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Affiliate Lab Interview

Yue-Jia Luo

Yue-Jia Luo, an affiliate of the CCSN, examines the relationship between human emotion and cognitive processing at the State Key Laboratory of Cognitive Neuroscience and Learning at Beijing Normal University. His most recent research explores facial expression processing and the role of anxiety in decision-making.

THE IMPACT OF EMOTION ON DECISION-MAKING IS AT LEAST AS IMPORTANT AS THE IMPACT OF COGNITION.

YUE-JIA LUO

ABOVE: Members of Yue-Jia Luo's lab at Beijing Normal University.

What broad questions drive your current research?

Generally, we are interested in the relationship between emotion and cognitive processing in human beings. Driven by this broad question, our group has conducted studies exploring two specific topics in recent years.

First, we are looking at the neural mechanisms of human facial processing. The face is very important in social exchanges, and for biological evolution. It provides information such as sex, age, charm, expression, identity, race, and so on. Among these, scientists have focused mostly on facial expression and identification. However, there remains a good deal of conflicting evidence about the relationship between the two.

According to orthodox face-recognition models, the processing of facial identity information takes place within a dedicated cognitive route that is independent of the cognitive route that processes other types of face-related information. Similar to these models, some studies have suggested that there is a parallel pathway between identity and expression processing. Some other studies have proposed that although there are two separate systems for processing identity and expression, these systems are not completely independent, but are interconnected. In order to further understand the relationship between identity and expression, we are investigating the neural mechanisms of facial identity and expression processing.

Secondly, we are investigating the effects of anxiety on decision-making processes. The relationship between anxiety and outcome evaluation (as well as outcome expectation) may be one of the reasons why highly anxious people tend to be risk averse. Previous studies on the impact of anxiety suggested that: (1) high-anxiety people would be more likely to expect negative outcomes, (2) high-anxiety people would be more likely to interpret the ambiguous outcomes as negative ones, and (3) high-anxiety people would evaluate the negative event as worse. However, most of the evidence supporting these viewpoints was from behavioral studies, employing measures such as self-report questionnaires.

Generally speaking, our study was inspired by the viewpoint that the impact of emotion on decision-making is at least as important as the impact of cognition. Compared with traditional theories that assume people rely on rational calculation to make choices, we believe that this perspective will be very valuable in understanding the nature of human decision-making. The aim of our study was to test the relationship between level of anxiety and outcome evaluation (as well as outcome expectation) in the trial-by-trial decision-making task, using the ERP components as the objective measures.

Your recent publication focuses on the role of anxiety in outcome evaluation. Do highly anxious people evaluate events differently from non-anxious people?

Our recent study supports the view that anxious people evaluate events differently from non-anxious people, as it reveals that anxious people evaluate the 'ambiguous' (i.e., uncertain) feedback as more negative than non-anxious people do. This view is also supported by some distinguished studies (e.g. Eisenberg et al., 1998; Wray & Stone, 2005; Mitte, 2007) that found that the subjective costs of the negative events are higher in the high-anxiety group than the low-anxiety group. In other words,

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ABOVE: Ancient Chinese women used fake dimples to embellish their smiles in an effort to obey the rule, "One must not show one's teeth when smiling." Similarly, modern Chinese women also use smile emoticons that contain "fake dimples": (*^_^*), (=^_^=), or (@^_^@).
Reprinted with permission from the authors, Luo et al.

RIGHT: Yue-Jia Luo, Professor at Beijing Normal University.

anxious people tend to evaluate the negative events as worse, compared with non-anxious people.

It has been suggested that anxiety is useful in protecting us from dangerous situations. Thus, it would be helpful for us to explain the 'judgmental bias' in evolutionary terms. If anxious people evaluate the negative events as worse, then it would be reasonable to presume that they are more likely to avoid dangerous events. We believe our findings have provided new insight into the relationship between anxiety and the process of evaluation.

What does electroencephalography tell us about how high- and low- anxiety individuals evaluate and learn from errors in decision-making?

Event related potential (ERP) studies can provide important information about the nature of outcome evaluation. Using the ERP method, a negative-going component (the feedback-related negativity, FRN) is observed between 200 and 300 milliseconds following the presentation of feedback stimuli. This component is consistently larger after monetary losses than after gains. Therefore, it is a suitable measure for investigating the process of outcome evaluation.

Retrospective reports, even though fulfilled by the participants themselves, may be only loosely tied to their real mental activity during tasks. By comparison, the ERP may provide insight into spontaneous evaluations in ways that overcome the difficulties of self-reports. In our study, although there was no intergroup difference in the post-task questionnaire, the FRN elicited by negative outcomes (as well as ambiguous outcomes) clearly showed differences between the high-anxiety and low-anxiety group.

Previous studies suggest that the ERP components (P200, FRN, P300, etc.) could serve as indicators of decision-making tendency, but the influence of anxiety is not yet clear. Given that the impact of anxiety on outcome evaluation is significant, it would be very good to ask if anxiety also plays a role in the adaptive learning from decision-errors. Surprisingly, one of our recent studies suggests that the answer to this question might be "no." In our opinion, anxious people might hold a form of 'compensation strategy' to help them with decision-making, so as to control the emotional effect during the task. We would like to further examine this hypothesis in the future.

Your recent work on the processing of facial expressions suggests that we react to facial emotion before other perceptual processes are complete. Could you summarize your model for facial expression processing?

In light of our recent research, we have proposed a hypothetical model involving three stages of processing for emotional facial expression. The first stage mainly distinguishes potentially threatening facial expressions from other expressions. This processing is very fast, automatic, and coarse. We can react to potentially threatening expressions (i.e., fear or anger) before other perceptual processes are complete. Negativity bias may be attributed to processing in this stage. Processing of emotional facial expressions is dominant in the second stage. During this stage, the brain can distinguish emotional from neutral facial stimuli, but cannot distinguish among different emotions. The brain distinguishes among emotional facial expressions in the third stage. In our recent work, N300 and P300 amplitude reflect further evaluation of information related to the affective valence of a face. Processing in the second and third stages is sensitive to attentional resource availability, while processing in the first stage remains relatively independent.

WE FOUND THAT THE CHINESE RELY ON INFORMATION FROM THE EYES TO SUCCESSFULLY DETECT REAL AND FAKE SMILES. PARTICIPANTS WHO FAVORED THE EYES WERE MORE ACCURATE THAN THOSE WHO FAVORED THE MOUTH.

YUE-JIA LUO

Are human facial expressions universal?

We think basic human facial expressions are universal in some sense. But this does not mean that facial expression in Western and Eastern cultures are identically perceived. A previous study found that some negative facial expressions consistently elicit lower recognition levels among Eastern compared to Western groups. Another recent study found that Westerners and Easterners actually adopt different decoding strategies when reading others' facial expressions. Westerners seem to distribute their fixations evenly across the face, whereas Easterners systematically bias theirs toward the eye region, ignoring the mouth region. This caused a significant deficit in categorizing "fear" and "disgust" in Easterners compared to Westerners. There is also evidence that Easterners evaluate the role of the mouth and eyes differently from Westerners when recognizing a smile. For example, the command "do *not* show one's teeth when smiling" was a strict rule of discipline for ancient Chinese women, who even used adornments (e.g., fake dimples) to make up for the scarcity of emotional information conveyed by the mouth during their closed-mouth smiles. In our study, we found that the Chinese highly rely on information from the eyes to successfully detect real (Duchenne) and fake (non-Duchenne) smiles. Participants who favored the eyes were more accurate than those who favored the mouth. More importantly, the ability to make use of the eyes in detecting the meaning of smiles is predicted by societal individualism and collectivism scores. Higher individualism scores predict less accuracy and sensitivity when using the eyes to interpret smiles, while higher collectivism scores predict more accuracy and sensitivity. Our results indicate that individuals in highly collectivist societies heavily rely on information from the eyes to identify and interpret facial expressions and social intentions. ■

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