidant motor movements both exists along a continuum (cf. handedness, footedness, and language) and is reversed in directionality in about 20 to 30% of individuals. If these variations in strength and directionality more generally reflect differential mappings of underlying emotional processes across the cerebral hemispheres, several potentially important implications arise for research concerning emotion-related asymmetries. For instance, if emotional processes are unconventionally organized in a given individual's brain, that person might exhibit atypical clinical symptomatology (Heller, Nitschke, Etienne, & Miller, 1997) or an atypical pattern of emotion-cognition interactions (Maxwell, Shackman, & Davidson, 2005; Shackman et al., 2006). Moreover, if reversals of approach and avoidance hemispheric mapping correspond to less positive and more negative levels of emotion (cf. Experiment 3), which may themselves be directly related to many potential factors of interest, the unrecognized presence of emotional left-handers in an investigation could affect both group-level effects and individual differences analyses.

It is intriguing to consider why the specific direction of hemispheric lateralization matters at all. In other words, why is the absolute strength of approach and avoidant segregation not the critical factor? Given that approach and avoidant processes are largely grounded in affable and antagonistic encounters between organisms, the observation that directional lateralization is important is consistent with Vallortigara and Rogers's (2005) argument that social selection pressures—which require that individually asymmetrical organisms coordinate their behaviors with those of other asymmetrical organisms—often result in population-level asymmetries developing over time. This observation is also consistent with data suggesting that reversals of other directional asymmetries (e.g., handedness) are associated with higher-than-baseline levels of anxiety (e.g., Hopkins & Bennett, 1994) and reduced psychological and physiological well-being (e.g., Coren & Halpern, 1991; Porac & Searleman, 2002).

Notably, the absence of a movement-by-hemisphere interaction in all conditions of Experiment 2 suggests that flexor and extensor motor actions may not, at a group level and of their own accord, be sufficient to activate approach and avoidant motivations per se, and is consistent with the findings of a much earlier study (Sobotka, Davidson, & Senulis, 1992). Only when elicited by visuospatial information denoting movement toward and away from the self were these actions asymmetrically represented across the cerebral hemispheres. This observation was further underscored by the absence of an interaction in Experiments 1 and 3 whenever the visuospatial context contained conflicting visuospatial information, but never when the visuospatial context was unambiguous. Further research will be needed to determine whether additional emotion-related contexts (e.g., responding to appetitive vs. noxious stimuli) can similarly bias perceptual-motor processing toward the LH and RH. These findings also raise the interesting question of whether perceptual-motor processing asymmetries extend to other approach- and avoidance-related actions (e.g., grasping vs. releasing an object).

At the very least, the present results imply that reified flexor-as-approach and extensor-as-withdrawal conceptualizations are perhaps stated too strongly. The meaning of these actions, as defined by their situated context and functional consequences, at least partially determines their relative mapping with respect to approach and avoidant motivations. More precisely, in the present investigation, it was the provision of an approach (directed toward the self) and avoidant (directed away from the self) visuospatial context that asymmetrically biased flexor and extensor movements toward the LH and RH, respectively. Whether the present method of indexing approach- and avoidance-related action asymmetries is a fast, reliable, and accurate technique for indexing emotion-related processing asymmetries in general remains to be seen. We invite other investigators interested in using these measures to contact us for an EPrime version (Psychology Software Tools, Inc., Pittsburgh, PA) of the tasks used in the present study or for other additional details.

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