Philosophy Study, August 2020, Vol. 10, No. 8, 511-516
doi: 10.17265/2159-5313/2020.08.005

Embodied Emotion: A New Direction for Embodied Cognition

BU Wenlai
Swansea University, Swansea, UK
WANG Huili
Dalian University of Technology, Dalian, China

With the development of embodied cognitive science, the embodiment of human high-level psychological processes such as language and emotions has been paid more and more attention. The importance of body and situation in the understanding of emotional experience is the core content of the embodied emotion. This article aims to review the current hypotheses and empirical evidence of embodied emotions, explains the significance and value of embodied emotion research, and thinks about the research prospects and research ideas of embodied emotion. At the same time, as a new theoretical point of view, emotional embodied view provides a new perspective for emotional research.

Keywords: embodied emotion, mirror neuron, embodiment, body

Introduction

Embodied emotion has a wide range of theoretical hypotheses and research evidence. From the theories of emotion, the facial feedback hypothesis, the body marking hypothesis, and the current embodied emotion standpoint, these views all prove that emotions are embodied. The view of embodied emotion believes that emotions are the emotions of the body, including the brain. The anatomical structure of the body, the way of body moves, and movement experience of the body determine how we process emotions. Related behavioral and brain mechanism studies support the embodiment of emotional processing. The current theoretical explanations of embodied emotions mainly include mirror neuron hypothesis, embodied imitation theory, and perceptual symbol system theory. At the same time, the thought of embodiment has deep philosophical and psychological origins: Husserl and Merleau-Ponty's phenomenology and James and Dewey's functionalism all contain plenty of embodied thoughts.

Definition of Embodied Emotion

There is increasing evidence that cognition is based on the body. Emotional expression and understanding are also closely related to the body. In the theory of embodied cognition, the concepts of resonance and imitation are widely accepted. Although the interpretation of embodied cognition is still controversial, with the discovery of mirror neurons and the hypothesis of mirror system, neurons in the same region of the brain will discharge in similar patterns whether observing others or performing their own actions. This fully shows that

BU Wenlai, Chinese-English Translation and Language Teaching, Swansea University, Swansea, UK.
WANG Huili, Dr., professor, School of Foreign Languages, Dalian University of Technology, Dalian, China; main research fields: Cognitive Linguistics and Cognitive Philosophy.

there is a link between the observation and execution of actions. Through the mirror system, human beings can map the behavior of others, so as to realize the understanding and cognition of others.

Regarding the meaning of embodiment, there is currently no unified view, and sometimes even conflicting (Wilson, 2002). With the deepening of research, the concept of embodiment, "situatedness", "enaction", and other concepts have been fused together to form an embodiment in a broad sense, that is, "the mind is rooted in the human body and the interaction between the body and the environment". Although the understanding of embodiment is still controversial, most researchers agree with the basic proposition of embodied view that cognitive processing is affected by the body, including the brain. In other words, the body's morphological structure, sensory system, motor system, and the nervous system that characterize the body all affect people's cognitive processing (Glenberg, 2010). The body's influence on cognition is not only reflected in the body's influence on cognitive processing, but also in the body's basic content for cognition. For example, the physical properties of the body determine that individuals can only perceive certain threshold stimuli; some abstract concepts often used by people, such as promotion, depreciation, enthusiasm, and indifference, can also be included in the concept of body-centered or body-perceived environment , as well as up, down, hot, cold, etc. In other words, the individual's body and its interaction with the environment provide a prototype for the individual to understand the world. Relevant empirical studies have also confirmed the embodied nature of human cognitive processing. The application and development of embodied view in cognitive science has attracted the attention of researchers in social cognition, emotion, and other fields. In recent years, many studies have found that emotional information processing is also embodied. This view can be called embodied emotion.

Hypothesis of Embodied Emotion

The hypothesis of embodied emotion can be traced back to the theories of emotion proposed by James (1884) and Lange (1885). Later, the facial feedback hypotheses proposed by Tomkins (1981), Izard (1981), Zajonc (1989), and somatic marker hypothesis proposed by Damasio (1998) all reflected the idea of embodied emotions.

The paradigm of embodied cognition has been increasingly confirmed by traditional behavioral experiments and neuroscience arguments in the field of cognitive science. Thinking is no longer regarded as a series of logical and abstract functions, but a biological system rooted in concrete experience, internal connection with specific actions and interaction with others. The theory of embodied cognition also provides us with a new perspective to explain the processing of emotional information. Emotional understanding is not a simple logical reasoning process. Situation and body play an important role in the process of emotional understanding. For example, when someone tells a joke in a bar, one of the audiences is laughing and the other is frowning. Which one can understand the essence of the joke better? According to common sense, we can also judge that the former would like the joke more. The above seemingly simple examples fully demonstrate the embodiment of emotion. Different states of the body may affect the individual's processing and understanding of emotions. According to the mimetic hypothesis of embodied cognition, this difference may be due to the fact that different initial states make it easier or harder for our bodies to imitate other people's emotional states, thus affecting the degree of resonance with them. Besides situation and body state, embodied emotion pays more attention to the important role of nervous system in emotional experience. For example, seeing the scene of a lion roaring can activate neurons in the visual, auditory, and emotional systems; later, even though the scene is

not there, the neurons in the visual, auditory, and emotional systems still have similar activation patterns when they think of the same picture even though the scene is not there. The perception of emotional stimulation (a roaring lion) causes visual, auditory, and emotional responses, which together constitute the special experience of "fear". These specific emotional states are extracted by the brain, and then when the lion is remembered, the nervous system representing visual impression is activated and related nervous systems such as hearing and emotional consciousness are activated, which leads to the re intuition of "fear" emotion. To sum up, we can summarize the core concept of embodied emotion as follows: Emotional expression, perception, processing, understanding and other processes are closely related to the body. Experiencing emotion or perceiving emotional stimulation or re extracting emotional memory will awaken highly overlapping psychological processing process. The behavior control of body parts closely related to emotional expression, such as facial expressions or body movements, will also affect the individual's perception, understanding, and processing of emotions. It is the body's re experience of emotional states that makes our understanding possible. If the body expression of the emotional information receiver is consistent with the emotional information transmitted by the emotional sender, it can promote and optimize the understanding in the communication process, while the inconsistent situation will have a negative impact on the emotional understanding. By linking the theory of embodied cognition with the study of emotions, we can better understand some emotional phenomena and emotional processing. Current empirical research is constantly providing new evidence for embodied emotion theory.

Empirical Evidence of Embodied Emotion

The view of embodied emotion holds that the perception of other people's emotions and their own experience of the same kind of emotions share the same body mechanism, and the physical changes caused by them are often consistent. A study of EMG found that both the observation of happy facial expressions and their own experience of happy emotions activated the muscle activities in the eye and cheek areas; in the recognition of other people's disgust expression and their own experience of disgust, both activated the activities of internal organs (such as feeling nausea). However, the recognition of sadness activated more relevant posture content and body schema, without obvious facial muscle activity, which was consistent with the situation of sadness experience (Oberman, Winkielamn, & Ramachandran, 2007). We used the expression control technology to make the subjects bite the horizontal pen with their teeth, while the lips could not touch the pen, so that the facial muscles, especially the mouth, were always in a tense state, resulting in irrelevant muscle "noise". We found that the "biting" operation specifically impaired the recognition of happy faces (Oberman et al., 2007). The detection of facial expression dynamic changes will also be affected by facial muscle activity. The study found that the subjects were asked to fix the pen on their teeth and lips, so that their facial muscles could not move freely. The subjects were given a video of "happy sad" or "sad happy" facial expression dynamic changes, and the subjects were asked to detect the position of the initial facial expression termination (offset) or the beginning of a new facial expression (onset), that is, when the subjects noticed the change of facial expression, the results showed that the subjects whose facial muscles were controlled were significantly later than those whose facial muscles could move freely (Niedenthal, Brauer, Halberstadt, & Innes-Ker, 2001). This means that facial muscles play an important role in the recognition of static and dynamic expressions. The perception of other people's emotions not only activates the activities of sensorimotor system, but also the corresponding neural activities. Relevant brain mechanism studies support

the hypothesis that the perception of other people's emotions or emotional symbols is embodied. A series of studies have shown that observing other people's emotions and experiencing the same emotions can produce similar brain activity.

As early as 20 years ago, Strack designed ingenious experiments to explore the effect of expression control on emotions. To control the facial muscles of the subjects, the subjects were asked to fix the pencil with teeth and fix the pencil with lips, so that the subjects were in two states of smiling expression and unable to smile. The task of the experiment is to ask the subjects to evaluate whether the cartoon is funny or not. The results showed that when the pencil was fixed with teeth, the score of the cartoon funny degree was significantly higher than that of the pencil held in the mouth.

Based on Strack's behavioral control research paradigm, Havas and his team conducted a more quantitative study on the relationship between body and emotion by changing the stimulus material and measuring the response time and accuracy of the subjects. The experiment presented the subjects with sentences expressing happy emotional events and sad emotional events, and asked the subjects to judge whether the sentences were positive or negative under different behavior control conditions. The final results are consistent with the results of the Strack's experiment and the theoretical hypothesis of embodied emotions. In order to eliminate the possibility that the subjects may not fully read the sentences for the sake of speed, which may lead to incomplete emotional priming, Havas and his team also designed a request for the subjects to judge whether the sentence is easy to understand in two states. The experimental results still found that there is a significant main effect between expressions and sentence valence. That is, the judgment speed of positive sentences is the fastest under the smiling expression, and the judgment speed of the negative sentences is the fastest when the expression is not smiling.

Conclusion

The idea of embodied emotions has led researchers to pay attention to the importance of physical activity and response in the process of emotional information processing. This is not only a breakthrough in the previous theory of emotional cognition, but also injects "physical" components into the mechanisms of observational learning, guided learning, empathy, and even interpersonal interaction. It also provides a certain theoretical basis for the study of the neurophysiological mechanism of emotions.

First of all, the emotional embodied view puts the body at the core of emotional information processing. The body state will not only affect the emotional information processing, but also will be accompanied by corresponding changes in the body state during the emotional information processing. The previous theories of emotional cognition ignored this point and simplified emotional response to cognitive evaluation processing, believing that emotion is the result of a series of cognitive evaluations. Secondly, the emotional "resonance" between individuals using the body as a medium is the basis of emotional observational learning and guided learning (Niedenthal, 2007). Individuals can produce emotional responses similar to those experienced personally by observing the emotional response of others to experience a certain emotional stimulus, event, or behavior, or just under the verbal guidance of others. This kind of emotional reaction similar to personal experience reduces many unnecessary harmful or threatening personal learning. At the same time, it also provides convenience for individuals to acquire positive experience or behavior, which is conducive to the survival and development of human beings. Thirdly, emotional information is the cornerstone of social interaction. Empathy between individuals mediated by body is conducive to good interpersonal interaction.

Both positive and negative evidence support this view. Autistic patients have difficulty in understanding other people's emotions, so they have difficulties in interpersonal communication. However, a study on facial similarity of couples found that after 25 years of marriage or more, the facial similarity between husband and wife is higher than that between their first marriage and random individuals of the same age, and the degree of similarity is related to the quality of marriage (Zajonc, Adelmann, Murphy, & Niedenthal, 1987). This is mainly due to the need for more empathy between couples, and empathy is achieved through the imitation of body conditions, especially facial muscles. Therefore, the high facial similarity between couples is the result of embodied imitation (Niedenthal et al., 2005).

Of course, although embodied emotions have attracted the attention of many foreign scholars, there are still many difficulties in the study of embodied emotions. First of all, emotion is an implicit experience, not as easy to control as behavior. How to accurately induce emotion is a key issue in the study of emotional embodiedness. At present, most people use language stimuli to activate emotions. Of course, pictures and videos can also be used to activate emotions. But has this indirect activation method successfully activated emotions? Is the final measured embodiment directly derived from for different emotional experiences? These questions still need to be explored.

References

Anderson, M. L. (2003). Embodied cognition: A field guide. *Artificial Intelligence, 149*(1), 91-130.

Barsalou, L. W. (2008). Grounded cognition. *Annual Review of Psychology, 59*, 617-645.

Damasio, A. R. (1998). Emotion in the perspective of an integrated nervous system. *Brain Research Reviews, 26*(2-3), 83-86.

Dapretto, M., Davies, M. S., Preifer, J. H., Scott, A. A., Sigman, M., Bookheimer, S. Y., & Iacoboni, M. (2006). Understanding emotions in others: Mirror neuron dysfunction in children with autism spectrum disorders. *Nature Neuroscience, 9*(1), 28-30.

Davis, J. I., Senghas, A., & Ochsner, K. N. (2009). How does facial feedback modulate emotional experience? *Journal of Research in Personality, 43*(5), 822-829.

Ding, J. (2009). A view of embodied emotion: Based on the second generation cognitive science. *Journal of Shandong Teachers' University (Humanities and Social Sciences), 54*(3), 94-97.

Duclos, S. E., Laird, J. D., Schneider, E., Sexter, M., Stern, L., & Van Lighten, O. (1989). Emotion-specific effects of facial expressions and postures on emotional experience. *Journal of Personality and Social Psychology, 57*, 100-108.

Duckworth, K. L., Bargh, J. A., Garcia, M., & Chaiken, S. (2002). The automatic evaluation of novel stimuli. *Psychological Science, 13*, 513-519.

Glenberg, A. M. (2010). Embodiment as a unifying perspective for psychology. *WIREs Cognitive Science, 1*, 586-596.

Glenberg, A. M., Webster, B. J., Mouilso, E., Havas, D., & Lindeman, L. M. (2009). Gender, emotion, and the embodiment of language comprehension. *Emotion Review, 1*(2), 151-161.

Havas, D. A., Glenberg, A. M., & Rinck, M. (2007). Emotion simulation during language comprehension. *Psychonomic Bulletin & Review, 14*, 436-441.

Liu, Y. (2011). The view of embodied emotion: A new perspective on emotion study. Retrieved from http://journal.psych.ac.cn/xlkxjz/EN/abstract/abstract973.shtml

Mahon, B., & Caramazza, A. (2008). A critical look at the embodied cognition hypothesis and new proposal for grounding conceptual content. *Journal of Physiology Paris, 102*, 59-70.

Martin, C., Bechara, A., Denburg, N., Granner, M., & Tranel, D. (2001). The effect of vagus nerve stimulation on decision-making. *Society for Neuroscience Abstracts*. Retrieved from http://freud.tau.ac.il/~mintz/Assets/Bechara2004vagusstimulation.pdf

McIntosh, D. N., Reichmann-Decker, A., Winkielman, P., & Wilbarger, J. (2006). When the social mirror breaks: Deficits in automatic, but not voluntary, mimicry of emotional facial expressions in autism. *Developmental Science, 9*(3), 295-302.

Niedenthal, P. M., Brauer, M., Halberstadt, J. B., & Innes-Ker, A. H. (2001). When did her smile drop? Facial mimicry and the influences of emotional state on the detection of change in emotional expression. *Cognition and Emotion, 15*, 853-864.

Niedenthal, P. M., Barsalou, L.W., Winkielamn, P., Krauth-Gruber, S., & Ric, F. (2005). Embodiment in attitudes, social perception, and emotion. *Personality and Social Psychology Review, 9*, 184-211.

Niedenthal, P. M. (2007). Embodying emotion. *Science, 316*, 1002-1005.

Niedenthal, P. M., & Maringer, M. (2009). Embodied emotion considered. *Emotion Review, 1*, 122-128.

Niedenthal, P. M., Winkielamn, P., Mondillon, L., & Vermeulen, N. (2009). Embodiemnt of emotion concepts. *Journal of Personality and Social Psychology, 96*(6), 1120-1136.

Niedenthal, P. M. (2014). Embodied emotion concepts. Retrieved from https://www.researchgate.net/publication/271515849

Oosterwijk, S., & Rotteveel, M. (2009). Embodied emotion concepts: How generating words about pride and disappointment influences posture. doi:10.1002/ejsp.584 Retrieved from www.interscience.wiley.com

Oberman, L. M., Winkielamn, P., & Ramachandran, V. S. (2007). Face to face: Blocking facial mimicry can selectively impair recognition of emotional expressions. *Social Neuroscience, 2*, 57-68.

Vermeulen, N., Corneille, O., & Niedenthal, P. M. (2008). Sensory load incurs conceptual processing costs. *Cognition, 109*(2), 287-294.

Winkielman, P. (2008). The embodied emotional mind. Retrieved from https://www.researchgate.net/publication/267971832

Wilson, M. (2002). Six views of embodied cognition. *Psychonomic Bulletin and Review, 9*(4), 625-636.

Zajonc, R. B., Adelmann, P. K., Murphy, S. T., & Niedenthal, P. M. (1987). Convergence in the physical appearance of spouses. *Motivation and Emotion, 6*, 125.