

“Gut-Based Warmth and Competence: Physiological Cues of Social Cognitive Content”

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Abstract

Warmth and competence constitute a universal framework for parsing social cognition, and the continuous exploration of their relationships with various elements in real-world contexts has increasingly highlighted their instrumental role. Compared with many elements that clearly possess social attributes, physiological cues directly derived from the visual perception of faces or colors, auditory perception of sounds, kinesthetic perception of body postures, and cutaneous perception of temperature changes can also be associated with the social perception of warmth and competence, a process that may occur through hypothetical pathways such as physiological-social perceptual associations or perceptual priming. Focusing on physiological-social perceptual relationships better demonstrates the flexibility of warmth and competence in parsing specific contexts; emphasizing the exploration of typical physiological cues, establishing configurational relationships between physiological cues and warmth/competence, and examining the impact of such relationships on social biases will facilitate the integration of warmth and competence into broader social applications.

Full Text

Perceived Warmth and Competence: The Role of Physiological Cues in Social Cognition

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Abstract: Warmth and competence constitute a universal framework for analyzing social cognition. As research continues to uncover their relationships with various elements in real-world contexts, their instrumental utility has become increasingly prominent. Unlike factors with explicitly social attributes,

physiological cues—such as visual information from faces or colors, auditory information from voices, kinesthetic information from body postures, and tactile information from temperature changes—can also influence social perceptions of warmth and competence. This process may occur through hypothesized pathways including physiological-social perceptual connections or perceptual priming. Focusing on the relationship between physiological and social perception better demonstrates the flexibility of warmth and competence in parsing specific situations. Establishing configurational relationships between typical physiological cues and warmth/competence, and examining how these relationships affect social biases, will help advance the application of warmth and competence in broader social contexts.

Keywords: warmth, competence, social cognition, physiological cues

1 Introduction

In daily life, people typically express their traits through speech, behavior, clothing, appearance, and environmental contexts. For instance, on social media, individuals curate different styles of photographs to showcase traits related to their professional or personal lives. Some female surgeons have used social media to challenge gender stereotypes in medicine, posting personal photos with captions like “I look like a surgeon” to emphasize that women can excel in surgical roles (Rimmer, 2015). But do these photos actually work? Based on the stereotype content model, Jarreau et al. (2019) confirmed that scientists’ selfies can alter public evaluations of scientists, demonstrating that photographs help convey trait information. How should we understand the underlying mechanism?

According to the stereotype content model and related theories, communion/warmth and agency/competence form the “Big Two” structure of social cognition content, also known as fundamental dimensions (Zuo et al., 2015). These dimensions align with two fundamental life goals: “communion” and “agency” (Bi, 2019). Communion/warmth information helps people assess others’ intentions to help or harm, driving social inclusion or exclusion, while agency/competence information helps evaluate whether others possess the capacity to act on those intentions, motivating people to enhance their own capabilities for effective responses or goal achievement. Complex real-world situations contain numerous cues that convey communion/warmth and agency/competence information. For example, benevolence, trust, cooperation, liking, belief consistency, value sharing, equality, and resource sharing—manifestations related to relationship closeness—contain communion/warmth information. Power, status, prestige, class, skill, influence, and respect—manifestations related to hierarchical position—contain agency/competence information (Abele et al., 2021).

Researchers have used people’s perception and judgment of warmth and competence to explain numerous phenomena: how technology-enhanced social services create positive experiences (Van Doorn et al., 2017); which doctors and hospi-

tals people trust and choose (Jain, 2022); what brand image characteristics consumers prefer (Zhu et al., 2020); which groups or situations foster cooperative behavior (Koch et al., 2020; Ellemers et al., 2020; McKee et al., 2022); what types of people prefer middle-way thinking (Li et al., 2019); and how people form beliefs about themselves and others (Abele & Wojciszke, 2007; Dricu et al., 2018; Frimer et al., 2011; Formanowicz et al., 2018; Seidman et al., 2020). When individuals, groups, or objects convey warmth and competence information, the subjective evaluations people form subsequently drive behavior.

The rules governing how people perceive warmth and competence information and form evaluations are complex. During social interaction, multiple factors influence warmth and competence judgments: whether one occupies the role of actor or observer (Abele & Wojciszke, 2014), perceptions of social structure (Fiske, 2018; Koch et al., 2016), and the expression of specific group identities and social identification (Ellemers et al., 2013). Warmth and competence evaluations lack stability, being affected by comparisons between targets (Yzerbyt et al., 2005; Judd et al., 2005; Kervyn et al., 2012), simultaneous or sequential evaluation of the two dimensions (Judd et al., 2019), and the perceiver's own goals (Abele et al., 2021) and situational context (Zuo et al., 2018). Some of these variations can be summarized as dimensional compensation effects (Yzerbyt, 2018; Dai et al., 2014; Cheng et al., 2016) and halo effects (Judd et al., 2005). As research continues to uncover warmth and competence information embedded in social phenomena, scholars have increasingly focused on integrating contextual cues while overlooking the forms of cues that directly convey warmth and competence information. This paper examines the relationship between physiological characteristics of human perception—such as faces, voices, body postures, and skin temperature—and warmth/competence information. By establishing “physiological-social” connection hypotheses, we analyze the mechanisms through which people achieve warmth and competence evaluations via physiological pathways, offering feasible suggestions for enriching the cue system of warmth and competence.

2.1 Visual Cues from Faces

Human faces contain rich social information, revealing age, gender, race, emotion, and intentions (Bruce & Young, 1986). Social cognition research uses valence/trustworthiness and dominance to parse face evaluations. Trustworthiness reflects judgments of others' intentions, while dominance reflects their capacity to inflict harm (Oosterhof & Todorov, 2008), showing functional correspondence with warmth and competence (Liu et al., 2020). Research indicates that trustworthiness correlates significantly with warmth perception, while the correlation between dominance and competence perception is somewhat weaker (Sutherland et al., 2016).

Facial physiological cues—including features, configuration, and expression—automatically convey trustworthiness information (Winston et al., 2002; Krumhuber et al., 2007). For example, people find it difficult to trust male peers with

high facial width-to-height ratios (the ratio of cheekbone distance to upper eyelid-upper lip distance), and these men do indeed engage in more deceptive behavior than those with lower ratios (Haselhuhn & Wong, 2012). People perceive baby-faced adults as more honest, friendly, and warm (Zebrowitz & Montepare, 1992), and black CEOs with baby faces receive higher warmth evaluations than their white counterparts (Livingston & Pearce, 2009). However, baby faces do not convey competence information for political candidates (Zebrowitz & Montepare, 2005). Smiling faces are perceived as warmer (Hack, 2014) and more trustworthy (Krumhuber et al., 2007; Sutherland et al., 2017; Todorov et al., 2015). Both male and female scientists who post smiling selfies receive higher warmth evaluations and greater trust, without reduced competence evaluations (Jarreau et al., 2019), demonstrating that smiling selfies convey warmth information and challenge the cold stereotype of scientists.

Facial information can be categorized according to warmth and competence. For instance, attractiveness, confidence, and masculinity can be classified as competence-related (Oh et al., 2019), with male faces conveying competence regardless of expression (Hack, 2014). Warmth and competence have become tools for evaluating faces (Oosterhof & Todorov, 2008). Saito et al. (2020) created virtual three-dimensional male faces and asked participants to rate “how warm does this person look?” and “how competent does this person look?” The resulting evaluations allowed classification into four categories: high warmth-high competence, high warmth-low competence, low warmth-high competence, and low warmth-low competence. When Ponsi et al. (2016) controlled for face trustworthiness, participants who perceived high warmth and high competence tended to categorize faces as in-group members, while those perceiving low warmth and low competence tended to categorize them as out-group members. This aligns with the stereotype content model’s assumptions about in-group favoritism and out-group derogation (Fiske et al., 2002), indicating that faces can also convey stereotype information.

Stereotypes and psychological states influence how people process warmth and competence information from faces. Imhoff et al. (2013) had participants select two faces from photographs with identical basic features—one that “looks like a male kindergarten teacher” and one that “looks like a male manager.” Participants then rated the faces on warmth and competence using brief implicit association tests and scales. Although unaware of the stereotypes (high warmth-low competence for kindergarten teachers, low warmth-high competence for managers), participants’ evaluations matched these stereotypes exactly. Saito et al. (2020) found that loneliness modulates attention to faces. Using face photographs from warmth/competence rating tasks as distractors in a target-detection paradigm, they found that participants reporting higher loneliness spent more time looking at warm faces, while less lonely participants focused more on competence-related faces. Ponsi et al. (2016) discovered that people with low in-group overexclusion effect (IOE—the tendency to categorize others as out-group members) rely more on facial warmth information for categorization, while those with high IOE rely more on competence information. These studies demonstrate that people indeed

use visual facial cues to complete warmth and competence judgments.

2.2 Auditory Cues from Voice

In social interaction, people can also use vocal information to assess others' backgrounds, traits, and personalities (Aronovitch, 1976). Vocal physiological cues—including pitch, intonation, and speech rate—trigger warmth and competence judgments. When forming competence evaluations, vocal characteristics may include fast speech with varied pitch (Aronovitch, 1976), high pitch without tremolo (Zoghaib, 2019), or simply high pitch (Oleszkiewicz et al., 2017). For warmth evaluations, vocal features include low pitch, dull timbre without tremolo (Zoghaib, 2019), though high-pitched female voices can also elicit such evaluations (Oleszkiewicz et al., 2017). Robots with higher-pitched voices also receive high warmth and competence evaluations (Zhang et al., 2021). However, vocal characteristics show group-level trends. Pemberton et al. (1998) found that Australian women's average pitch decreased from 229Hz to 206Hz over 48 years (1945-1993). Berg et al. (2017) found that German women's fundamental frequency dropped by 6-7 semitones. The average pitch gap between women and men has narrowed, suggesting women's voices are conveying traits more similar to men's.

Gendered vocal cues influence evaluations differently. People use distinct vocal cues to infer traits for men and women. Aronovitch (1976) found that greater intensity variation in male voices and lower fundamental frequency in female voices were judged as less friendly. When male voices spoke the word “hello,” trustworthy vocal features included higher initial fundamental frequency with approximately U-shaped pitch contour, while untrustworthy features included lower initial pitch that remained constant or rose slightly at the end (Belin et al., 2017).

When male and female voices convey identical content, people form different warmth and competence evaluations that align with stereotypes of men as low warmth-high competence and women as high warmth-low competence. Dou et al. (2022) programmed robots with voice pitches mimicking men, women, and children; the male-voiced robot received the highest competence and lowest warmth ratings. Since male voices typically have lower pitch than female voices, lower-pitched female voices can also convey masculine traits. To minimize attention to vocal features, Krahe and Papakonstantinou (2020) selected an abstract, difficult text and manipulated a female reader's voice from its natural 201Hz to 220Hz and 165Hz. Participants preferred the 220Hz voice, rating it as having more positive (e.g., gentle) and negative (e.g., childish) feminine qualities, while the 165Hz voice conveyed more positive masculine qualities (e.g., analytical). Ko et al. (2009) had male and female voices read identical job resumes (masculine versions: car salesman, security guard, basketball; feminine versions: florist, aerobics instructor, yoga). Participants gave lower competence ratings to resumes read by female voices. When voices described candidates' success/failure experiences and warmth/competence traits, participants judged

female-voiced candidates as less capable of performing the tasks.

Language influences vocal fundamental frequency. When the same person uses different languages (including accents or dialects), they may sound like different people, affecting others' evaluations. People with standard accents receive higher competence evaluations (intelligence, confidence) and vitality evaluations (liveliness, enthusiasm) (Giles & Edwards, 2010). Fuertes et al. (2012) found that accents trigger evaluations based on status (intelligence, social class), solidarity (trustworthiness, in/out-group membership), and vitality (activity level).

2.3 Kinesthetic Cues from Body Posture

Approach-avoidance information biases people toward warmth evaluations. Freddi et al. (2014) presented warmth and competence trait words in enlarged or reduced fonts to create approach or avoidance distance perceptions. Enlarged fonts increased warmth evaluations while reduced fonts decreased them, with no effect on competence evaluations. Virtual three-dimensional faces performing nodding, shaking, or static movements were rated; participants preferred nodding faces, perceiving them as more approachable (Osugi & Kawahara, 2018). When one's own body posture creates approach-avoidance states, warmth evaluations are also affected. Following Portuguese phonology rules, Garrido et al. (2019) created words producing inward or outward mouth movements (e.g., "bateco" creates inward, swallowing-like motion; "catebo" creates outward, spitting-like motion). Used as email usernames for virtual characters, inward-motion words led to higher warmth ratings, with no competence differences.

When body postures convey power, hierarchy, or goal-directedness, people focus on competence evaluations. After performing powerful poses like expansive stances, individuals feel more competent and powerful, and subsequently receive higher competence ratings from others (Cuddy et al., 2011). Freddi et al. (2014) presented warmth/competence words with vertical motion, creating upward/downward movement perceptions. Top-down vertical motion increased competence evaluations, while bottom-up motion decreased them. Forward body movement or even preparing for such movement can affect competence evaluations. Although forward movement relates to approach-avoidance, it enhances motivation for success and goal achievement (Natanzon & Ferguson, 2012; Landau et al., 2014; Robinson & Fetterman, 2015). Horchak et al. (2016) selected a U.S. presidential speech containing 12 forward-movement metaphors but no "warmth" or "competence" terms. An experimental group performed one minute of low-resistance stationary cycling at normal speed, then read the speech while standing with one foot forward; a control group read it with feet together. The experimental group rated the politician's competence significantly higher than the control group, with no warmth difference. When the metaphorical expressions were removed, this differential evaluation disappeared.

According to conceptual metaphor theory, people can represent and process

abstract concepts through sensorimotor experiences, with abstract social information processing influenced by spatial environmental stimuli (Yin et al., 2013). Abele et al. (2021) used horizontality and verticality to outline the structure of social cognition content, suggesting conceptual metaphorical features of warmth and competence. Body posture can both convey spatial environmental stimuli and produce specific spatial movement stimuli, indeed affecting how people process warmth and competence information.

2.4 Tactile Cues from Temperature

Temperature information primarily influences warmth evaluations. People holding cold coffee perceive strangers as cold, while those holding hot coffee perceive them as warm (Williams & Bargh, 2008). fMRI results show that the ventral striatum and middle insula connect physical warmth perception with social warmth (Inagaki & Eisenberger, 2013). Compared to the concept of warmth, social warmth emphasizes interpersonal connection. When people cannot perceive social warmth in interactions, they unconsciously regulate body temperature through behaviors like taking hot baths (Bargh & Shalev, 2012). During social interaction, perceived physical warmth enhances comfortable, prosocial cognitions (Baumeister & Leary, 1995; Raison et al., 2015). However, temperature information from communication media does not affect warmth evaluations. Willemse et al. (2018) used teddy bears as media, remotely controlling their heartbeat, temperature, and simple movements. Participants were told the bear's temperature came from room temperature, artificial control, a virtual interaction partner, or a real partner's body heat, but no differences in warmth evaluations emerged.

3 Hypotheses About the Role of Physiological Cues

Based on physiological characteristics, faces, voices, and bodies provide warmth and competence cues. Physiological cue perception belongs to bodily perception, while warmth and competence perception belongs to social perception. Two “physiological-social” association hypotheses can be established: the connection hypothesis and the priming hypothesis. The former emphasizes a matching foundation between the two perceptual systems, including physiological substrates, connecting mediators, associative memory, and conceptual networks. The latter emphasizes that warmth and competence constitute fundamental dimensions for processing all information, including physiological cues.

3.1 Physiological-Social Perceptual Connection Hypothesis

First, bodily and social perception may activate common brain regions, making bodily perception appear as a medium for warmth and competence evaluations triggered by external stimuli. The ventral striatum and middle insula, for example, connect physical warmth perception with social warmth (Inagaki & Eisenberger, 2013). Red and orange colors create warm feelings (Fenko et al., 2010),

while blue creates cold feelings. Changing background color from blue to orange increases warmth evaluations for virtual characters, real estate agents, and online shopping sites (Choi et al., 2016). Through daily experiences of matching bodily and social perception (Morgan et al., 1975), the brain integrates visual expectations like “red-hot” and “blue-cold.” People compare these visual expectations with actual tactile sensations. When touching blue and red objects of identical temperature, people perceive blue objects as warmer (Ho et al., 2014). Red objects must be physically warmer to meet expectations, reinforcing the “red-hot” and “blue-cold” association.

Second, social categorization and concepts serve as crucial connecting mediators. According to the dynamic interactive model, facial, vocal, and bodily cues constitute low-level perceptual processing that continuously interacts with social categorization, stereotypes, and high-level perceptual processing (Freeman & Ambady, 2011). During person construal, people process physiological cues bottom-up while high-level processing and stereotypes operate top-down, with social concepts like gender, race, age, and emotion completing the integration. In facial processing neural mechanisms, the fusiform gyrus perceives facial representations, the orbitofrontal cortex performs top-down visual processing, and the prefrontal cortex retrieves relevant social concepts (Freeman & Johnson, 2016). Based on prior semantic associations, Bagnis et al. (2019) confirmed that social knowledge stored in the prefrontal cortex can predict and explain facial information. Thus, the prefrontal cortex serves as a key connector, activated by visual signals from the fusiform gyrus while helping the orbitofrontal cortex integrate visual stimuli by modulating fusiform signals to match orbitofrontal expectations.

Third, associative memory establishes connections between social perception and non-living entities. Non-living entities can help or harm people, requiring judgments about their capacity to do so. They can also possess anthropomorphized traits of group inclusion or goal achievement. Thus, warmth and competence evaluations originally applied to living entities become associated with non-living ones. For example, consumers perceive for-profit companies (Aaker et al., 2010) and brands that skillfully achieve goals (Kervyn et al., 2012) as more competent, while non-profit companies (Aaker et al., 2010) and brands that consider public welfare (Kervyn et al., 2012) as warmer. Sensory stimuli activate associative memory (Anderson & Bower, 2014), allowing extraction of warmth and competence information for non-living entities. Jha et al. (2020) found that haptic sensations from objects trigger different warmth and competence evaluations. Participants receiving career counseling services evaluated the providing company based on business card weight; heavier cards (higher paper weight) signaled greater competence, while unlaminated, softer cards signaled greater warmth. Increasing flyer weight also improved warmth and competence evaluations for retailers with poor images.

Finally, conceptual networks expand the scope of connections. Warmth and competence are abstract labels with rich connotations: warmth includes gen-

erosity, affiliation, sincerity, and friendliness; competence includes efficiency, skill, ambition, determination, and wisdom. These concepts are commonly used to describe and judge people, events, and objects, each abstracting psychological processes and behavioral manifestations. According to conceptual metaphor theory, abstract concept representation is grounded in sensorimotor (embodied) experience (Lakoff & Johnson, 1980). While metaphorical cognition involves conceptual mapping, embodied cognition emphasizes how bodily sensations or activities represent concepts (Peng & Yu, 2012). Connections like “up is moral,” “big is strong,” and “warm is friendly” link physical experiences (“up,” “big,” “warm”) to abstract concepts (“moral,” “strong,” “friendly”). When people use bodily sensations or actions to understand specific concepts, they simultaneously complete warmth and competence judgments.

3.2 Physiological-Social Perceptual Priming Hypothesis

People tend to use specific dimensions to understand reality, with various stimuli serving as triggers for these cognitive dimensions. Warmth and competence are commonly used dimensions, activated not only by stimuli from people, organizations, and objects, but also applicable to evaluating novel entities like artificial intelligence (McKee et al., 2022). Scheunemann et al. (2020) equipped small spherical robots with variable-speed rotation programs and signal reception modules, enabling movement and interaction. In predicting preferences for robot behavior, warmth and competence proved the optimal predictive dimension combination, whether robot movement trajectories resulted from programmed autonomy or participant interaction. According to mind perception theory, people judge whether entities possess “minds” based on experience and agency (Gray et al., 2007; Waytz et al., 2010), dimensions similar to warmth and competence. Once entities are perceived as having minds, warmth and competence evaluations may change. For instance, anthropomorphizing money significantly increases its warmth and competence evaluations (Zhou et al., 2019). People and objects trigger warmth and competence evaluations with slightly different emphases: people receive higher warmth evaluations, while non-living entities like companies are judged more on competence (Aaker et al., 2010).

Faces commonly prime warmth and competence evaluations, directly conveying trait information. Eyes and mouths primarily convey warmth, particularly the area below the eyes near the nostrils and the lower lip region. The eye area also conveys competence, primarily through upper eyelid folds and lower eyelids, plus the upper lip and philtrum (Messer & Fausser, 2019). Based on these features, convolutional neural networks (CNNs) simulate human social perception, achieving 90% accuracy in predicting face warmth ratings and 80% for competence (Messer & Fausser, 2019). Lin et al. (2021) had participants interpret unfamiliar white faces, with selected English words reflecting warmth, competence, femininity, and youth. Face recognition aims to extract category information, subsequently activating stereotype processing (Zhang & Zuo, 2012). Vocal cues also provide category information. When evaluating male adoptive

parents based solely on voice, heterosexual participants rated men who sounded gay as warmer and more skilled at childcare (Fasoli & Maass, 2020), aligning with stereotypes of female childcare abilities.

People process physiological cue information according to their expectations. Once these cues prime processing, they cannot control whether results align with the cues themselves. Levin and Banaji (2006) used photo brightness to explore racial stereotypes. When comparison photos matched a black face's brightness, participants believed the comparison needed to be darker to match. When an ambiguous-race photo was labeled black, participants rated it darker; when labeled white, they rated it brighter. Photo brightness also affected voter evaluations. When a candidate's campaign photo background was brightened, supporters rated them as more honest and representative, while opposing partisans rated them as less honest and representative (Krosch et al., 2013). Individuals universally intend to belong to specific groups, and physiological cues provide entitativity information. People develop psychological group perceptions through similar physiological features like skin color (Dasgupta et al., 1999). Entitativity leads people to ignore individual differences, focusing on physiological and psychological homogeneity. People with similar physiological features are easily assigned group-specific traits—for instance, certain skin colors being associated with kindness or hostility (Duncan, 1976; Sagar & Schofield, 1980).

4 Implications and Future Directions

Physiological cues of warmth and competence remain scattered throughout social cognition research without systematic investigation, primarily because they explain social phenomena less powerfully than social factors. This has led social cognition research to focus on two aspects rather than the relationship between bodily and social perception. First, researchers have excavated the social attributes of stimuli, with faces becoming primary stimuli sources that carry socially salient features like gender, age, race, and emotion. Second, they have reinforced the content structure of social cognition, with horizontality and verticality becoming dimensional features of various content structures. The stereotype content model, dual perspective model (DPM), behavioral regulation model (BRM), dimensional compensation model (DCM), and agency-beliefs-communion model (ABC model) all use communion and warmth as horizontal labels indicating relationship closeness, and agency and competence as vertical labels indicating status hierarchy (Abele et al., 2021).

Physiological cues of warmth and competence permeate specific social scenes and can serve as entry points for parsing social cognition. According to the “stimulus-cognition-response” framework, stimulus sources and their features help parse the rules of warmth and competence evaluation. As the applicability of warmth and competence expands to non-living entities, cognitive processes are shown to derive not entirely from social factors but also from physiological cue stimulation. These cues trigger both bodily perception and social perception of warmth and competence. Clarifying their connection mechanisms will further enhance the

theoretical value and practical utility of warmth and competence for parsing reality and solving problems.

Physiological cues can be classified as early or low-level perceptual processing. Social cognition researchers have long recognized the necessity of early perceptual processing. Facial, vocal, and bodily cues participate in bottom-up cognitive processing, facilitating social categorization (Kawakami et al., 2017). Social categorization provides cognitive shortcuts but may subsequently trigger stereotypes, prejudice, and discrimination (Zuo et al., 2019; Dovidio et al., 2017), consistent with real-world stereotyping processes (Zhang & Zuo, 2012; Wang et al., 2010; White et al., 2009). Based on visual and social categorization neural mechanisms, Bagnis et al. (2019) propose that social perception represents a stable outcome of three interacting constraints: facial cue extraction, social categorization formation, and stereotype-related semantics achieving consistency through mutual interaction.

Parsing physiological cues and their mechanisms can provide simplified, operational guidance for solving complex social problems. Human behavioral diversity means that behavioral regularities may face inexplicable real-world situations (Lü et al., 2018). Warmth and competence have become effective tools for simplifying social cognitive schemas (Wang & Cheng, 2015), already providing useful instruments for reducing cognitive load. Since social factors are relatively stable, changing related warmth and competence evaluations is difficult, limiting their applicability. Physiological cues offer new breakthroughs. Therefore, we propose three research implications at theoretical and practical levels.

First, establish a “physiological-social” perceptual mapping of warmth and competence to identify typical physiological cues. When evaluating warmth and competence, every situation or event contains rich information. Researchers can either strip away all abstract, complex social factors or focus on patterns in physiological cues. According to the connection hypothesis, physiological cues may simultaneously trigger bodily perception and social perception of warmth and competence. According to the priming hypothesis, physiological cues may concretize social factors at the physiological level, triggering social perception of warmth and competence. Social cognition cannot proceed without social factors—only after perceiving individual attributes can people integrate them into complex information processing, with some attributes related to physiological manifestations. Testing both hypotheses requires systematically excavating physiological cues beyond the currently identified faces, voices, and body postures. These cues’ strong intuitive characteristics will help understand evaluation processes and may lead to concise, effective methods for changing evaluation outcomes. Formally, physiological cues carry “physiological-social” perceptual relationships, simplifying factors affecting warmth and competence evaluations. Essentially, they provide necessary cognitive processing information for warmth and competence.

Second, establish configurational mechanisms between physiological cues and warmth/competence. To reveal precise regularities, social cognition research

typically describes independent effects of specific factors on warmth and competence evaluations, explaining their combined influence through verified relationships. While this approach helps extract essential rules, it faces two dilemmas: different factor combinations alter real situations, and different combinations produce different mechanisms, weakening the utility of these regularities for understanding reality and solving problems. Known physiological cues like faces, voices, and bodies have not produced consistent, categorical patterns, making existing research models unsuitable. Instead, establishing configurational mechanisms at the set level offers a theoretically and ecologically sound approach. When people produce a warmth or competence evaluation, related physiological cues may combine in multiple ways—call these configurations. Each real situation contains specific physiological cues that produce a warmth or competence evaluation, forming a configuration corresponding to that evaluation. Cue type, structural features, frequency, and duration can serve as operational indicators, reducing each situation to a categorical physiological cue configuration. By comparing evaluation differences, configurational mechanisms can verify combined effects of different cues while revealing specific cues' independent influences.

Third, grounded in real-world needs, excavate how “physiological-social” perceptual relationships of warmth and competence prime social bias mechanisms. Warmth and competence are fundamental dimensions of social cognition content, parsing how social factors like age, race, gender, occupation, status, power, and resources produce stereotypes, prejudice, discrimination, and stigma, with predictive effects on social biases. These social factors universally exist in real situations, presetting evaluation tendencies. Guiding appropriate warmth and competence evaluations is one strategy for activating positive social bias effects and reducing negative ones. Changing social factors can achieve this but represents a long, complex systemic process. Physiological cues offer immediate adjustability for changing situational elements. Based on “physiological-social” perceptual relationships, adjusting environmental features (color, lighting, temperature) and behavioral features (mouth curvature, eye-brow movement, vocal pitch, body posture) can shift warmth and competence evaluations. The magnitude of this shift is key to how these relationships prime social bias.

At the theoretical level, exploring “physiological-social” perceptual relationships of warmth and competence will further 完善 social perception formation rules. At the applied level, physiological cues will reduce cognitive resource burdens in warmth and competence evaluations. Facing complex social problems, people must invest substantial cognitive resources to obtain solutions. Warmth and competence have already simplified complex social schemas (Wang & Cheng, 2015). As society increasingly demands social psychological services, introducing physiological cues can provide more efficient, convenient, and operational methods, promoting the nudge effect of warmth and competence in solving social problems and meeting individualized needs for specific issues in social development.

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