KEER2010, PARIS | MARCH 2-4 2010
INTERNATIONAL CONFERENCE ON KANSEI ENGINEERING AND EMOTION RESEARCH 2010

EMOTIONS IN TANGIBLE USER-PRODUCT INTERACTION:
A PSYCHOLOGICAL REVIEW.

Valentijn Visch

Industrial Design, Technical University Delft. The Netherlands

ABSTRACT

Man-product interactions traditionally involve tangibility to a large degree (cf. buttons, handles, steering wheels). In the digital product domain, the amount of tangible interaction devices is growing since a decade (cf. iPhone, Wii, Hitachi's "Force"). The user's bodily motor behavior is at the core of tangible interaction. This paper will show that the user's emotions are closely connected to her motor behavior.

This paper aims to give a theoretical start to investigate the possibilities of integrating the user's emotional bodily motor movements in interaction design. It will give a compact psychological overview on the user's emotions and her motor behavior within a product interaction context. First, the expression of emotions by motor movements will be outlined - using appraisal theory. Second, it will be shown that a user can be cued to attribute specific emotions to products – using attribution theory. Finally, embodied cognition and body-feedback theory will show how products and interactions can elicit specific user emotions. The paper will conclude with the future applications and research aims with regard to affective product interaction.

keywords: *emotion, tangibility, interaction, attribution, body feedback*

1. INTRODUCTION

"I get really angry after work everyday and I punch my steering wheel. Could this damage anything?" posted in August 2009 at the Yahoo! Answers forum. This example shows that users have emotions that influence their behavior. Upon being in an angry state, specific anger related action tendencies are activated such as preparation to fight [1,2]. The coping mechanism in the brain of the user [3,4] decides if and how the anger is expressed. Although it would be preferred to express it upon the cause of the anger situation, the 'work' of the person in this example, this would probably result in undesired outcomes, such as being fired. Therefore the person 'releases' his anger privately on a product instead of releasing it in public on her boss. However, the person is still concerned about the results of her anger, motivating the posting of the quoted message at the forum.

Consider the owner's car to be a classic Austin Mini Cooper of the 1960's which might explain the caring for the damage on the steering wheel. Owners of such a classic cars are motivated to buy these cars because they love the 'classic lines', 'honest technology' or because they remind them of their youth (-desires). Future owners might be motivated to choose a car that answers to their emotional product desires: e.g. "I want a car that expresses classic fun". The features of a classic Mini, being small, brightly colored and roundly edged, facilitates the attribution of characteristics like 'fun', ' cute' and 'classic'. Although these features can predict the attributed emotions to the car, such emotions might not be directly reflected in the viewer. The viewer finds his car, but not himself, 'cute' or 'classic'. However, upon seeing a car drive, viewers will likely attribute the same set of emotions that they attribute to the car, also to the car owner. By choosing a car, the owner thus influences the emotion how she is perceived (cf. 'the driving body'[5]). Subsequently, if your car is being perceived as possessing and expresssing a particular emotion, may leads to you believe that you're yourself expressing and possessing that emotion. So people drive a Hummer to feel indifferent and self-contained, a Toyota Prius to feel responsible and morally just, or a Ferrari to feel proud by making others jealous. The eliciting of such emotions might also influence the behavior of the drivers. The classic car owner can be characterized as a *proud* owner, as is reflected in numerous car-websites. This *pride* is reflected in the above-average caring behavior for the car. Similarly, the attributed emotion to a car seems directly to influence driver behavior: the 'independent' Hummer owners are fined over 40 times more than the *dignified* Jaguar owner (source: ISO Quality Planning).

Emotions can thus be attributed to the product, but they might also be evoked by the interaction with the product. To stay with the car example, the position of the driver in the car might influence the feeling of the driver according to an embodied metaphor. Sitting in a Hummer and towering out above the rest will likely favor feelings of *power* and *independence*, whereas sitting a low Jaguar evoke feelings like *modestly,* but since this car is exclusive the emotion will probably be one like *understated dignity*. Also, the bodily feedback during the driving can influence the drivers' emotion. A car giving very direct engine feedback to the driver will likely put the driver in an excited mood. Several car manufacturers (e.g. BMW, Mercedes) adjusted their cars with a *comfort* versus *sport* mode, affecting the directness of feedback in engine and suspension.

Summarized, the user's behavior in product interaction can be influenced by (a) the emotional state of the user, elicited by a non-product related event, (b) the emotion attribution process, (c) the emotions elicited during the use of the product. These three phases of product emotions do not elicit the same kind or same intensity of emotion, but they are mutually influential and contain a temporal sequential order from a to c. It is important to realize that user experienced emotions can change quickly, especially within a (dynamical) interaction processes. For instance, in the first quote of the steer-slamming driver, the driver firstly experience anger, followed by relief when hitting the steering wheel, and followed by regret upon the possible car damage.

In the present paper I'll describe the psychological mechanisms behind these three user-product emotions with a focus on emotional (bodily) motor behavior of the user. Firstly, emotional bodily expressions will be described, followed by attribution processes, followed

by embodied emotion, followed by body-feedback emotions. Finally, the advantages of these mechanisms for interaction design will be listed as well as future research aims.

2. USER EXPRESSIONS OF EMOTIONS

There is a general consensus among emotion theorists that emotions are elicited and differentiated by an *appraisal* processes (cf. [6] for an overview). That is, a subject interprets or *appraises* an event and this appraisal will be responsible for the occurrence of a specific emotion. For instance, owing and driving a Hummer might be appraised as expressing independency and power, eliciting a feeling of desire and pride. By someone else the Hummer possession might be appraised as expressing an anti-social and anti-environmental attitude, eliciting a feeling of disgust. Which emotion is experienced, is therefore dependent on the subject's *appraisal* of an event involving an object and not on the object by itself. This appraisal processes is dependent on series of stimulus evaluation checks [4] such as *relevance* (of the event for the subject), *implication* (of the possible consequences for the subject), *coping potential* (amount of control and power to modify the event) and *normative significance* (consequences related to the social world). Although the subjective appraisal may differ, some events will result in the same appraisal for all organisms, since the stimulus evaluation checks will be more or less the same among all participants: a looming car is appraised as dangerous eliciting anxiety. An emotional *appraisal*, typically operating on a subconscious level [4,7], is intimately coupled to changes in appraising organism such as to physiological changes (cf. hearth rate rises) , an action tendency (cf. approach), and motor expression (cf. smiling).

There is a general consensus among emotion theorists that emotions are elicited and differentiated by an *appraisal* processes (cf. [6] for an overview). That is, a subject interprets or *appraises* an event or situation and this appraisal will be responsible for the occurrence of a specific emotion. For instance, one might appraise a Hummer as expressing independency and power, eliciting a feeling of desire and pride when in possession. In contrast, someone else can appraise the Hummer as a car expressing an anti-social and anti-environmental attitude, eliciting a feeling of disgust. Which emotion is experienced, is therefore dependent on the subject's *appraisal* of an object and not on the object by itself. The appraisal processes consists of a series of stimulus evaluation checks [4] such as *relevance* (of the event for the subject), *implication* (of the possible consequences for the subject), *coping potential* (amount of control and power to modify the event) and *normative significance* (consequences related to the social world). Although each individual appraisal of an event may result in a different emotion, some events will result in the same appraisal for all organisms. For instance, a looming car is appraised as dangerous eliciting anxiety. The process of appraisal, operating at a subconscious level [4,7] is coupled to physiological changes of the organism (cf. hearth rate), an action tendency (cf. an approach tendency), and a specific motor expression (cf. rising of arms).

On a behavioral level emotional appraisals firstly activates the motivational component [8] of action *tendencies* (e.g. fight/ flight [1]). This action may or may not lead to specific bodily *expressions* of emotions. For the present paper I want to focus on the motor expression since this will directly influence the user-product behavior; for instance experiencing *joy* while driving a bicycle can activate specific motor expressions for *joy* such as raising the arms or

pulling the handlebar/ taking bends in the cycling situation. These expressions might be partly suppressed or modulated by the coping process of the individual, but they will always result in some motor actions specific for each emotion. A limited numbers of experiments [9, 10, 11] analyzed emotional expressions of people and found specific motor actions for each emotion. An expression of joy contains for instance a large amount of upward movements whereas sadness contains a small amount of downward movements. The analyzed material of these studies consisted of actors, who were asked to express the specific emotions. Of course, in reality emotions are not always expressed in this way: e.g. the expression of anger by smacking a car steering wheel. The motor expressions can be consciously suppressed to a large degree, for instance due to an emotion regulation strategy [3]. However, suppression of emotions might have advantages at the moment (not being fired when being angry at your boss, or not falling of a mountain when suppressing trembling of fear), in the long run suppression is costly (cf. the subject's incidental memory is impaired and her blood pressure raises [12]. Also, malfunctioned emotional coping mechanisms are closely associated with psychiatric disorders such as depressions [13]. So motor expressions may be suppressed, the individual might still feel the desire to express them at another moment.

From a perspective of user-product interaction it is important to know if and how user emotions interfere with product interaction. This was the subject of my recent pilot experiment. In the experiment subjects were asked to follow a red moving dot with a handheld sensor. The red dot was represented on the a screen-displayed coordinate system (x,y,z) that was adapted to the subjects arm length (side, vertical, frontal). The red dot movements were varied in 6 conditions: three dimensions (x,y,z), two directions (towards, away from the body). The movements of the user, the sensor, were visible by an interactive yellow dot on the screen. When this yellow dot reached the midpoint of the track, e.g. when the user was stretching her arm halfway, the visual feedback on the screen disappeared and a standardized picture eliciting emotions (IAPS [14]) appeared. Meanwhile, the subjects were instructed to continue their movement as accurate as possible, e.g. stretching her arm completely at a continuous velocity and straight direction. It was found that the elicited emotions interfered with the movement in a predictable manner. Congruency between the emotional motor expression of the viewer and the task related motor movement enhanced the user-product interaction whereas incongruency inhibited interaction. For instance, anger is expressed by a forward movement, and the experience of anger during a stretched forward movement accelerated a frontal stretched arm-movement and decelerated an arm-movement towards the body in the frontal plane.

Emotions of the user thus interfere, in accordance with standard motor expressions, in the tangible interaction processes. Tangible interaction designers could benefit from this knowledge by applying it in the design in order to make the interaction more emotional, -effective, -intuitive or -ecologically validated (cf. tangible interaction at the airport portals reducing negative appraisals). Although the appraised event might not be related to the product, the product offers specific possibilities for the user to express his emotions; such as the steering wheel that might, and will be, used to express anger on.

3. ATTRIBUTED EMOTIONS TO A PRODUCT

When subjects are presented with simple animated stimuli, they will show little hesitation to attribute emotions to them [15,16] or high order concepts such as fictionality [17]. These attributions are preceded by the low-order automatized attribution of *animacy*. Animacy attribution decides upon the neurologically processing area in the brain: when animacy is perceived, and attributed, the perception is processed in the STS area that is also active in social perception [18]. The cues that are needed for animacy attribution are very primitive: e.g. something taking a corner and changing direction [19] or two objects interacting [20]. The movement cues responsible for the more conscious emotion attribution process are, not surprisingly, more or less analogues to the movements of emotion expressions – indicating that viewers posses implicit knowledge of expressive movements that is used in emotion expression and recognition. For instance, subjects attribute joy to accelerated movements and sadness to decelerated movements [21, 17].

The capacity of specific movement cues to elicit emotion attribution of the user is most often used in animation film and virtual agents, but it may as well be used in an abstract form to let users attribute emotions to cell-phones [22] or automatic doors [23]. In general, attribution research tries to find the responsible stimuli (/product) parameters to predict an attribution of the viewer/user to the product. For instance, a physically balanced product elicits viewer attributions of *security* [24] to the product.

Although product features can elicit predictable emotional attribution, it is essential to note that these attributions are 'placed' on the object by the viewer and are *not* emotions which are *experienced* by user. A user may attribute 'boredom' to a table but still feel 'happy' or 'excited'. Also, the user may attribute 'anger' to a large butcher's knife, but feel 'anxiety' or 'disgust' himself. In entertainment, the difference between attribution and experience is clear: film viewers may laugh at a comical actor expressing anxiety when falling off a cliff. The attributed anxiety to the actor served as an event to be appraised by the filmviewer. The implication of this event is very low for the viewer: he will not fall of the cliff and he knows that film is not reality but acted. The relevance for of the scene for the viewer might be that he wants to be entertained, which is why he went to the cinema to see a comedy. The expressed anxiety by the actor will then be appraised as comedy. However, despite the viewer's appraisal of the actor's anxiety as *joy*, the next section will propose that the recognition of the anxiety involves a simulated anxiety experience in the viewer – which may be very short but may also be responsible for the intensity of succeeded experienced joy.

4. INTERACTIVE EMOTIONS

4.1. Eliciting User Emotions by Implicit Interaction: Embodied Cognition

The link from emotion attribution to emotional experience can be explained by the process of embodied cognition. This theory proposed that our knowledge is grounded in sensory experience [25] and activated by neurological multimodal simulation processes. With regard to emotion elicitation and recognition, the argument runs as follows. When watching someone who is expressing an emotion, for instance sadness, the incoming visual data will, under influence of mirror-neurons [26], be *simulated* in the observer's brain [27] involving multimodal activation including the premotor cortex. The simulation will automatically

provoke the observer to experience the subject's sad behavior [28] leading to a shared feeling between observer and observed [29]. This shared feeling facilitates the observer's recognition of the subject's emotions [30] which in turn may be appraised by the observer. Within interaction design, emotional contagion might be useful for affective computing involving expressive agents.

Perceiving an object, classifying it conceptually, or attributing meanings to it, thus involves the activation of the multimodal experience associated with that concept: the *simulation*. For instance, upon reading the word 'telephone', the brain will simulate an experience involving a telephone and thus activate the auditory area of the brain [31]. Upon seeing a hammer, motor regions responsible for using that hammer are activated [32]. A simulation is not an exact copy of a previous experience but adjusted by memory and situated in the present context [25]. For instance, subjects who were asked to visually indicate the steepness of a hill were significantly influenced by the weight of the backpack they were carrying [33].

In sum, within the perception of a product, meanings and emotions are not only attributed to the product, but also experienced. This simulated emotion might be experienced as direct emotion within the viewer, a coffin expressing sadness facilitates the elicitation of 'sadness' in the viewer, but it might also function as an event to be appraised (e.g. the experience of 'satisfaction' or 'angriness' at the sad coffin). The motor expression involved in the experience of the (simulated) experience will influence the user's behavior. However, the user's motor movement may not only follow from an emotion or simulation, but it may also initiate an emotion as will be described in the next section.

4.2. Eliciting User Emotions by Explicit Interaction: Body Feedback

Seeing a product can not only elicit user's emotions but using a product can do this as well. The body feedback theory shows that the specific motor action of the user can generate specific emotions. This theory was initiated by William James and Carl Lange [34] who proposed that a subject recognizes his emotions because of the emotion specific physiological changes. In short, you notice that your eyes are wet upon which you feel *sad*. Numerous contrasting evidence to this theory has been found, mainly focusing on the proposed emotional dependency from the mind to the body as a single mechanism the explain emotions [35]. However, it was also found that in some cases the body could facilitate specific emotional experiences. For instance, [36] showed that subjects who were holding a pencil between their lips, and thereby forcing a smile, evaluated cartoons as being much more pleasant than when holding the pencil between their teeth, forcing a sad mouth. Since some centuries, psychotherapy used this body feedback effect by placing a stick along a depressed patient's back in order decrease the depression. Straight sitting is a feature of the expression of positive emotions, so the therapy predicted that straightening the back would facilitate the experience of positive mood in the patient. Research by [37, 38] confirmed that slumped versus straight body postures respectively facilitated negative versus positive emotional experiences.

The same mechanism, the effective analogy between an emotion expression and a bodily action of the user, explains for a large part the embodied metaphor theory. Not only sitting straight facilitates a positive mood – because the bodily experience facilitates the activation of a positive mood – but UP is almost always experienced as GOOD [39]. This suggests that

metaphors rely for a large part on embodied expressions that might be activated by specific perceptions, communication, or body postures.

With regard to product design, a specific designed motor interaction would facilitate the eliciting of specific user emotions. For instance a low door would initiate humiliation whereas a high door would initiate pride; letting subjects bow during their work at a sewing machine might influence their emotions negatively (cf. it was shown that performing upward movement facilitates recollection of positive memories [40]). It should however, be considered that other experiences, such as boredom or physical tiredness could be more dominant. A probability network, incorporating all other emotional cues, could decide on the chance that a predicted emotion could appear.

5. APPLICATIONS AND AIMS

Consciously integrating, controlling, and predicting emotions in products is a worthwhile aim for product designers since any product might elicit emotions that influence its appreciation as well as its use. The advantages to deliberately integrate emotions in product design interaction are: (1) The product can be emotionally differentiated on a multisensory level (e.g. a refrigerator eliciting dignity and another refrigerator eliciting coziness); (2) Integrating emotions in the user-product interaction enhances the user's experience of the product, since emotions are a fundamental and continuous component of human life [41]; (3) Integrating emotions in the interaction will make the interaction more fluent since the user's implicit emotional knowledge is used. Fluent interaction and processing on its turn is experienced by the user as intuitive - generating a positive affect [42]; (4) Adjusting products to emotional behavior increases the ecological validity of the product use – it will reduce misuse (e.g. someone in stress trying to dial 112 on an I-Phone).

Further on the presented theory on embodied affective interaction can be applied in intelligent systems to (a) recognize the user's emotion, (b) adapt the interaction process to this emotional user behavior, and (c) to adapt the interaction process to elicit a target emotion in the user.

The rise of tangible user interfaces of the past year, e.g. the Wii or the Force (a Hitachi home cinema remote control based on gesture recognition) demand careful attention of the user's affective movements. As gestures contain richer movements, involving more movement parameters, than button-press movements, gestures are prone to be used and misused by user affects. For interaction researchers the following questions remain to be answered: (1) which emotions are wanted to be used in the interaction? and: how does this depend on the user's personality and product usage goals? (2) What is exactly the effect of suppressed emotions on MMI interaction behavior? (3) Can affective movements enhance explorative and game-like MMI? (4) Is there an optimum between experienced and simulated emotions depending on product-use? This paper aimed to give a theoretical start to investigate the possibilities of emotional body movement in interaction design. I do hope the paper inspires to future theoretical, experimental, and applied research within the design context.

REFERENCES

01. Frijda, N.H., *The emotions,* Cambridge University Press, 1986.
02. Pichon, S., de Gelder, B, and Grèzes, J., Two different faces of treat: Comparing the neural systems for recognizing fear and anger in dynamic body expressions, *NeuroImage,* Vol. 47, No. 4, pp. 1873-83, 2009.
03. Koole, S.L., The psychology of emotion regulation: An integrative review, *Cognition and Emotion,* Vol. 23, No. 1, pp. 4-41, 2009.
04. Sander, D., Grandjean, D., and Scherer, K.R., A systems approach to appraisal mechanisms in emotion, *Neural Networks,* Vol. 18, pp. 317-352, 2005.
05. Sheller, M., Automotive emotions: Feeling the car, *Theory, Culture & Society,* Vol. 21, No. 4/5, pp. 221-42, 2004.
07. Frijda, N.H., Emotion experience and its varieties, *Emotion Review,* Vol. 1, No. 3, pp. 264-271, 2009.
08. Scherer, K.R., What are emotions? and how can they be measured?, *Social Science Information,* Vol. 44, pp. 695-729, 2005.
09. De Meijer, M., The contribution of general features of body movement to the attribution of emotion, *J. of Nonverbal Behavior*, Vol. 13, No. 4, pp. 247-68, 1989.
10. Glowinski, D., Camurri, A., Volpe, G., Dael, N., and Scherer, K., Technique for automatic emotion recognition by body gesture analysis, *Computer Vision and Pattern Recognition Workshops*, 1-6, 2008.
11. Wallbott, H.G., Bodily expression of emotion, *European Journal of Social Psychology,* Vol. 28, pp. 879-96, 1998.
12. Richards, J.M., and Gross, J.J., Composure at any cost? The cognitive consequences of emotion suppression, *Personality and social psychology bulletin,* Vol. 25, pp. 1033-44, 2009.
13. Philips, M.L, Drevets, W.C., Rauch, S.L., and Lane, R., Neurobiology of emotion perception II: Implications for major psychiatric disorders. *Society of Biological Psychiatry,* Vol. 54, pp. 515-28, 2003.
14. Lang, P.J., Bradley, M.M., and Cuthbert, B.N., International affective picture system (IAPS): Digitized photographs, instruction manual and affective rating. *Technical Report A6, University of Florida,* 2005.
15. Heider, F. and Simmel, M., An experimental study of apparent behavior, *American Journal of Psychology*, Vol. 57, pp. 243-49, 1944.
16. Michotte, A., The emotions regarded as functional connection, In *Michotte's experimental phenomenology of perception (eds. Thinès, G., Costall, A., and Butterworth, G.),* Erlbaum, Hillsdale, 1991 [1950].
17. Visch, V.T., and Tan, E.S.H., Categorizing moving objects into film genres: The effect of animacy attribution, emotional response, and the deviation from non-fiction, *Cognition,* Vol. 110, No. 2, 2009.
18. Allison, T., Puce, A., and McCarthy, G., Social perception from visual cues: Role of the STS region, *Trends in Cognitive Sciences,* Vol. 4, No.7, pp. 267-278, 2000.
19. Tremoulet, P. D., and Feldman, J., Perception of animacy from the motion of a single object, *Perception,* Vol. 29, pp. 943-951, 2000.
20. Schulz, J., Friston, K.J., O'Doherty, J., Wolpert, D.M., and Frith, C.D., Activation in posterior superior temporal sulcus parallels parameter inducing the percept of animacy, *Neuron,* Vol. 45, No. 4, pp. 625-35, 2005.
21. Visch, V.T., and Goudbeek, M.B., Emotion Attribution to Basic Parametric Static and Dynamic Stimuli, *In the IEEE proceedings of Affective Computing Conference,* IEEE Catalog Number: CFP0964H-USB, Amsterdam, 2009.
22. Fagerberg, P., Ståhl, A., and Höök, K., eMoto: Emotionally engaging interaction, *Pers. Ubiquit. Comp,* Vol. 8, pp. 377-381, 2004.

23. Ju, W., and Takayama, L., Approachability: How people interpret automatic door movement as gesture, *International Journal of Design,* Vol. 3, No. 2, 2009.
24. Rompay, T., Hekkert, P., Saakes, D., and Russo, B., Grounding abstract object characteristics in embodied interactions, *Acta Psychologica*, Vol. 119, No. 3, pp. 315-351, 2005.
25. Barsalou, L.W., Simulation, situated conceptualization, and prediction, *Phil. Trans. R. Soc. B.,* Vol. 364, pp. 1281-1289, 2009.
26. Gallese, V., and Goldman, A., Mirror neurons and the simulation theory of mind-reading, *Trends in Cognitive Sciences,* Vol. 2, No. 12, pp. 493-501, 1998.
27. Rizzolatti, G., and Craighero, L., The mirror-neuron system, *Annual review of neuroscience,* Vol. 27, pp. 169-92, 2004.
28. Decety, J., and Jackson, P.L., The functional architecture of human empathy, *Behavioral and Cognitive Neuroscience Reviews,* Vol. 3, No. 7, pp. 71-100, 2004.
29. Jackson, P.L., Meltzoff, A.N., and Decety, J., How do we perceive the pain of others? A window into the neural processes involved in empathy, *NeuroImage,* Vol. 24, No. 3, pp. 771-779, 2004.
30. Heberlein, A.S, and Atkinson, A.P., Neuroscientific evidence for simulation and shared substrates in emotion recognition: Beyond faces, *Emotion Review,* Vol. 1, No. 2, pp. 162-177.
31. Kiefer, M., Sim, E., Herrnberger, M., Groth, J, and Hoenig, L., The Sound of Concepts: Four Markers for a Link between Auditory and Conceptual Brain Systems, *The Journal of Neuroscience*, Vol. 28, No. 47, pp. 12224-30, 2008.
32. Beauchamp, M.S., and Martin, A., Grounding object concepts in perception and action: Evidence from fMRI studies of tools, *Cortex,* Vol. 43, pp. 461-468, 2007.
33. Profitt, D.R., Embodied perception and the economy of action, *Perspectives on psychological science,* Vol. 1, No. 2, pp. 110-122, 2006.
34. James, W., and Lange, C.G., *The Emotions*, Baltimore, MD: Williams & Wilkins, 1922 [1885-87].
35. Cannon, W.B., The James-Lange theory of emotions: A critical examination and an alternative theory, *The American Journal of Psychology,* Vol. 100, pp. 567-86, 1987.
36. Strack, F., Martin, L.L., and Stepper, S., Inhibiting and facilitating conditions of the human smile: A nonobtrusive test of the facial feed-back hypothesis, *Journal of Personality and Social psychology,* Vol. 54, No. 5, pp. 768-777, 1988.
37. Riskind, J.H., and Gotay, C.C., Physical posture: Could it have regulatory or feedback effects on motivation and emotion?, *Motivation and Emotion,* Vol. 6, No. 3, pp. 1573-6644, 1982.
38. Stepper, S., and Strack, F., Proprioceptive determinants of emotional and nonemotional feelings, *Journal of Personality and Social Psychology,* Vol. 64, No. 2, pp. 211-20, 1993.
39. Meier, B.P., and Robinson, M.D., Why the sunny side is up: Associations between affect and vertical position, *Psychological Science,* Vol. 15, No. 4, pp. 243-247, 2004.
40. Casasanto, D., and Dijkstra, K., Motor action and emotional memory. *Manuscript submitted for publication*, 2009.
41. Russell, J.A., Core affect and the psychological construction of emotion, *Psychological Review, Vol.* 110, No. 1, pp. 145-172, 2003.
42. Topolinksi, S., and Strack, F., The analysis of intuition: Processing fluency and affect in judgments of semantic coherence, *Cognition and Emotion, in press.*