

Cognitive Mechanisms, Influencing Factors, and Theoretical Models of In-Group Bias in Face Recognition

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Abstract

Face cognition research indicates that individuals demonstrate significantly superior performance in recognizing and recollecting faces from their own groups (e.g., race, gender, age) compared to faces from other groups. In recent years, experimental investigations have been conducted regarding this self-group bias in face recognition. Researchers have proposed two theoretical frameworks—the perceptual experience hypothesis and social cognition theory—to account for its underlying cognitive processing mechanisms, while the categorization-individuation model and dual-pathway model represent novel explanatory frameworks that respectively integrate these two theoretical perspectives. Researchers have also examined the neural mechanisms of self-group bias in face recognition, investigating the effects of factors such as perceivers, target individuals, and evaluation tasks on this bias. Enhancing the ecological validity of research on self-group bias in face recognition, constructing integrated theoretical models, and strengthening cross-cultural and indigenous research represent important future research directions.

Full Text

Cognitive Mechanisms, Influencing Factors, and Theoretical Models of Own-Group Bias in Face Recognition

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Abstract

Research on face cognition demonstrates that people exhibit significantly better performance in recognizing and remembering faces from their own groups (e.g., race, gender, age) compared to faces from other groups. In recent years, experimental studies have investigated this own-group bias in face recognition, with researchers proposing two theoretical frameworks—the Perceptual Expertise Hypothesis and the Social-Cognitive Approach—to explain its underlying cognitive mechanisms. The Categorization-Individuation Model and the Dual-Route Model represent newer theoretical integrations that combine these two approaches. Studies have also examined the neural mechanisms underlying own-group bias in face recognition and explored how factors related to perceivers, target faces, and evaluation tasks influence this phenomenon. Future research should focus on enhancing the ecological validity of own-group bias studies, constructing integrated theoretical models, and strengthening cross-cultural and indigenous research efforts.

Keywords: face recognition; own-group bias; perceptual expertise hypothesis; social-cognitive approach; categorization-individuation model; dual-route model

Face recognition has long been a crucial research topic in social cognition. Due to differences in personal experience and cognitive structure, people exhibit specific social-cognitive biases when recognizing faces, most notably the pervasive own-group bias (Hills, Pake, & Dempsey, 2018). Groups hold significant adaptive value for human survival and development, and research on own-group bias in face recognition has garnered increasing attention from scholars worldwide, yielding important findings (Cronin, Craig, & Lipp, 2018; Herliz & Lovén, 2013; Hugenberg, Wilson, See, & Young, 2013; Man & Hills, 2017; Martschuk & Sporer, 2018; Proietti, Macchi Cassia, & Mondloch, 2015; Short, Semplo-nius, Proietti, & Mondloch, 2014; Tham, Bremner, & Hay, 2015; Wan, Crookes, Reynolds, Irons, & McKone, 2015; Wiese, Komes, & Schweinberger, 2013; Yan et al., 2017; 吕勇, 刘亚平, 罗跃嘉, 2011; 唐卫海, 张晓沛, 唐乐, 李楠, 刘希平, 2017). However, because own-group bias in face recognition involves multiple elements from social cognition—including faces, groups, cognition, and the self—important questions regarding its cognitive processing mechanisms and theoretical explanations remain to be explored.

1 Concept and Universality of Own-Group Bias

Own-group bias refers to the psychological phenomenon where people demonstrate significantly better performance in recognizing and remembering faces from their own groups (such as race, gender, or age) compared to faces from other groups (Blandón-Gitlin, Pezdek, Saldivar, & Steelman, 2014; Rule, Ambady, Adams, & Macrae, 2007). Notably, this phenomenon in face recognition is fundamentally distinct from ingroup bias. Meta-analyses and empirical studies have shown that own-group bias is not associated with group attitude evaluations (Bernstein, Sacco, Young, & Hugenberg, 2014), but rather relates to

differential processing motivation for ingroup versus outgroup faces.

Gender, race, and age serve as the important “Big Three” social categories for distinguishing self-identity from other-identity (佐斌, 温芳芳, 宋静静, 代涛涛, 2019) and have received particular attention in own-group bias research. Among these, research on own-race bias demonstrates that people more easily recognize faces from their own race compared to other-race faces (Tanaka, Heptonstall, & Hagen, 2013). This research was supported by the Major Project of the National Social Science Fund of China (18ZDA331) and the Fundamental Research Funds for the Central Universities (CCNU19ZN021). Received date: 2019-04-04. Corresponding author: Zuo Bin zuobin@mail.ccnu.edu.cn Additionally, studies on own-age bias reveal that people more readily recognize and remember faces of individuals within their own age range (Rhodes & Anastasi, 2012; Wiese et al., 2013).

Own-gender bias, also known as the cross-sex effect or own-sex bias, has become a research hotspot in recent years (Herliz & Lovén, 2013; Hills et al., 2018). This bias is evidenced by superior recognition and memory for faces of one’s own gender compared to opposite-gender faces (Lovén, Herlitz, & Rehnman, 2011). Previous research has demonstrated the own-gender bias phenomenon using diverse methodologies, including standard old/new recognition paradigms (Hills et al., 2018), the Cambridge Face Memory Test (CFMT) (McKone et al., 2012), and face inversion tasks (Man & Hills, 2017). For instance, several studies have found that female participants show greater accuracy in recognizing female faces compared to male faces (Herlitz & Lovén, 2013; Lewin & Herlitz, 2002; Lovén et al., 2011). Similarly, research indicates that men also exhibit own-gender bias, with male participants demonstrating better memory for male faces than female faces (Hugenberg, Young, Bernstein, & Sacco, 2010; Man & Hills, 2017; Rhodes & Anastasi, 2012; Rule, Garrett, & Ambady, 2010; Sporer, 2001).

2 Cognitive Processing of Own-Group Bias

When individuals demonstrate superior memory for ingroup member faces in face recognition tasks, at which stage of cognitive processing does this advantage emerge? How do factors such as attention allocation and social categorization influence this processing? Concurrently, what patterns of brain activity are associated with face recognition? Research on own-group bias has made substantial progress in addressing these questions.

2.1 Encoding Processes in Own-Group Face Recognition

Current research on the cognitive processing mechanisms underlying own-group bias in face recognition remains limited but has primarily focused on three key questions. First, does the bias occur during the encoding stage or post-encoding stage? For example, Young, Bernstein, and Hugenberg (2010) manipulated instructions before and after face encoding and found that enhancement or reduc-

tion of own-gender bias occurred exclusively during the encoding stage, suggesting that bias primarily emerges during face encoding. Second, what role does attention play in face encoding? Lovén et al. (2011) compared the effects of full versus divided attention on own-gender bias and found that divided attention did not significantly influence the bias. Third, how does social categorization affect biased processing? The formation of ingroup and outgroup identities through categorization plays a crucial role in generating own-group bias (Young et al., 2010).

2.2 Cognitive Neural Mechanisms of Own-Group Face Recognition

The discovery of own-group bias in face recognition has prompted increased interest in exploring its underlying cognitive neural processes, with emerging technologies such as eye-tracking, electroencephalography (EEG), and neuroimaging being applied to preliminary investigations of this phenomenon (Wiese & Schweinberger, 2018; Wolff, Kemter, Schweinberger, & Wiese, 2014). Specifically, eye-tracking studies have revealed that participants show attentional bias toward ingroup targets and allocate longer fixation times, with this more concentrated and prolonged attention contributing to better recognition performance for ingroup faces (Kawakami et al., 2014).

ERP studies have found that own-gender faces elicit larger N170 amplitudes in female participants (吕勇等, 2011). Other research on own-race bias in face recognition has shown that White participants exhibit longer N170 components in response to Black (outgroup) faces compared to White faces (Ofan, Rubin, & Amodio, 2011), with longer N170 latencies for other-race faces (Wesis, 2012). 吕勇 et al. (2011) also found that old and new faces elicited different P1 amplitudes in female participants. However, whether the P1 component genuinely reflects facial race group differences that subsequently affect face recognition remains controversial.

3 Main Factors Influencing Own-Group Bias in Face Recognition

Factors influencing own-group bias in face recognition can be organized into three categories: characteristics of the perceiver, emotional and contextual cues of the target faces, and properties of the research task. Perceiver-related factors include self-reference and individual expectations for interaction outcomes. Target-related factors encompass emotional affect and ecological context. Task-related factors involve instructional differences and processing depth.

3.1.1 Self-Reference

Self-reference in participants produces positive effects on verbal recognition memory. Rogers, Rogers, and Kuiper (1977) compared the impact of self-referential processing with other types of processing (structural, phonological,

semantic) on memory and found that participants in self-referential processing tasks showed the best recognition memory for previously evaluated words. Based on this, researchers consider self-reference a powerful encoding tool for recognition memory. Does self-reference also influence own-group bias in face recognition?

Research indicates that self-reference facilitates own-group bias in face recognition. For example, Ebner (2011) investigated own-age bias in face recognition and found that faces of target individuals similar in age to participants possessed stronger self-relevance, playing an important role in the own-age bias phenomenon. Compared to faces of targets from other age groups, encoding faces of similarly aged targets may involve more self-reference because these faces are more highly associated with the participant. This high degree of association enhances interest and motivation in processing same-age faces, leading to more careful observation and longer fixation times, which consequently improves recognition performance for own-group faces.

3.1.2 Individual Expectations for Interaction Outcomes

A typical stable factor in own-group bias is that people generally anticipate more frequent and important interactions with ingroup members than with outgroup members. Research demonstrates that expected interpersonal interaction outcomes play a significant role in own-group bias (Van Bavel & Cunningham, 2012). Indeed, the ingroup serves as a stable source of psychological and physical support, making its importance to individuals self-evident. Consequently, individuals hold more numerous and detailed interaction expectations and attention for ingroup members, with cognitive processing typically being individuated. For outgroup members, although individuals typically default to categorical treatment, when they value the outcomes of interactions with outgroup members, they may engage in individuated processing of those members (Wilson, See, Bernstein, & Hugenberg, 2014). Van Bavel and Cunningham (2012) found that when participants were told they would have more interactions with assigned ingroup members, clear own-group bias emerged. However, when participants were led to believe they would have equally frequent and important interactions with both ingroup and outgroup members, own-group bias diminished as outgroup member recognition improved.

3.2.1 Emotional Affect

The emotional affect of target faces also plays an important role in own-group bias. For example, a study on own-race bias in face recognition found that White participants showed better recognition for White faces than Black faces under neutral emotional conditions, demonstrating clear own-race bias and perceiving outgroup Black faces as homogeneous. However, when faces displayed angry expressions, the own-race bias effect in memory completely disappeared (Ackerman et al., 2006). Similarly, Wang (2013) examined own-gender bias in face recognition by incorporating facial expressions with positive, negative, and

neutral emotions to test participants' recognition memory for faces with different emotional valences. The results showed that female participants demonstrated better recognition memory for female faces with positive emotions, also exhibiting own-gender bias in face recognition. These findings indicate that target facial emotions serve as an important moderating factor in own-group bias.

3.2.2 Ecological Context

Most previous research has employed standard static faces as stimulus materials. However, in daily social interactions, people more frequently recognize natural faces embedded in social contexts. As face materials become more ecologically realistic, the own-group bias effect in face recognition also changes. For example, Freeman et al. (2013) used functional magnetic resonance imaging (fMRI) to analyze participants recognizing faces in typical American versus typical Chinese environments. They found that participants' retrosplenial cortex (RSC) and orbitofrontal cortex (OFC) showed high sensitivity when stimulus faces and surrounding contexts displayed congruence, with this response increasing linearly as faces in typical American environments appeared more White and faces in typical Chinese environments appeared more Asian.

3.3.1 Instruction Differences

Different instructions lead participants to complete different tasks during the learning phase, which influences the magnitude of own-group bias in face recognition. For example, research on the own-race effect shows that motivation-individuate instructions, which ask participants to pay attention to individuating features of other-race faces during learning, significantly reduce the own-race bias effect (Young et al., 2010; Young & Hugenberg, 2012). In own-gender bias research, investigators have manipulated the degree to which participants focus on different aspects of target faces. For instance, male participants show larger own-gender bias when evaluating masculine traits (e.g., dominant) compared to neutral traits (e.g., cute) (Motta-Mena, Picci, & Scherf, 2016). Requiring participants to make attractiveness or uniqueness judgments during the learning phase, compared to simply telling them to look at faces, also creates differences in cognitive processing that alter face recognition performance (Hills et al., 2018). Relative to uniqueness judgments, attractiveness judgments lead participants to engage in deeper processing of opposite-gender faces (Rhodes, Simmons, & Peters, 2005), thereby weakening the own-gender bias effect.

3.3.2 Processing Depth

The "depth of processing" for stimulus materials influences own-group bias. Judging faces based purely on physical features typically requires only shallow processing, whereas inferring personality traits necessitates deeper processing. For example, researchers have manipulated processing depth through different experimental tasks (e.g., gender judgment, cuteness rating, honesty rating) and found that judgments requiring trait inference (e.g., honesty) lead to deeper face

processing and improved memory performance, while judgments based on more superficial attributes (e.g., gender) result in shallower processing and reduced memory performance (Bower & Karlin, 1974).

Some researchers have further suggested that difficulties in recognizing outgroup member faces arise because processing of outgroup faces remains at a superficial level (Sporer, 2001).

Since the pioneering work of Bower and Karlin (1974), numerous studies have used a series of orienting tasks to examine differences between shallow and deep processing of faces (Mueller, Bailis, & Goldstein, 1979). Overall, most studies consistently find that different types of instructional orientations lead to different recognition performance. However, some findings contradict this view. For example, Sporer (1991) compared eight different encoding strategies that manipulated encoding depth, degree of elaborative processing, and types of self-generated evaluations. The results showed that when participants adopted holistic face processing strategies, recognition outcomes were largely similar and not significantly better than natural encoding strategies, but memory performance was poorest when participants consistently focused on a single facial dimension.

4 Theoretical Models Explaining Own-Group Bias

Regarding the causes of own-group bias in face recognition, two theoretical explanations currently exist: the Perceptual Expertise Hypothesis and the Social-Cognitive Approach. The Categorization-Individuation Model and the Dual-Route Approach to Other-Race Effect attempt to integrate these two explanatory frameworks from different perspectives.

4.1 Perceptual Expertise Hypothesis

The Perceptual Expertise Hypothesis posits that differential contact experience with various social groups leads to recognition differences between own-group and other-group faces (Michel, Corneille, & Rossion, 2010). Lack of experience with other-race faces results in insufficient basic perception during face encoding, yielding lower correct recognition rates compared to own-race faces.

Researchers have proposed various aspects of this perceptual encoding deficiency, including lack of holistic processing leading to greater reliance on feature-based processing (Hayward, Crookes, & Rhodes, 2013) and low-quality representation in face space (Valentine, 1991). Experience-based explanations suggest that the quantity or quality of contact with different group faces predicts observed biases. From a processing perspective, face processing theory holds that people more frequently employ holistic processing for own-group faces compared to other-group faces (Michel, Corneille, & Rossion, 2007). Holistic processing involves Gestalt-based encoding of the entire face, relies on visual experience, typically operates automatically and unconsciously, is difficult to verbalize, and involves chunking that facilitates recognition memory. On the other hand, Valentine's (1991) face-space model clearly describes how experience influences

face perception. This model proposes that each face is stored in a space with multiple dimensions, where each dimension represents facial features most commonly encountered (McKone, Aitkin, & Edwards, 2005). When two common faces become difficult to discriminate, people can add dimensions to face space to aid differentiation. With increased experience, individuals more easily exclude or ignore less relevant information, developing specialized and efficient processing strategies. Increased experience also leads to faces of less frequently encountered groups being stored farther from the center of face space.

Research on own-race bias provides evidence for experience-based explanations. Sporer and Horry (2011) reported that Turkish individuals living in Germany showed no significant difference in recognition performance for German versus Turkish faces, whereas German participants demonstrated clear recognition advantages for German faces over Turkish faces.

4.2 Social-Cognitive Approach

Unlike the Perceptual Expertise Hypothesis, the Social-Cognitive Approach posits that people automatically categorize ingroup and outgroup member faces based on categorical features during recognition. Individuals spontaneously engage in individuated processing of ingroup faces, attributing social importance to them and conducting deep individuated information processing. In contrast, when perceiving outgroup members, they focus on common group features while neglecting individuating information, leading to inaccurate recognition of old versus new outgroup faces (Hehman, Mania, & Gaertner, 2010; Hugenberg et al., 2010; Pauker et al., 2009; Sporer, 2001).

Several studies show that increasing participants' motivation to individuate faces from other ethnic groups can reduce or even eliminate the other-race effect (Hehman et al., 2010; Young et al., 2010; Young & Hugenberg, 2012). These motivational manipulations include providing instructions to individuate other-race faces (Hugenberg et al., 2007; Young et al., 2010; Young & Hugenberg, 2012), offering cues that lead other-race faces to be categorized as ingroup members (Hehman et al., 2010), and presenting faces with angry expressions (Young & Hugenberg, 2012).

Findings from own-age bias research provide evidence for motivational explanations. For instance, preadolescent children show greater own-age bias compared to younger children (Picci, Gotts, & Scherf, 2016), possibly because older children are less willing to interact with younger children, while younger children typically desire to interact with older children.

Sporer's (2001) In-Group/Out-Group Model of Face Processing supports the Social-Cognitive Approach among the two theories discussed above. This model proposes that when encountering an ingroup member's face, default automatic processing begins with configural encoding—focusing on how facial elements are configured, attending to both local features and their relationships, which characterizes expert processing of normal upright faces. When encountering an

outgroup member' s face, perception of outgroup feature cues triggers a categorization process before activating other typical face perception strategies. Comparing the processing of ingroup versus outgroup faces, individuals skip the categorization step when processing ingroup faces, whereas categorization is assumed to be the first step in processing outgroup faces. Thus, recognizing outgroup member faces involves a more complex cognitive process, requiring longer response times.

4.3 Integrated Categorization-Individuation Model and Dual-Route Model

Among classical theoretical models of own-group bias in face recognition, both the Categorization-Individuation Model and the Dual-Route Model attempt to integrate the Perceptual Expertise Hypothesis and the Social-Cognitive Approach into comprehensive explanatory frameworks. However, these two models integrate the theories differently: the Categorization-Individuation Model emphasizes that contact experience and social motivation simultaneously influence individual face recognition, whereas the Dual-Route Model posits that only one of these factors—either contact experience or social motivation—dominates when recognizing faces from different groups.

4.3.1 Categorization-Individuation Model Researchers have proposed the Categorization-Individuation Model to integrate the Perceptual Expertise Hypothesis and the Social-Cognitive Motivational Approach to explain own-group bias (Hugenberg et al., 2013; Hugenberg et al., 2010). According to this model, some own-group biases in face recognition are caused largely (or entirely) by different levels of individuation motivation, such as differences in perceiving faces within versus outside one' s team. Other biases result largely (or entirely) from different levels of individuation experience, such as differences between how humans perceive other human faces versus animal faces. Still other ingroup biases are simultaneously influenced by both individuation motivation and individuation experience, such as differences between perceiving own-race versus other-race faces.

It is important to note that individuation experience and motivation may vary across different cultures or subcultures.

The Categorization-Individuation Model provides an intuitive cognitive framework for own-group bias with “experience” as the horizontal axis and “motivation” as the vertical axis. This framework organically integrates the Perceptual Expertise Hypothesis and the Social-Cognitive Motivational Approach, offering concrete and diverse group examples for their joint operation. Additionally, it enables clearer positioning of different group types (e.g., gender, race, sexual orientation, teams) within the experience-motivation coordinate system of the model. For instance, motivation plays a dominant role in own-group bias for “teams,” while both motivation and experience are important for “race.”

This provides a comparative reference system for understanding similarities and differences in own-group bias characteristics across groups.

4.3.2 Dual-Route Model Wan et al. (2015) attempted to integrate the Perceptual Expertise Hypothesis and Social-Cognitive Approach from the perspective of different cognitive routes, proposing that different cognitive pathways exist for different outgroup faces and offering possible solutions for modifying own-group bias and improving face recognition for other groups. When individuals view outgroup member faces, two routes lead to the ultimate “other-race effect” –lower recognition performance for outgroup member faces compared to own-group faces.

Route 1: This route assumes that when Caucasians raised in Western cultures and Asians raised in Eastern cultures view each other’s racial group faces, lack of experience with the target stimuli leads to lower-level perceptual processing and deficient perception of the other race’s faces. In this situation, increasing social motivation does not improve recognition of other-race faces. Improvement can be achieved by using computer programs to generate faces with quantitative differences from norm faces (Sporer, 2001), creating other-race faces with greater distinctiveness from one another.

Route 2: This route assumes that when White Americans view Black American faces, Black Americans’ lower social status or differences from White Americans on other dimensions lead White Americans to perceive Black faces as “other,” focusing attention on categorical-level rather than individual-level information, resulting in deficient perception of the other race’s faces. In this situation, improving White Americans’ perception of Black faces can be achieved by increasing social motivation.

The Dual-Route Model provides systematic and ecologically grounded theoretical support for integrating the Perceptual Expertise Hypothesis and Social-Cognitive Motivational Approach by identifying two distinct cognitive pathways to the other-race effect under conditions of “lack of perceptual experience” versus “lack of social motivation.” On one hand, the model clearly categorizes two different individual difference scenarios regarding perceivers’ motivation and experience with target stimuli in the generation of own-group bias. On the other hand, it offers in-depth analysis of the distinct cognitive processing pathways under these different conditions, providing an important reference for understanding the cognitive mechanisms underlying own-group bias.

5 Research Prospects

Research on the examination, cognitive processing, neural mechanisms, and theoretical explanations of own-group bias in face recognition has yielded considerable achievements. However, analysis of existing studies reveals certain limitations that warrant further exploration in several areas.

First, as a key element of social cognition, face stimuli play an important role in own-group bias. Most previous research has used standard upright static faces, rarely examining changes in facial physical properties such as holistic/local features, upright/inverted orientation, or background color changes and their impact on own-group bias. Particularly in real-life social interactions, people do not recognize standard static faces but instead encounter real, natural faces rich with information such as age, race, and emotional state, often accompanied by contextual background information. For example, some backgrounds are consistent/inconsistent with gender stereotypes of the face, some contain different proportions of group faces, and others reflect implicit social group relationships. How do these changes in face materials, especially ecological modifications, influence own-group bias? These socio-ecological questions regarding own-group bias in face recognition merit in-depth investigation.

Second, examination of factors influencing own-group bias reveals that the “self” plays a central role in face recognition. However, current research predominantly adopts an “other-evaluation” perspective, seldom considering how self-related information (such as individual physiological differences, group stereotypes, different social group role identities, and social relationships) affects the cognitive processing mechanisms of own-group bias. Therefore, constructing integrated models that reveal the psychological mechanisms of own-group bias from a “self” perspective represents an important future research direction.

Third, although emerging EEG technologies have been applied to own-group bias research, most studies still rely on behavioral measures, lacking systematic investigation of the neurophysiological mechanisms underlying own-group bias. Consequently, employing EEG and neuroimaging techniques, eye-tracking, and mouse-tracking technologies to provide more objective evidence for the cognitive processing mechanisms of own-group bias holds significant academic value.

Finally, most current research on own-group bias has been conducted in Western sociocultural contexts. However, individuation experience and motivation may differ across cultures or subcultures, leading to different cognitive processing mechanisms in face recognition. Few existing studies involve cross-cultural comparisons, leaving the role of cultural factors in face recognition unclear. What effects might own-group bias exhibit in China’s group-oriented cultural context? Therefore, future indigenous research on own-group bias should incorporate cultural differences as an independent variable, exploring the psychological processes of individuals from different cultures or subcultures during face recognition to enrich and develop this field theoretically.

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Cognitive mechanism, influencing factors and theoretical model of own-group bias in face recognition WEN Fangfang; ZUO Bin; MA Shuhan; XIE Zhijie (School of Psychology, Center for Studies of Social Psychology, Central China Normal University, Key Laboratory of Adolescent Cyberpsychology and Behavior, Ministry of Education, Wuhan 430079, China) Abstract: Research about face recognition shows that people are better at recognizing faces of their own groups (e.g. race, sex, and age) compared to faces of other groups. In recent years, researchers have conducted experiments to explore such own-group biases in face recognition. Two competing theoretical explanations for this Own Group Bias are the Perceptual Expertise Hypothesis and the Social-Cognitive Approach. We propose a new model based on an integration of these two approaches: the Categorization-Individuation Model and Dual-Route Approach, and explored its neural mechanisms, implications for cognitive processing, and sensitivity to factors such as perceivers, targets, and evaluation tasks. Important future directions include improving the ecological validity of the study, putting forward with a comprehensive theoretical model and strengthening cross-cultural comparative studies.

Key words: face recognition; Own-Group Bias; Perceptual Expertise Hypothesis; Social-Cognitive Approach; Categorization-Individuation Model; Dual-Route Approach to Other-Race Effect

Note: Figure translations are in progress. See original paper for figures.

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