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COGNITIVE PATTERNS IN FACIAL SYMMETRY PERCEPTION

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Abstract. *The article focuses on the study of cognitive patterns that shape the perception of facial symmetry as a factor in evaluating personality and an individual's social relevance. The purpose of the research is to explore the cognitive mechanisms involved in the perception of facial symmetry and to identify the interpretations and socio-psychological judgments that arise from this parameter. The study employed general scientific methods of cognition: analysis; synthesis; induction; deduction; systematization; modeling; generalization. The findings show that the face is perceived as a unique type of visual stimulus, triggering both automatic and conscious cognitive processes. It was established that facial assessment occurs instantly and involves specific neural structures – the occipital and fusiform brain areas responsible for recognizing configuration, emotional expression, and social relevance. The study revealed that the brain integrates emotional reactions, repeated exposure effects, motivational significance, and the ability to decode socially meaningful signals, forming a holistic perceptual image of a person. It was found that facial symmetry automatically triggers a range of interpretations involving aesthetic, psychological, and social judgments. The results indicate that people unconsciously associate symmetry with stability, emotional balance, social openness, and trustworthiness. Symmetrical faces are linked to lower levels of neuroticism, higher agreeableness, openness to experience, and conscientiousness, while asymmetrical ones are associated with emotional tension, impulsivity, and social detachment. The practical value of the study lies in the potential application of the results in psychological diagnostics, social perception, clinical psychology, and neuropsychology.*

Keywords*: symmetry, face, cognition, perception, social evaluation.*

Introduction

The face is one of the key stimuli in human perception, allowing for rapid recognition of socially significant information. Unlike other objects, a face triggers an immediate response from both perceptual and emotional systems, forming a first impression even before conscious evaluation begins. One of the defining parameters that plays a crucial role in this process is symmetry – a structural feature perceived as a sign of naturalness, balance, and harmony.

Today, the pursuit of symmetry has become a dominant aesthetic imperative. People, either unconsciously or intentionally, tend to seek facial symmetry, seeing it as a marker of beauty, health, stability, and internal wholeness. As emphasized by L. W. Simmons et al., symmetry is viewed as a desirable developmental outcome and an indicator of genetic quality, forming the basis for numerous social and evolutionary advantages [9]. This interest in facial symmetry extends beyond everyday or aesthetic practices (such as in cosmetology) and creates demand for a deeper scientific understanding of the nature of this phenomenon.

Despite growing attention to the topic of symmetry in popular and media discourse, the scientific investigation of cognitive mechanisms behind the perception of symmetrical faces remains fragmented. There is a lack of systematic analysis of how symmetry is processed at the neurocognitive level, what conclusions an observer draws when perceiving a symmetrical or asymmetrical face, and how this perception influences judgments about personality traits. This gap highlights the relevance of the topic and defines its importance in the interdisciplinary fields of cognitive psychology, neuroscience, and social cognition.

Literature Review

The issue of cognitive patterns in the perception of facial symmetry remains insufficiently explored in the scientific literature. Significant contributions to the topic have been made by G. Rhodes, F. Proffitt, J. M. Grady, and A. Sumich [8], who demonstrated that symmetry positively correlates with ratings of attractiveness, desirability, and interpersonal appeal, regardless of the gender of the subject or the person being evaluated. Their experiment manipulating levels of symmetry indicated that even artificially idealized faces were perceived more favorably than asymmetrical ones. An equally important study was conducted by F. L. Eißing, D. Dirksen, C. Runte, and S. Jung [2], who found that excessive symmetry does not provoke rejection but is perceived positively, particularly by professionals in the medical field. This has practical value for plastic surgery, where striving for maximum symmetry is often desirable. Research by L. W. Simmons, G. Rhodes, M. Peters, and N. Koehler [9] emphasized the importance of distinguishing between fluctuating and directional asymmetry. It is the random deviations, which may signal developmental issues, that evoke negative aesthetic reactions, as opposed to more stable, directional asymmetries.

In turn, S. Bona, Z. Cattaneo, and J. Silvanto [1] presented a neurophysiological approach to studying symmetry, focusing on the role of the occipital face area (OFA) and the lateral occipital cortex (LO) in its perception. L. Noor and D. C. Evans [6] explored how symmetry affects social impressions of personality, while A. C. Little and B. C. Jones [4] demonstrated the existence of specific mechanisms of preference for symmetry that are not linked to its conscious recognition. K. Meyer, W. Sommer,

and A. Hildebrandt [5] examined symmetry within a broader context of social-cognitive abilities, and R. Onken et al. [7] discussed it in relation to clinical conditions, particularly body dysmorphic disorder. D. Švegar [10] and N. Lents [3] highlighted the connection between symmetry and notions of health, as well as its evolutionary-psychological aspects. This material is supplemented by a recent popular publication in The Guardian [11], which points to cultural hypersensitivity to symmetry in the digital age.

The study also drew on expert literature from contemporary online sources, including PsychologyToday [3] and The Guardian [11], which reflect current perceptions of symmetry in popular culture.

Despite the considerable amount of literature on the topic, there remains a shortage of systematized material directly addressing the focus of this research. Therefore, using various scientific methods, information was analyzed, grouped, and structured in line with the subject of the study.

Purpose of the Article

The purpose of the article is to explore the cognitive mechanisms involved in the perception of facial symmetry and to identify the interpretations and socio-psychological judgments formed based on this parameter. In order to achieve this goal, the following tasks will be carried out during the research: analyze the features of face perception as a socially significant visual stimulus; describe the specifics of facial symmetry perception and its role in forming initial evaluations; determine what conclusions about personality traits are drawn by observers based on facial symmetry; examine how symmetry is perceived under conditions of psycho-emotional instability or clinical deviations.

Research Results

The face belongs to a limited category of visual stimuli that receive prioritized processing in the human cognitive system. Studies by K. Meyer et al. demonstrated that face perception is accompanied by characteristic changes in behavioral strategies – particularly an increase in “response caution,” which manifests as a tendency to make slower but more accurate decisions when recognizing faces, in contrast to inanimate

objects [5]. This indicates the presence of a specific socio-cognitive mechanism that enhances error sensitivity during face identification and likely serves an evolutionary adaptive function.

Additionally, according to A. C. Little and B. C. Jones, even in the absence of conscious ability to detect symmetry in a face, people tend to visually and aesthetically single it out among other stimuli, suggesting the automatic nature of the underlying mechanisms [4]. Similar effects are supported by findings from G. Rhodes and colleagues, who linked facial symmetry with increased overall attractiveness and quicker attention engagement [8]. Moreover, the perception of facial symmetry is associated with the formation of positive judgments about personality traits such as honesty, reliability, or dominance, as shown in the research by F. Noor and D. C. Evans [6]. In turn, L. W. Simmons and colleagues argued that symmetry may be perceived as a marker of developmental stability, adding evolutionary meaning to the attractiveness of symmetrical faces [9].

At the same time, to understand how these perceptual preferences are implemented at the neural level, it is important to examine the brain structures involved in face and symmetry recognition. Within the functional-neurophysiological approach, S. Bona, Z. Cattaneo, and J. Silvanto used transcranial magnetic stimulation (TMS) to selectively inhibit the activity of key cortical areas, including the right occipital face area (right OFA), its left counterpart (left OFA), the right lateral occipital cortex (right LO), and the vertex as a neutral control site [1].

Let us consider the findings on face perception – key components responsible for processing both invariant and dynamic facial characteristics:

- Occipital face area (OFA) – responsible for the initial analysis of facial morphological features, including the relative positioning of the eyes, nose, mouth, and so on. OFA is considered the first specialized region involved in structural face encoding before any semantic interpretation occurs [1];
- Fusiform face area (FFA) – the primary structure for identifying a face as a unique individual. This region is activated when recognizing familiar faces, demonstrates selective sensitivity to facial configuration, and is critical for forming a

holistic percept [1];

- Posterior superior temporal sulcus (pSTS) – specializes in processing dynamic features such as gaze direction, mouth movement, and emotional expressions. The pSTS is responsible for the social interpretation of temporary changes in facial appearance, which is essential for understanding the intentions of an interlocutor [1];
- Lateral occipital cortex (LO) – although not face-specific, it is involved in the visual analysis of shapes and object structures in general. Its activation is relevant for recognizing overall symmetry, which may complement the processing of symmetrical facial patterns [1].

This network is supported by frontal and parietal regions involved in attention regulation, contextual assessment, and integration of social information. Therefore, the specificity of face perception – and particularly symmetry – emerges through the interaction between highly specialized sensory areas and cognitive modules responsible for social interpretation.

Let us examine the key aspects that distinguish face processing and evaluation in the human brain [3].

Table 1 - Characteristics of human face perception

№	Feature	Brief description	Criteria / examples
1	Automaticity	Faces trigger a rapid unconscious response before any rational analysis occurs.	Activation of subcortical areas during passive viewing; fast emotion recognition.
2	Separation of recognition and emotional evaluation	It is possible to “like” a face without clearly recognizing the person.	Patients with deficits in face/taste recognition but preserved emotional response.
3	Mere exposure effect	Repeated subconscious exposure increases likability even without memory of the stimulus.	Accumulation of “likes” toward faces seen previously, even if the person is not recognized.
4	Dual neural pathways	Fast subcortical and slower cortical routes operate simultaneously.	Parallel processing of threat signals and later conscious evaluation of features.
5	Division of “wanting” and “liking”	Motivational desire to look (“wanting”) and enjoyment of viewing (“liking”) are based on different mechanisms.	Separate domains of “want to see” vs. “pleasant to see” in facial perception tests.

Face perception is defined by a complex of parallel automatic and conscious processes that integrate a broad range of sensory, emotional, and socially significant information. Among the key criteria used by the brain to evaluate a face, researchers highlight immediate emotional valence; the effect of subconscious repetition; the separation of motivational appeal from aesthetic evaluation; and the ability to quickly recognize socially relevant signals such as emotional expression, gaze direction, or indicators of physical health [3]. This combination of mechanisms explains why faces spontaneously attract attention and evoke emotional responses – even when the observer has no conscious intention to focus on them.

In this context, facial symmetry gains special significance, playing a fundamental role in forming initial visual judgments. Symmetry is considered one of the most reliable markers of physical attractiveness, rooted in biological, cognitive, and sociocultural mechanisms. From an evolutionary-biological perspective, symmetry is viewed as a phenotypic indicator of developmental stability – that is, the organism's ability to maintain morphogenetic balance under internal or external stress. This stability is achieved through the precise regulation of homeotic gene expression during embryonic development and postnatal tissue growth.

Microfluctuations in symmetry, which may result from mutations, infections, toxic exposures, or nutrient deficiencies, often lead to slight but noticeable asymmetries in facial features. Even if these deviations are not consciously recognized, they may be processed subcortically as signals of potential physiological suboptimality [4]. Conversely, a high degree of symmetry is often associated with good health, genetic quality, and reproductive advantage, which underpins its universal aesthetic appeal.

Further analysis of the cognitive mechanisms involved in perceiving facial symmetry shows that this parameter functions as a high-level metasignal that integrates evolutionary, neurocognitive, and social aspects of person evaluation.

Evolutionary significance: from the perspective of evolutionary psychology, facial symmetry acts as a signaling marker of an individual's biological and genetic quality. A high degree of symmetry is interpreted as an indicator of effective adaptation

to environmental pressures, suggesting the capacity to maintain morphogenetic stability during critical developmental stages. This stability, in turn, correlates with reproductive fitness, making symmetry one of the key parameters in sexual selection processes. Individuals with more symmetrical features are more frequently chosen as mates, facilitating the transmission of symmetrical phenotypes to future generations [4].

Cognitive economy: symmetrical images possess an internal structural order that reduces the cognitive load on the perceptual system. Due to their high predictability, symmetrical configurations activate visual cortical areas more quickly and intensely than asymmetrical ones, making them easier to process under limited attentional resources. This mechanism ensures energy-efficient processing of symmetrical faces compared to chaotic or complex structures [4].

Indicator of health and psycho-emotional stability: research shows a consistent link between facial symmetry and the perception of both somatic and psychological well-being. Individuals with highly symmetrical features are more often rated positively on traits such as emotional balance, agreeableness, social appeal, and confidence. In contrast, asymmetrical features are associated with increased anxiety, impulsivity, and social tension [9].

Mnemonic accessibility: symmetrical faces are more easily remembered, more quickly identified, and more frequently classified as attractive compared to asymmetrical ones. Experimental data using mirror duplication of facial halves show that symmetrical versions create more durable perceptual traces. Thus, symmetry functions as a cognitive “mnemonic anchor” that supports the positive emotional encoding of the object [4].

Facilitation of emotion recognition: faces with a high degree of symmetry facilitate the interpretation of emotional expressions. Due to the regularity in the positioning of key features such as the eyes, eyebrows, and mouth, symmetrical faces allow for faster and more accurate decoding of emotional states. This creates the foundation for a positive first social evaluation, influencing further interaction – from trust to empathic response [4].

Social attribution: facial symmetry also affects socio-psychological evaluations. In contexts unrelated to sexual selection, symmetrical features correlate with expectations of higher competence, authority, and social influence. This indicates that symmetry serves as a basic heuristic in shaping the general psychosocial image of a person [4].

In summary, facial symmetry is a multi-level cognitive signal that enables individuals to quickly and automatically assess both the biological quality and social relevance of another person. Based on symmetry, a set of primary judgments is formed—from perceived health status to anticipated personality traits. This integrative cognitive function of symmetry lays the groundwork for further analysis of which facial features, particularly symmetry, influence the attribution of psychological characteristics. In their study, Noor F. and Evans D. C. demonstrated how facial symmetry affects the perception of personality traits and attractiveness. Their findings allow us to summarize which traits observers associate with symmetrical versus asymmetrical faces. The authors experimentally altered facial symmetry in photographs and recorded how this influenced ratings according to the Big Five personality model (table 2).

Table 2 - Perceived personality traits associated with symmetrical faces

№	Personality trait (Big Five)	Symmetrical faces	Asymmetrical faces
1	Neuroticism	Less emotional, less anxious, calm	More anxious, emotional, prone to anger
2	Extraversion	No clear difference identified	No clear difference identified
3	Openness to experience	Tendency toward greater openness	Perceived as less open, sometimes less intelligent
4	Agreeableness	More friendly, sincere	Less agreeable, more distant
5	Conscientiousness	More disciplined, reliable	Impulsive, less responsible

Symmetrical faces create impressions of emotional stability, friendliness, and responsibility in observers, along with a tendency toward openness, while asymmetry is subconsciously associated with traits linked to psycho-emotional tension, impulsivity, and lower social appeal. At the same time, extraversion as a trait did not show a stable correlation with symmetry [5].

The process of evaluating facial symmetry depends not only on the physical characteristics of the stimulus but also on the psychological state of the observer. A study by R. Onken, D. Capponi, and F. A. Dietel found that individuals with body dysmorphic disorder (BDD) perceive faces differently compared to those without clinical symptoms. Specifically, participants with BDD demonstrated heightened sensitivity to minimal deviations from symmetry; however, this accuracy does not reflect more effective or healthier recognition of facial features overall [7].

The key factor was the subjective impression: how a person interprets symmetry, not the degree to which it is objectively present. Attractiveness judgments in both BDD and non-BDD individuals depended equally on perceived symmetry, whereas objective metric indicators (such as those obtained through 3D modeling) had no significant impact on aesthetic evaluation. At the same time, individuals with BDD exhibited increased fixation on details, hypercontrol, and negative emotional reactions to their own faces, accompanied by anxiety, self-criticism, and reduced self-esteem. These findings indicate that symmetry assessment is part of a broader affective-cognitive process that becomes disrupted in the presence of mental disorders. As a result, the adequate perception of symmetry requires a holistic and stable psycho-emotional background that supports the balanced integration of sensory and cognitive mechanisms [7].

Moreover, it should be considered that ideal symmetry is not always perceived as aesthetically pleasing. As noted by D. Zaidel, perfectly symmetrical faces –especially those created artificially—often evoke visual discomfort or a sense of unease. This occurs because excessive symmetry disrupts the expected individuality of a face, making it unnaturally uniform and devoid of character [11]. The human visual system is evolutionarily tuned to detect deviations, nuances, and asymmetries that shape uniqueness and recognizability. It is often minor asymmetries that create aesthetic interest and cognitive engagement, as well as enhance the impression of a “living” presence. As a result, asymmetrical features may sometimes be perceived as more authentic, natural, and emotionally expressive than idealized symmetrical images [11].

In this light, the excessive idealization of symmetry as a universal standard of

beauty or psychological well-being is methodologically and theoretically limited. Symmetry is undoubtedly an important marker, but it is not a self-sufficient criterion in forming cognitive or social evaluations of a face. An adequate understanding of its role requires taking into account individual, contextual, and psychological variables. This opens the door to further analysis of which facial features – beyond symmetry – contribute to the attribution of psychological characteristics to others.

Conclusions

The study shows that the face is perceived as a unique type of visual stimulus that activates both automatic and conscious cognitive processes. Its evaluation occurs instantly, involving specific neural structures such as the occipital and fusiform regions responsible for recognizing configuration, emotional expression, and social relevance. The brain integrates immediate emotional response, repeated exposure effects, motivational significance, and the ability to rapidly interpret socially relevant signals, resulting in a holistic perceptual image of a person.

Facial symmetry automatically triggers a range of interpretations that include both aesthetic and psychological judgments. According to the study, people form impressions based on symmetry that reflect overall stability and predictability, emotional balance, social openness, kindness, and reliability. Symmetrical faces are associated with lower levels of neuroticism, greater agreeableness, openness to experience, and conscientiousness. In contrast, asymmetrical faces are perceived as less predictable, more emotionally tense, impulsive, and socially distant. This type of perception is quick, intuitive, and often unconscious, yet it has a significant impact on the formation of initial personality assessments.

At the same time, the accuracy of symmetry evaluation depends on the observer's psycho-emotional state. In clinical cases, particularly in body dysmorphic disorder, sensitivity to minor asymmetries increases, while the ability to make balanced aesthetic judgments decreases. Moreover, perfectly symmetrical faces may sometimes evoke feelings of anxiety or threat due to their unnatural uniformity. Therefore, symmetry is not a universal ideal, and its perception varies depending on the observer's internal state and individual experience.

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