The Facilitating Effect and Mechanisms of Shared Attention on Interpersonal Relationships

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Abstract

Joint attention refers to the immediate attentional perception from a first-person plural perspective, where an individual perceives that another person is simultaneously focusing on the same object while they themselves are attending to it. Recent studies have demonstrated that joint attention not only influences cognitive processing, emotional experiences, and motivational levels but also systematically promotes the improvement of interpersonal relationships. However, relevant evidence remains scattered across different research contexts, and an integrated framework for its underlying mechanisms is still lacking. Based on a systematic review of empirical research regarding the interpersonal benefits of joint attention, this paper integrates the primary mechanistic pathways across three levels: cognitive, affective, and motivational-behavioral, while discussing corresponding neural representations in light of electrophysiological and neuroimaging evidence. Building upon this, the paper proposes an interpersonal effect model of joint attention, emphasizing that joint attention facilitates the holistic improvement of multiple interpersonal components through the synergistic operation of multiple pathways, potentially forming a dynamic cycle of relationship enhancement. Finally, the practical implications of this model in contexts such as education and virtual reality are discussed.

Full Text

Preamble

The Facilitating Effect and Mechanisms of Shared Attention on Interpersonal Relationships*1 Yuan Shengfeng 1

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Shared attention refers to the immediate perceptual experience in which an individual, while attending to a specific object, perceives that another person is simultaneously focusing on the same object. This process leads to the formation of a

"first-person plural" perspective of current attentional awareness. Recent research has demonstrated that shared attention not only influences cognitive processing, emotional experiences, and motivational levels but also systematically promotes the improvement of interpersonal relationships.

However, relevant evidence remains scattered across diverse research contexts, and there is a lack of an integrated framework for its underlying mechanisms. Based on a systematic review of empirical studies regarding the interpersonal benefits of shared attention, this paper integrates the primary mechanistic pathways across three levels: cognitive, affective, and motivational-behavioral. Furthermore, we discuss the corresponding neural representations by incorporating evidence from electrophysiological and neuroimaging studies. On this basis, the paper proposes an Interpersonal Effect Model of Shared Attention, emphasizing that shared attention drives the holistic improvement of multiple relational components through the synergistic operation of multiple pathways, potentially forming a dynamic cycle of relational enhancement. Finally, the practical implications of this model in contexts such as education and virtual reality are discussed.

关键词

Shared attention, interpersonal relationships, common knowledge, common ground, and interpersonal attraction.

1.1 人际关系的概念、结构及常用研究指标

Interpersonal relationships are psychological relationships formed and developed during the process of human interaction (Zheng & Yu, 2011; Zhu et al., 2025). Positive interpersonal relationships not only promote individual work efficiency, learning engagement, and healthy physical and mental development but also contribute to enhancing collective cohesion and social productivity (Yu, 2024; Zeng et al., 2024; Zheng & Yu, 2011; Chen et al., 2025; Grossman, 2022; Zhu et al., 2025). Conversely, impaired interpersonal relationships or long-term negative relational states are closely associated with a series of major psychological and social problems, including anxiety, depression, self-harm, suicide, and criminal

behavior (Hu et al., 2024; Huang et al., 2021; Holt-Lunstad, 2024). It is evident that improving interpersonal relationships is of great significance for individual well-being and social development. Systematically identifying the factors that influence these relationships, and thereby providing theoretical guidance for the construction of healthy interpersonal connections, constitutes an important mission for the field of psychology in China.

Chinese scholars generally maintain that interpersonal relationships comprise three components: cognitive, affective, and behavioral. The cognitive component reflects an individual' s perception and understanding of the state of a relationship; the affective component reflects the degree of emotional satisfaction and the level of intimacy or distance between parties; and the behavioral component is manifested through the external expressions and outcomes of interaction (Zheng & Yu, 2011). This framework provides a clear and widely accepted theoretical foundation for research on interpersonal relationships. However, a substantial body of empirical research indicates that an individual' s interpersonal interaction behavior is often guided and regulated by psychological drivers such as goals, needs, and motivations (Chen et al., 2024; Gable, 2006; Ogolsky & Stafford, 2023; Rosta-Filep et al., 2023).

In recent years, relevant theoretical analyses have also pointed out that psychological processes related to others can be understood across cognitive, affective, and motivational levels, with motivation playing a key role in guiding and regulating the direction and intensity of behavior (Carlston et al., 2024). Building upon this, while retaining the cognitive and affective components of interpersonal relationships, this paper conceptualizes the traditional behavioral component as an integrated "motivation-behavior" component that encompasses both the motivational basis and the behavioral performance. This approach allows for a more systematic discussion of the generative mechanisms underlying explicit interpersonal behavior.

Previous research on interpersonal relationships has typically employed a series of psychological and behavioral indicators—such as trust, intimacy, and cooperative tendencies and behaviors—to describe or summarize the state, quality, and changes in relationships. However, due to differences in research objectives and theoretical perspectives, these indicators have mostly been used in a fragmented manner, lacking systematic integration within a unified framework. Based on the aforementioned "cognitive, affective, and motivation-behavior" tripartite framework, these indicators can be carefully organized and categorized according to their conceptual definitions and specific research functions.

Specifically, in existing research, indicators such as trust (Li et al., 2022), social distance (Wang et al., 2023; Trope & Liberman, 2010), self-other overlap (Zi & He, 2019; Wang et al., 2024), and perceived understanding (Cahn, 1990; Gordon & Chen,

2016) are frequently used to reflect the cognitive dimension of interpersonal relationships. Indicators such as intimacy (Cheng et al., 2025; Bergeron et

al., 2021), emotional bonding (Ding et al., 2023; Luo et al., 2022), and affective closeness (Korchmaros & Kenny,

2017) are primarily used to characterize the affective dimension. Meanwhile, social approach-avoidance (Chen et al., 2025; Gable, 2006; Gable & Gosnell, 2013), relationship maintenance and investment (Canary & Stafford, 1992; Rusbult, 1980; Stafford & Canary, 1991), interpersonal coordination (Zhou et al., 2022), and cooperation (Ma & Cui,

2018) are often used to represent the motivation-behavior dimension. These indicators do not constitute parallel types or dimensions of interpersonal relationships; rather, they serve to describe or quantify the state and dynamics of an individual' s interpersonal relationships across various research contexts.

1.2 共享注意的概念界定与理论基础

Shared attention refers to the psychological state in which an individual, while attending to a specific object, perceives that others are simultaneously attending to the same object, thereby forming a first-person plural perspective of the current attentional experience ("we are attending together"). In this state, the individual' s own perspective overlaps with that of the group, allowing them to perceive the world through the lens of "we" (Liu et al., 2022; Emery, 2000; Shteynberg, 2015; Shteynberg et al., 2023; Stephenson et al., 2021). As a fundamental social psychological phenomenon, shared attention is ubiquitous in daily social contexts such as conversation (Wohltjen & Wheatley, 2021), teaching and learning (Dikker et al., 2017; Forrin et al., 2021; Kalsi et al., 2023), film viewing (Dziura et al., 2021; Haj-Mohamadi et al., 2018), parent-child interaction (Green et al., 2010), and live streaming (Zheng, 2022; Lin et al., 2014). It exerts a silent yet profound influence on human learning, work, and daily life.

For a long time, the conceptual boundaries between "shared attention"and "joint attention"have not always been strictly distinguished (Shen & Lin, 2024; Emery, 2000; Pfeiffer et al., 2013). To further clarify the core concept of this paper, it is necessary to briefly explain the relationship between the two. Joint attention is typically defined as the process by which individuals coordinate their attention toward the same object during an interaction (Emery, 2000; Scaife & Bruner, 1975; Stephenson et al., 2021). Its foundational behaviors primarily include gaze following and finger pointing (Xu & Zhang, 2020). In recent years, some scholars have also emphasized communicative acts as a necessary prerequisite (Moll, 2024).

In contrast, shared attention is a subjective psychological state based on a first-person plural perspective. It can be formed by inferring from general knowledge or situational cues and does not strictly require specific gaze guidance or direct communication as a prerequisite; nor does it necessarily require the other party involved in the synchronous focus to be physically present at the same location (Shteynberg, 2015). On the other hand, these two concepts are not isolated or

mutually exclusive research categories: joint attention can be regarded as an important pathway or cue for the formation of shared attention (Stephenson et al., 2021). In certain contexts, it is precisely through the joint attention process —involving the confirmation of and feedback to gaze cues—that shared attention between individuals is established and maintained (Dikker et al., 2017; Wolf & Tomasello, 2020a).

The theory of shared attention proposed by Shteynberg in 2015 suggests that humans have gradually evolved a psychological mechanism conducive to group functioning. Its primary function is to facilitate the acquisition and maintenance of common knowledge, thereby supporting more effective interpersonal communication, understanding, and cooperation. Specifically, when individuals perceive that they are synchronously attending to an object with others to whom they feel a sense of relationship closeness, they enter a state of shared attention. In this state, more cognitive resources are focused on the object of synchronous attention.

This focus leads to a series of shared attention effects, including more robust memory (He et al., 2014; Shteynberg, 2010; Wagner et al., 2017), stronger motivation (Shteynberg & Galinsky, 2011; Walton et al., 2012), more extreme judgments (Boothby et al., 2014; Shteynberg, Hirsh, Galinsky, et al., 2014), higher emotional intensity (Shteynberg, Hirsh, Apfelbaum, et al., 2014; Wagner et al., 2015), and enhanced (behavioral) learning outcomes (Sarasso et al., 2022, 2024; Shteynberg & Apfelbaum, 2013). These effects intensify as the relationship between shared attention partners becomes closer (Boothby et al., 2016, 2017). The state of shared attention possesses significant leverage, as it can direct a substantial amount of cognitive resources toward a target synchronized with others through a relatively limited investment of initial cognitive effort (Shteynberg, 2015). Shteynberg further proposed in 2018 that the explanatory mechanisms for shared attention effects may also include the RICOR (Representation and Incorporation of Close Others' Responses) model of social influence, as well as the role of communal relationship contexts.

1.3 本文的核心问题与综述思路

As previously mentioned, systematically identifying the factors influencing interpersonal relationships and their mechanisms of action is a critical task that current psychological research must address. Against this backdrop, this paper selects joint attention—a fundamental socio-psychological phenomenon—as a key entry point for investigating the improvement of interpersonal relationships. This choice is based on several considerations. First, joint attention is ubiquitous in daily social interactions and maintains high conceptual consistency across various contexts; its core consistently refers to an individual' s mental representation that "we are attending to something together." Second, joint attention is not merely an internal individual attentional process; rather, it is predicated on the perception of another' s attentional state. It requires individuals to link their own attentional experiences with those of oth-

ers, thereby possessing distinct interpersonal attributes and functioning as a socio-psychological phenomenon naturally embedded within the structure of social interaction. Third, from a theoretical perspective, joint attention theory was originally developed to support more effective interpersonal communication, understanding, and cooperation. Introducing joint attention into the study of interpersonal relationships is not an ad hoc merging of disparate concepts, but rather an alignment with the theory' s inherent concern for the quality of human social interaction. In summary, examining interpersonal relationships through the lens of joint attention offers clear theoretical direction and broad practical significance.

Systematically incorporating the dimension of interpersonal relationships into the theoretical framework of joint attention is also essential and irreplaceable for enhancing its theoretical integrity. Although recent studies have found that joint attention contributes to the improvement of interpersonal relationships, existing theoretical reviews have yet to systematically integrate these findings [**?**, **?**, **?**], which to some extent limits our understanding of the social significance of joint attention.

At the same time, according to joint attention theory, the characteristics of interpersonal relationships (such as relational closeness) are themselves important factors that facilitate and influence the state of joint attention [**?**, **?**], a theoretical view that has received empirical support [**?**, **?**, **?**]. It is evident that interpersonal relationships are not marginal supplementary variables in the joint attention theoretical system but occupy a central position. Furthermore, synthesizing existing theory and empirical evidence reveals that the level of interpersonal relationship between partners may serve as both an input (a prerequisite and influencing factor) and an output (where joint attention promotes relationship improvement) of the joint attention state. This phenomenon suggests that joint attention may constitute a potential key link in a cycle of interpersonal relationship improvement: positive interpersonal relationships lead to stronger joint attention effects, which in turn further promote the improvement of those relationships [**?**, **?**].

Based on the above discussion, this paper will systematically review and integrate relevant research findings centered on the core question of "how joint attention promotes the improvement of interpersonal relationships." First, we will systematically review the empirical evidence demonstrating that joint attention facilitates interpersonal relationships.

Building on this foundation, we will delve into the mechanistic level by organizing the primary pathways through which joint attention influences interpersonal relationships, supplemented by relevant neuroscientific evidence. Subsequently, we will integrate these different mechanistic pathways to construct a comprehensive theoretical model of the transition from joint attention to interpersonal relationship improvement, highlighting the potentially critical role of joint attention in the cycle of relationship enhancement. Finally, we will propose prospects for future research directions.

2 共享注意促进人际关系的基本现象

In recent years, a growing body of research has demonstrated that when individuals engage in shared attention with others, it is often accompanied by positive changes in interpersonal relationships. These changes are not limited to a single metric but are reflected across various psychological components at different levels of interpersonal interaction. This chapter focuses on the fundamental phenomenon of shared attention facilitating interpersonal relationships, systematically examining these effects from three dimensions: cognitive, affective, and motivational-behavioral.

2.1 共享注意对人际关系促进作用的认知层面体现

Following the proposal of Shared Attention Theory, Shteynberg and colleagues further examined the interpersonal effects of shared attention [**?**, **?**]. The researchers assigned 447 undergraduate participants to either a shared attention group (synchronous co-attention) or a non-shared attention group (asynchronous co-attention). Psychological closeness was employed as the core interpersonal metric, primarily reflecting an individual' s subjective mental representation of the social distance between self and others. In the experiment, the participant' s shared attention partner was played by a research assistant or confederate, and a minimal sense of relational closeness was established through a creativity task prior to the start of the experiment. The results demonstrated that psychological closeness toward the partner significantly increased under the shared attention condition. Based on this large-sample experimental design, the study provided strong causal evidence and proposed the term "the interpersonal effects of shared attention" to describe the impact of shared attention on interpersonal relationships.

The aforementioned research also indicated that the existence of the interpersonal effects of shared attention depends on the specific characteristics of the stimuli. Specifically, the increase in psychological closeness only manifested when the shared stimulus content affirmed a participant' s existing beliefs (in this study, expressed as support for either evolution or creationism); no such effect was observed under conditions of belief negation or mixed information. In their discussion, the authors further noted that the stimuli used in the study were all belief-related and did not include entirely neutral stimulus types. Consequently, the conclusions of this study are primarily applicable to belief-related contexts, and their applicability to other types of stimuli or broader cultural contexts remains to be further explored.

In examining the interpersonal effects of shared attention, the studies mentioned above utilized a co-viewing paradigm. While this paradigm is often regarded as originating from the joint attention research tradition, it is also compatible with the psychological connotations of shared attention in several key respects from the perspective of method-construct matching. Classic joint attention research typically emphasizes interactive cues as core operational features, highlighting

the alignment of attention through behaviors such as gaze following [?, ?, ?, ?, ?]. In contrast, shared attention does not require explicit interaction as a necessary condition; its core criterion is whether the individual forms a subjective representation that "we are attending to this together" [?, ?]. By systematically weakening interactive cues such as gaze confirmation and deictic communication, the co-viewing paradigm ensures that the observed effects are more likely to depend on the subjective perception of another' s synchronous co-attention formed through situational cues [?, ?]. Therefore, utilizing the co-viewing paradigm as an appropriate operationalization of shared attention is clearly justified at the level of method-construct matching.

Overall, the number of empirical studies directly testing the impact of shared attention on the cognitive representation of interpersonal relationships remains limited. This highlights a weak link in the theoretical framework of shared attention that requires further empirical supplementation.

Fortunately, the existing evidence is methodologically rigorous and provides preliminary yet powerful indications that shared attention does indeed have a positive impact on the cognitive components of interpersonal relationships. We will now turn to the empirical evidence regarding the facilitative role of shared attention on interpersonal relationships at the affective level.

2.2 共享注意对人际关系促进作用的情感层面体现

Rennung and Göritz (2015) recruited university students to investigate the effects of shared attention by manipulating two experimental conditions: synchronous co-viewing and synchronous but separate viewing. The study utilized self-reported group cohesion as a core metric, which included an assessment of the individuals' experience of affective bonding. The results demonstrated that participants in the synchronous co-viewing condition reported significantly higher levels of affective bonding. However, as the evidence provided by this study was primarily established within the context of high-arousal negative emotions, it is necessary to examine whether this effect generalizes across different types of emotional valence by incorporating additional evidence.

Dziura et al. (2021) conducted a study with undergraduate students using stimuli of varying emotional valence (positive, negative, and neutral) to examine the impact of shared attention on the subjective sense of "togetherness" through a co-viewing paradigm. This metric, measured via self-reports, primarily reflects the participants' experience of affective bonding during the experiment. By using cues, the researchers manipulated the participants' subjective perception of whether their attention was congruent or incongruent with others. The findings revealed that participants' ratings of subjective togetherness were significantly higher under the shared attention condition.

Taken together, these findings suggest that shared attention consistently enhances the experience of affective bonding, regardless of whether the stimuli are high-arousal negative emotions, positive, or neutral. This indicates that the

Figure 1

Figure 1: Figure 1

facilitative effect of shared attention on the affective dimension of interpersonal relationships does not depend entirely on emotional arousal; rather, it likely stems from the mechanism of shared attention itself. In addition to this core evidence, several other studies employing different research approaches and situational settings have provided further support for the role of shared attention in promoting interpersonal relationships at the affective level (Cheong et al., 2023; Chung et al., 2024; Dunbar et al., 2016).

2.3 共享注意对人际关系促进作用的动机 — 行为层面体现

Research indicators such as social approach-avoidance and cooperation are frequently employed to reflect the motivational-behavioral dimensions of interpersonal relationships. Compared to subjective self-reports, these behavioral metrics offer significant advantages, as they can capture changes in inter-individual relationships during early human development and even within non-human animal species. Examining the interpersonal effects of joint attention from a motivational-behavioral perspective provides a critical entry point for revealing its functional characteristics across different developmental stages and species.

In a study involving 4- to 5-year-old preschool children and great apes [**?**], researchers investigated the cognitive foundations of social commitment and cooperation. The study aimed to determine whether the tendency to fulfill social expectations and maintain joint actions is a uniquely human trait or shared with our closest primate relatives.

The experimental design required pairs of participants to engage in a collaborative task to obtain a reward. The researchers introduced a condition where one participant had the opportunity to abandon the joint activity to pursue an individual reward. The results indicated significant differences between the two species. While preschool children often displayed a sense of obligation to their partner—frequently waiting for their partner or communicating before leaving—great apes were primarily driven by individual gain and showed little regard for the social commitment once a better individual option became available.

These findings suggest that the psychological mechanisms underlying social commitment may have evolved specifically within the human lineage to support complex forms of cooperation. By age four, human children already demonstrate an understanding of the normative expectations involved in collaborative activities, a trait that appears to be absent in great apes. This research highlights the importance of shared intentionality and the development of social norms in early human ontogeny, providing a clearer picture of the evolutionary divergence in social cognition between humans and other primates.

By manipulating whether participants established a common ground at the beginning of an observation (through brief mutual eye contact), researchers examined whether the viewing experience was represented as shared attention. The results indicated that children in the shared attention condition exhibited significantly higher levels of social proximity in subsequent interactions. Further research extending these findings to earlier developmental stages (approximately 2–4 years old) also observed an enhancement in subsequent social proximity behaviors within co-viewing contexts [**?**, **?**]. Providing complementary evidence at the cross-species level, studies have found that great apes also demonstrate positive changes in social proximity behavior following shared viewing experiences [**?**, **?**].

Evidence from early development and cross-species comparisons collectively suggests that the interpersonal effects of shared attention may not be entirely the product of postnatal socialization. Instead, these effects likely involve deeper evolutionary roots and biological foundations. This inference remains to be systematically tested at the mechanistic level in future research.

Beyond social avoidance, existing research has further expanded the interpersonal effects of shared attention to include aspects such as cooperation and relationship maintenance. Studies have demonstrated that shared attention can significantly enhance cooperative behavior between individuals. For instance, when individuals focus on the same object or task, they are more likely to develop a sense of "we-ness," which facilitates better coordination and mutual support in collaborative environments. This shared focus serves as a cognitive foundation for establishing common ground, which is essential for effective communication and joint action.

Furthermore, shared attention plays a crucial role in the maintenance and strengthening of social relationships. By engaging in shared attentional states, individuals signal their interest and investment in the interaction, which fosters emotional bonding and interpersonal closeness. This process is not limited to immediate interactions but also contributes to long-term relational stability. Research indicates that frequent experiences of shared attention are associated with higher levels of trust and empathy, suggesting that the ability to synchronize attention is a fundamental component of healthy social functioning and the development of enduring social ties.

empirical landscape [**?**, **?**, **?**, **?**, **?**].

Taken together, existing research consistently demonstrates at the cognitive, emotional, and motivational-behavioral levels that shared attention facilitates positive changes in interpersonal relationships across various contexts. However, the aforementioned evidence remains largely at the level of phenomenal description, and the internal mechanisms underlying the interpersonal effects of shared attention have yet to be further elucidated. The next chapter will systematically explore the potential psychological mechanisms and associated neural representations through which shared attention promotes interpersonal

relationships.

3 共享注意促进人际关系改善的机制路径

Based on the tripartite framework of interpersonal relationships (see Section 1.1), this chapter focuses sequentially on the cognitive, affective, and motivational-behavioral mechanisms underlying the interpersonal effects of shared attention. Furthermore, we incorporate supporting evidence from the field of neuroscience to examine the potential neural representations and implementation of these psychological mechanisms.

3.1 共享注意促进人际关系改善的认知路径

This section focuses on the cognitive pathways through which joint attention facilitates the improvement of interpersonal relationships. It specifically examines the following aspects: the characteristics of acquiring and forming mutual knowledge and common ground within joint attention contexts; how these "shared prerequisites" support positive shifts in the cognitive representation of interpersonal relationships; the amplifying effects of joint attention on cognitive processes; and the specific characteristics of mentalizing within joint attention scenarios.

3.1.1 共享注意通过共有知识与共同背景支持人际关系的认知表征

In interpersonal contexts, individuals must not only acquire information about the external world but also determine whether others possess the same information and whether they are aware of each other' s state of knowledge. Common knowledge is distinguished from a general state of mutual knowledge in this sense: it requires not only that information be known by multiple parties but also that each party knows the information is known by all relevant individuals [**?**, **?**, **?**]. Extensive research has demonstrated that common knowledge is a vital prerequisite for the smooth execution of communication, coordination, and collective action [**?**, **?**, **?**, **?**, **?**].

Among the various psychological mechanisms leading to common knowledge, joint attention is considered to possess a unique structural advantage [**?**, **?**, **?**]. If one relies solely on layer-by-layer inference—such as "I know that you know that I know" —common knowledge logically falls into an infinite recursion, a process that is psychologically inefficient and difficult to achieve. Joint attention provides a more cognitively feasible and efficient path for the formation of common knowledge.

When individuals experience an attentional state from a first-person plural perspective, representing an objective event or object as "content being synchronously and jointly attended to by us," the knowledge state of the other is no longer introduced as an external inference but is instead directly embedded within the attentional representation. In this state, individuals do not need to

separately confirm whether others are aware of the information they possess, because joint attention itself implies a holistic grasp of each other' s knowledge states. Consequently, joint attention effectively reduces recursive uncertainty regarding others' cognitive states without increasing cognitive load, providing a cognitively parsimonious and psychologically robust indexing mechanism for common knowledge. This structural advantage makes joint attention a critical psychological foundation for the formation of common knowledge during high-frequency, real-time interpersonal interactions.

Common ground typically refers to the set of knowledge, beliefs, or experiences that are defaulted as "already shared" by interacting parties during communication and collaboration. Its core function is to provide a shared frame of reference for understanding and action, thereby reducing uncertainty and coordination costs in communication and enabling smooth interpersonal interaction [?, ?, ?].

Common knowledge provides the essential cognitive foundation for the formation of common ground: when a piece of information is represented as common knowledge, it satisfies the conditions for being used by default in interaction, allowing it to unfold as common ground within specific interactive contexts [?, ?, ?].

The common knowledge formed through the structural advantages of joint attention, and the subsequent unfolding of common ground, constitute the "shared premises" between interacting parties in joint attention scenarios. With the formation of these shared premises, individuals no longer need to repeatedly confirm or clarify each other' s state of understanding, leading to several positive cognitive shifts. First, the criteria by which individuals judge whether they are understood by others are systematically optimized, allowing perceived understanding to be maintained at a higher level [?, ?, ?, ?, ?]. Second, individuals more easily form consistent expectations regarding others' behavioral responses (predictability) and represent the other party as a dependable agent in critical situations (reliability), thereby supporting the formation of trust judgments [?, ?, ?, ?, ?]. Third, the distinction between self and other regarding underlying premises is weakened, making it easier to represent the other as being "in the same position of understanding as oneself," which promotes the narrowing of social distance and enhances the level of self-other overlap [?, ?, ?, ?, ?].

In summary, by supporting the formation of common knowledge and its unfolding as common ground, joint attention "reinforces"the premises of understanding during interaction. This provides a cognitive foundation for the stable generation and development of various interpersonal relationship judgments.

3.1.2 共享注意认知效应及其增幅作用

Shared attention theory (Shteynberg,

2015) posits that under conditions of shared attention, an individual' s cognitive

resources are more intensely allocated to the current focus of attention. This allocation subsequently influences both the depth and the manner of information processing, leading to systematic advantages across various cognitive tasks—a phenomenon known as the cognitive effect of shared attention. A series of empirical studies have supported this perspective, with results primarily demonstrating enhancement effects in memory [**?**, **?**, **?**, **?**, **?**] and learning [**?**, **?**, **?**, **?**].

The aforementioned cognitive amplification effect is not an independent mechanism by which joint attention facilitates interpersonal cognitive representation. Instead, it functions by enhancing the depth of information processing, retention, and adoption, thereby increasing the probability and stability with which relevant content enters and is maintained as mutual knowledge, eventually unfolding into a common ground. Consequently, the cognitive amplification effect of joint attention provides a robust cognitive foundation for the "shared premise" pathway within interpersonal interactions.

This provides critical support for continued operations.

3.1.3 共享注意情境下的心智化过程

After proposing the theory of shared attention, Shteynberg and colleagues further noted that shared attention involves not only external objects in the objective world but also an inward reference to shared subjective states (Shteynberg et al., 2020). This distinction reflects the researchers' emphasis on different functional aspects of shared attention rather than a separation of the psychological phenomena themselves. That is to say, shared attention inherently implies a grasp of the attentional states of others; thus, it structurally and naturally contains components related to mentalizing (Boothby et al., 2014; Dziura et al., 2021).

Mentalizing contributes to the improvement of cognitive representations of interpersonal relationships (Asan et al., 2024; Bagby et al., 2025; Dionne et al., 2025; Fonagy et al., 2002; Frith & Frith, 2006; Wu et al., 2022). Based on the theoretical context of shared attention itself (Shteynberg, 2015; Shteynberg et al., 2020), the mentalizing process within shared attention contexts may possess unique

favorable conditions for unfolding: an individual' s understanding of another' s mental state is embedded within the framework of a "we-representation." This process does not rely on complex recursive reasoning but instead manifests as a low-load understanding process from a first-person plural perspective. Consequently, mentalizing in shared attention contexts not only "can occur" but is "more likely to occur stably," thereby further strengthening its capacity to support the improvement of interpersonal relationships at the cognitive level.

3.2 共享注意促进人际关系改善的情感路径

During interpersonal interactions, emotions not only constitute an individual' s immediate response to social situations but also serve as a vital bridge in the formation and evolution of relationships. This section focuses on the affective dimension of interpersonal relationships, systematically reviewing how shared attention regulates individual emotional experiences. Furthermore, it explores how shared attention facilitates positive shifts in interpersonal relationships, supported by key affective processes such as interpersonal attraction and empathy.

3.2.1 共享注意情绪效应：共享注意情境下人际关系改善的情感基础

Research has systematically examined the impact of shared attention on emotional experience through a series of experiments, discovering that shared attention can amplify the intensity of an individual' s emotional response to a stimulus. The direction of this amplification depends on the emotional valence of the stimulus itself (Shteynberg, Hirsh, Apfelbaum, et al., 2014). Specifically, when individuals synchronously attend to pleasant images or videos with a close other, their positive emotional experience (e.g., happiness) is significantly enhanced. Conversely, when the stimuli are replaced with sad images or videos, participants' negative emotional experience (e.g., sadness) is significantly increased. Subsequent research findings have further supported this emotional amplification effect of shared attention (Bhargave et al., 2018; Boothby et al., 2014, 2016, 2017).

On the other hand, some studies have found that in certain contexts, shared attention can lead to more positive emotional experiences for participants, even when the object of attention is a negative stimulus (Dziura et al., 2021; Wagner et al., 2015). This phenomenon does not contradict the previously mentioned emotional amplification effect; rather, it reflects differences in the hierarchy of emotional representation. While previous studies required participants to report their specific feelings toward a stimulus, Dziura et al. asked participants to report their general affective experience.

Under conditions of shared attention, general affective experiences and specific emotional reactions to unpleasant stimuli may diverge. For example, sharing unpalatable food with a friend might make the food itself seem even more distasteful, yet the overall experience may still feel better because the moment was shared with another person (Shteynberg, 2018).

Taken together, existing research indicates that shared attention can systematically optimize an individual' s emotional experience. According to classic theoretical perspectives in social psychology [?, ?, ?], positive emotion itself can serve as a reinforcing factor.

Specifically, these factors lead individuals to perceive higher levels of interpersonal attraction from those with whom they interact (May & Hamilton, 1980).

Theoretical and empirical evidence in the field of relationship science further suggests that during sustained interpersonal interactions, interpersonal attraction serves as a vital emotional foundation for the formation and deepening of relational experiences, such as intimacy (Bergeron et al., 2021; Laurenceau et al., 1998; Reis & Shaver, 1988), affective bonding (Epstein et al., 2025), and emotional closeness (Korchmaros & Kenny, 2001; Lee et al.,

1990) (Baxter et al., 2022; Byrne & Clore, 1970; Huston & Levinger, 1978; Jolink & Algoe, 2024; Regan, 2015). Consequently, the optimization of emotional experiences brought about by shared attention facilitates interpersonal attraction among interacting parties, thereby constituting a critical basis for the transformation of the shared attention effect into deeper interpersonal relational experiences.

3.2.2 共享注意通过降低共情的心理成本优化情感联结

Stephenson et al. (2021) point out that joint attention, as a high-order state of social attention, not only provides input for subsequent social cognitive processing but also simultaneously mobilizes processing networks related to emotional understanding and empathy.

Shteynberg et al. (2020) note that a key characteristic of joint attention is that it is directed not only toward external objects but also toward shared subjective states (see Section 3.1.3 for details). Under this structural condition, emotions are not merely experienced as private internal feelings; rather, they are integrated into a subjective framework of a first-person plural perspective—an experience of "what we are feeling together." Within this emotional experience structure characterized by a first-person plural perspective, the emotional states of others no longer rely entirely on complex inferential processes for understanding. Instead, they are more directly incorporated into the current mental process. In this context, empathy-related processing does not necessarily depend on high-load emotional inference or simulation. Instead, it is more likely to form a process of emotional alignment that occurs naturally within the shared context, allowing empathy to proceed with a lower threshold and reduced cognitive load.

It is noteworthy that empathy itself has been widely regarded as a critical prerequisite for the formation of affective bonds [**?**, **?**]. The role played by joint attention is not to create empathy or affective bonds from scratch, but rather to structurally optimize their operation based on existing empathy-bond pathways. By enabling a low-threshold, sustainable state of empathy, joint attention structurally enhances the efficiency of forming and maintaining affective bonds.

In summary, existing research reveals two affective pathways through which joint attention promotes the improvement of interpersonal relationships. First, it fosters interpersonal attraction by optimizing individual emotional experiences, thereby driving a series of positive changes in the experience of interpersonal relationships. Second, it enhances the efficiency of forming and maintaining

affective bonds by reducing the psychological costs of empathy. While these two pathways have different focuses, both can relatively independently fulfill the key affective functions of joint attention in improving interpersonal relationships.

3.3 共享注意促进人际关系改善的动机 — 行为路径

This section focuses on how shared attention facilitates the transition from internal psychological shifts to observable interpersonal behaviors by influencing individual motivational states and behavioral readiness.

3.3.1 共享注意通过结构性认知条件支持人际协调与合作

Existing theoretical frameworks [?, ?] and empirical evidence [?, ?, ?, ?, ?, ?, ?, ?, ?] consistently demonstrate that common knowledge constitutes one of the core cognitive prerequisites for interpersonal coordination and cooperation. Furthermore, common ground has been theorized [?, ?, ?] and empirically confirmed [?, ?, ?, ?] to facilitate interpersonal communication, coordination, and cooperation. The acquisition, maintenance, and deployment of these shared premises possess unique structural advantages within the context of joint attention (see Section 3.1.1).

Social norm theory posits that higher levels of perceived predictability and trust judgments enable individuals to achieve behavioral alignment without the need for repeated trial-and-error, particularly under conditions where strategic uncertainty is reduced by norms [?, ?, ?, ?]. This perspective is further supported by empirical research [?, ?, ?, ?]. Within this framework, joint attention provides favorable conditions for the execution of interpersonal coordination and cooperative behaviors by supporting higher levels of perceived predictability and trust during social interactions (see Section 3.1.1 for details).

Taken together, the more efficient acquisition of common knowledge, the formation of common ground, and the heightened levels of perceived predictability and trust within joint attention contexts may provide a critical psychological foundation for the occurrence of coordination and cooperation. This is achieved by enhancing motivations and behavioral tendencies oriented toward collaborative action [?, ?, ?, ?].

3.3.2 共享注意通过趋近动机塑造社交趋近行为

The motivational theory of emotion posits that emotions inherently possess both experiential and motivational-regulatory functions, providing approach-avoidance signals for an individual' s behavioral system \cite{郭秀娟等, 2023; D' Arms & Jacobson, 2023; Gable & Harmon-Jones, 2010}. This theoretical perspective has received empirical support from a range of recent studies [?, ?, ?, ?, ?]. Consequently, the optimization of emotional experience facilitated by joint attention (see Section

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1) may contribute to the activation and reinforcement of approach motivation within interpersonal interaction contexts.

Joint attention may also influence approach motivation through a parallel mechanism involving interpersonal attraction (see Section 3.2.1). Interpersonal attraction is generally understood as the positive evaluation and liking an individual develops toward an interaction partner, often operationalized through metrics such as "liking scores" and "desire for interaction." The conceptual essence of attraction inherently points toward an individual' s behavioral preference regarding whether to approach or initiate interaction in social settings [?, ?, ?, ?, ?].

Approach motivation is not synonymous with specific interactive behaviors; rather, it provides directional readiness for an individual' s behavioral choices along the social approach-avoidance continuum. When approach motivation predominates, individuals are more likely to reduce avoidance responses and increase behavioral tendencies toward proactive approach, initiating interaction, or maintaining contact in actual social situations [?, ?, ?, ?]. Thus, approach motivation serves as a vital mediating link through which joint attention influences social approach-avoidance behavior, providing a critical bridge for the transition of joint attention' s effects from the psychological level to overt interpersonal behavior.

3.3.3 共享注意通过关系承诺促进关系保持与持续投入

According to the investment model proposed by Rusbult, individuals are more likely to develop higher levels of relationship commitment when their overall evaluation of their current relationship is more positive—that is, when they experience higher levels of relationship satisfaction (Brozowski et al., 2022; Rusbult, 1980; Rusbult & Buunk, 1993). Relationship satisfaction is generally defined as an individual' s global evaluation of their current relationship, centered on a comprehensive weighing of positive and negative emotional experiences within that relationship (Liu et al., 2015; Rusbult & Buunk, 1993). Shared attention is often accompanied by more positive interpersonal experiences (see 3.2.1), thereby providing a vital psychological foundation for enhancing relationship satisfaction and its subsequent transformation into relationship commitment.

When individuals develop high levels of relationship commitment, they become more inclined to maintain and invest in their current relationship at a behavioral level rather than turning to alternative options (Rusbult, 1980; Rusbult & Buunk, 1993). Consequently, relationship commitment serves a critical motivational mediating role between relationship evaluation and specific behaviors.

Through this mechanism, shared attention—originating from immediate interactional experiences—can be gradually transformed into long-term interpersonal relationship maintenance effects. Within the framework of Rusbult's investment

model, this process is facilitated through the mediating role of relationship commitment.

3.3.4 共享注意过程中个体需要的即时满足

Joint attention is not only a state of attentional synchrony but also a social experience characterized by distinct subjective value. Existing research indicates that joint attention is often accompanied by a series of positive subjective experiences, such as an enhanced sense of social presence [?, ?], a sense of belonging to a group [?, ?], and a deeper engagement with shared experiences [?, ?].

These experiences do not arise from retrospective reflective evaluation; rather, they are immediate psychological shifts perceptible during the process of joint attention itself. The process of joint attention and its accompanying subjective experiences are highly compatible with the descriptions of "need satisfaction" found in various motivational theories, such as the satisfaction of the need to belong [?, ?], the need to share [?, ?], and the need for shared reality [?, ?, ?, ?].

The fulfillment of these needs does not primarily depend on the accumulation of long-term relationships or the outcomes of subsequent interactions. A significant number of joint attention studies utilize paradigms involving strangers, virtual partners, or short-term tasks; even in these contexts where the relational foundation is weak, individuals consistently report corresponding subjective experiences. This suggests that the satisfaction of needs through joint attention does not stem primarily from the pre-existing quality of the relationship itself, but is instead embedded within the structure of the immediate interaction. As long as a state of joint attention is established, the associated satisfying experiences can emerge in the moment of interaction.

The need satisfaction that individuals obtain during the moment of joint attention constitutes an immediate and perceptible psychological benefit. Social exchange theory [?, ?, ?] provides a powerful perspective for further understanding this process.

When individuals receive psychological rewards of subjective value from a joint attention partner during an interaction, that partner is more likely to be experienced as an attractive interaction target. Consequently, through the mediating link of need satisfaction, joint attention further facilitates the strengthening of interpersonal attraction in a social exchange sense, providing a critical foundation for positive changes in interpersonal relationships.

3.4 共享注意人际效应机制的神经层面证据

Although the facilitative effects of shared attention on interpersonal relationships are primarily manifested through a series of psychological and behavioral changes, recent neuroscientific research has provided critical support for understanding the neural representations of these shifts. Given that existing evidence primarily offers correlational and supportive clues [?, ?, ?, ?, ?, ?], this paper

does not treat neural activity itself as the direct causal mechanism of the interpersonal effects of shared attention. Instead, neural activity is understood as supportive evidence accompanying the aforementioned cognitive, emotional, and motivational processes. In other words, findings from neuroscience do not function independently of psychological mechanisms; rather, they provide cross-level corroboration for the key psychological processes involved in shared attention from a neural perspective.

Based on this premise, this section will synthesize existing neuroimaging and electrophysiological research to briefly summarize the neural evidence corresponding to the mechanisms of shared attention' s interpersonal effects. This discussion will focus on the state-based and cross-individual synergistic representations of shared attention, as well as its characteristic neural activity within key functional networks such as mentalizing, emotion, and reward processing.

3.4.1 共享注意作为持续社会背景的状态性神经表征及其跨个体维度

The core of joint attention does not lie in whether an individual happens to be directed toward the same object as another person at a specific moment; rather, it depends on whether the individual holistically represents their current attentional experience as "we are attending together" (Shteynberg, 2015). Once this first-person plural perspective is established, the individual' s processing of external information, their understanding of others' mental states, and their overall orientation toward the interactive context are systematically regulated over a period of time. In this sense, joint attention can be regarded as a sustained psychological state.

Shared attention is characterized as a sustained state rather than a series of fleeting attentional alignment events [**?**, **?**]. Furthermore, the formation of a shared attentional state depends on an individual' s perception and integration of another person' s attentional state; consequently, it possesses an inherent collaborative quality that transcends individual boundaries from its inception [**?**, **?**]. Given these "state-like" and "collaborative" characteristics of shared attention, its neural implementation should not be manifested merely as isolated, instantaneous neural responses. Instead, it likely functions as a "state-dependent collaborative representation."

Regarding the state-related aspects of neural representation, Otten et al. (2002) proposed that neural activity can be categorized into "state-related" and "item-related" components. The former refers to neural activity that remains stable across multiple trials and influences the overall processing orientation, with its variations occurring independently of specific stimuli. Building upon this conceptual framework, Dziura et al. (2021) conducted a functional magnetic resonance imaging (fMRI) study suggesting that an individual' s neural activity during joint attention involves both sustained and dynamic processes. In this context, the sustained process stems primarily from the continuous presence of the joint attention context, whereas the dynamic process arises from the tempo-

ral unfolding of the shared event itself. To address this theoretical distinction, the study employed two complementary methods: a time-averaged sustained activation analysis and a time-dependent dynamic inter-subject synchrony analysis.

This method distinguishes and characterizes the state-based neural features and dynamic synchronization neural features of shared attention. Regarding coordination, inter-brain synchrony can be regarded as a latent neural indicator reflecting the cross-individual coordination of shared attention. Inter-brain synchrony typically refers to the phenomenon where neural activity patterns between individuals exhibit correlation or synchronicity during social interaction [?, ?, ?, ?, ?]. This phenomenon may reflect that individuals are in a state of shared attention [?, ?]; furthermore, some empirical studies support the notion that shared attention may contribute to the formation of inter-brain synchrony [?, ?, ?].

In summary, both existing theoretical frameworks and empirical evidence suggest that shared attention is best understood at the neural level as a continuous, cross-individual state-dependent synergistic representation. This conceptualization provides a comprehensive framework for subsequent discussions across different levels of neural networks.

3.4.2 共享注意中的心智化网络表征

Mentalization generally refers to the psychological process by which individuals perceive and understand intentional mental states—such as thoughts, feelings, and intentions—in both themselves and others, using this understanding to interpret behavior (Arabadzhiev & Paunova, 2024; Luyten et al., 2024).

Its neural basis primarily relies on a functional network centered on the medial prefrontal cortex (mPFC) and the temporo-parietal junction (TPJ, particularly the posterior TPJ). The posterior medial cortex (including the precuneus/PCC) and temporal social-semantic regions serve as extended nodes; together, these structures support the online inference and integrative understanding of others' mental states during social interactions (Chang et al., 2023; Gan et al., 2024; Schurz et al., 2021).

While neuroimaging evidence specifically targeting joint attention contexts remains relatively limited, existing research provides important clues regarding the involvement of mentalizing networks during states of joint attention. Dziura and colleagues (2021) utilized a naturalistic co-viewing paradigm to examine differences in neural responses when individuals watched videos in either joint or non-joint attention conditions. By manipulating participants' subjective perception of whether they were "synchronously attending with another person," the experiment isolated the experience of joint attention. The results indicated that under the joint attention condition, the mPFC not only exhibited significantly enhanced time-dependent activity but also showed higher inter-subject correlation (ISC) in dynamic cross-subject synchrony analyses. Furthermore,

Stephenson et al. (2021) have theoretically proposed that joint attention may function as a higher-order social attentional state that modulates multiple social cognitive systems, including the mentalizing network.

By integrating these neural findings with the previously proposed psychological mechanisms, we can cautiously interpret the functional role of the mentalizing network in this context.

Under conditions of joint attention, the mPFC exhibits higher activation levels and stronger cross-subject time-series consistency. Although this neural pattern does not directly equate to an increase in "mentalizing efficiency," the processing stability and consistency it reflects likely correspond to mentalizing processes becoming more state-like and automated within joint attention contexts. Functionally, this is highly compatible with the "low-threshold, low-load mentalizing process" proposed in Section

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5. Furthermore, when mentalization operates as a state-based social cognitive support system—rather than an explicit tool dependent on iterative recursive reasoning—it may enable individuals to grasp the shared premises of interaction more continuously and at a lower cognitive cost. This, in turn, provides a more stable cognitive foundation for the acquisition and maintenance of common knowledge.

3.4.3 共享注意中的情绪网络表征

Neuroscientific research generally posits that emotion processing is collaboratively implemented by distributed functional networks composed of multiple cortical and subcortical regions. These primarily involve key areas such as the amygdala, insula, anterior cingulate cortex, and the ventromedial prefrontal cortex (vmPFC).

These regions are primarily involved in processes such as emotional salience assessment, interoception and subjective experience, integration of emotional responses, and emotional value evaluation and regulation, respectively [**?**, **?**, **?**].

In recent years, studies have begun to focus on the activity characteristics of emotion-related neural networks in the context of joint attention, with evidence mainly derived from electrophysiological and brain imaging research. Studies based on electroencephalogram (EEG) indicators show that joint attention can modulate neural response patterns of emotional information during early processing stages. Specifically, in a within-subject design [**?**, **?**], researchers compared neural responses to emotional face processing under alone and joint attention conditions by manipulating participants' social perception of "whether they were synchronously attending with others." The results showed that, compared to the alone condition, the amplitude of event-related potential (ERP) components related to emotional content processing (such as the early posterior

negativity, EPN) was significantly enhanced under the joint attention condition. This suggests that in joint attention contexts, an individual' s attentional allocation and neural processing gain for emotional information are increased.

Regarding brain imaging, [**?**] observed a significant social context × emotional valence interaction in the vmPFC, manifested as a stronger response in this region during the joint viewing of emotional videos (compared to non-joint viewing of emotional videos and joint viewing of neutral videos). Further valence-specific analysis revealed that the aforementioned "joint emotion vs. non-joint emotion" effect was primarily driven by negative emotional conditions, as this region showed significant differences across social contexts only in the context of negative emotions. In the bilateral amygdala, inter-subject neural synchrony under the joint positive emotion condition was significantly higher than in the non-joint positive emotion condition, while a trend toward the opposite pattern was observed under negative emotion conditions; simultaneously, synchrony in the joint positive emotion condition was significantly higher than in the joint negative emotion condition. These results indicate that in joint attention contexts, the activity of the emotional network is not enhanced globally; rather, it manifests in a valence-dependent manner through changes in the mean response of social-emotional integration nodes and the inter-individual dynamic synchrony of emotional salience nodes.

[**?**] also pointed out that joint attention rapidly integrates the emotional salience of the target object through an emotional evaluation network centered on the amygdala, coordinating emotion-related processing within a social context. This provides theoretical support for the emotional network activation and synchronization characteristics observed in the aforementioned empirical studies.

The findings described above provide neural-level support for the optimization of emotional experience in joint attention contexts (see Section 3.2.1 for details). Specifically, joint attention may simultaneously amplify an individual' s immediate experience of emotional stimuli by enhancing the early neural processing of emotion-related information. At the same time, when facing negative emotional stimuli, the differences in neural responses related to joint attention suggest that it may exert a buffering effect on the overall emotional experience, making it easier for individuals to maintain a relatively positive emotional state during interactions.

3.4.4 共享注意中的奖赏网络表征

Reward processing primarily relies on the coordinated activity of a distributed functional network centered on the ventral striatum (VS) and the ventromedial prefrontal cortex (vmPFC) [**?**, **?**, **?**]. This network collectively supports the evaluation, integration, and updating of the subjective value of stimuli or contexts. Through interactions with motivational and action systems, it facilitates the reinforcement and maintenance of behavioral choices [**?**, **?**, **?**, **?**]. Within this framework, the VS is more closely associated with reward anticipation, moti-

vational drive, and reinforcement learning, whereas the vmPFC plays a critical role in integrating value from diverse information sources—such as emotions, social cues, and goal relevance—and is regarded as a vital hub for subjective value representation [?, ?, ?, ?]. Furthermore, the reward network is highly sensitive to social contexts, such as being accepted, gaining approval, or engaging in coordinated interactions with others; these cues are generally categorized as "social rewards" [?, ?, ?, ?].

Existing functional magnetic resonance imaging (fMRI) research provides direct evidence for the involvement of the reward network in joint attention contexts. [?] found that the vmPFC is highly sensitive to the interaction between social context and emotional background: when viewing emotional videos, the time-averaged activation level of the vmPFC was higher under joint attention conditions than in solitary conditions. However, no such enhancement was observed when viewing neutral videos, which even showed an opposite trend. Similarly, in a social sharing study based on friend pairs [?, ?], researchers found that activity in the VS and the medial orbitofrontal cortex was significantly enhanced when individuals viewed emotional images together with a familiar person. Taken together, these findings consistently suggest that joint attention does not automatically increase activity in reward-related regions in all contexts; rather, the brain' s reward network is more likely to be mobilized when joint attention is combined with emotional stimuli.

From a mechanistic perspective, the activation of the reward network in joint attention contexts may provide internal support for positive changes in interpersonal relationships in two ways. On one hand, it may enhance interpersonal attraction and the tendency toward closeness by assigning value to the emotional experience of joint attention. On the other hand, an individual's relational needs are often immediately satisfied during the process of joint attention (see Section 3.3.4 for details). The associated value experience may be supported by the reward network, thereby providing an intrinsic motivational foundation for the improvement of interpersonal relationships.

4 共享注意人际效应模型

The preceding sections have systematically reviewed the primary empirical phenomena through which shared attention facilitates the improvement of interpersonal relationships, analyzing the underlying psychological mechanisms and neural representations across cognitive, emotional, and motivational-behavioral dimensions. While these discussions provide valuable clues for understanding the mechanisms behind the interpersonal effects of shared attention, a critical problem remains unresolved: how are these disparate mechanisms, scattered across different pathways, integrated during real-world interpersonal interactions to produce relatively stable changes in relationship structures? Merely providing a parallel description of these mechanisms is insufficient to explain how shared attention bridges the hierarchical gap between short-term attentional experiences and structural shifts in relationships. Consequently, it is nec-

Figure 1

Figure 2: Figure 1

essary to move beyond individual analyses to a model-based level, performing a more systematic integration of the mechanisms underlying the interpersonal effects of shared attention.

Based on these considerations, this chapter proposes an Interpersonal Effect Model of Shared Attention (Figure 1

). This model aims to provide a structural integration of existing empirical evidence and mechanistic analyses, thereby establishing a clearer and more testable connection between shared attention theory and interpersonal relationship research. By doing so, it offers a holistic perspective for understanding the systemic role of shared attention in the evolution of interpersonal relationships.

4.1.1 共享注意状态的形成与关键调节因素

This model takes the formation of a shared attention state as its starting point, which depends on two fundamental premises (Shteynberg, 2015): "simultaneous co-attention," which requires the attention of interacting parties to be directed toward the same object synchronously; and "relationally close others," which involves an individual' s immediate perception of the self-other relationship. To avoid ambiguity, the latter is further elaborated below.

Conceptually, shared attention does not merely refer to the objective alignment of attentional focus; rather, it requires individuals to form a first-person plural perspective at the subjective level, representing the attentional experience as "we are attending together." This representation implies a fundamental premise: the interacting other must be included by the individual within the category of "we." Consequently, an individual' s perception of relational closeness to the other constitutes one of the critical psychological precursors for the formation of a shared attention state (Shteynberg, 2015). Relational closeness here is not equivalent to a stable intimate relationship, but rather refers to the individual' s minimal perception in a shared context that the other can be regarded as a "member of a collective."

Operationally, this premise is treated as being met by default in some shared attention studies (e.g., Eskenazi et al., 2013; Sarasso et al., 2022, 2024). As proponents of shared attention theory have noted, simply sitting side-by-side appears sufficient to activate a minimal level of relational closeness, thereby enabling the individual to generate the perception that "we are attending together" (Shteynberg, 2015, 2018).

Relational closeness is not only a prerequisite for the formation of a shared

attention state but also a significant factor influencing its intensity and effect size. Shteynberg (2015) explicitly pointed out that a stronger state of shared attention is more likely to emerge when relationally closer others attend to the same object more synchronously; this view has also received empirical support (Boothby et al., 2016, 2017). Therefore, in the present model, "relationally close others" is regarded as an essential psychological premise for the formation of shared attention, while also serving as a psychological variable with continuous characteristics: its minimum level supports the formation of shared attention, while its increase may further amplify the psychological effects and interpersonal consequences of shared attention.

In the following sections, this model further focuses on how shared attention acts on interpersonal relationships through different pathways, integrating the previously discussed cognitive, affective, and motivational-behavioral pathways into a unified model structure.

4.1.2 共享注意人际效应的三条机制路径

(1) Cognitive Pathway: Shared attention leverages the representational advantage of a first-person plural perspective to reduce recursive uncertainty regarding the epistemic states of others. This allows critical information to more easily transition into mutual knowledge and unfold as a common ground. On this basis, interacting parties can more readily establish the judgmental prerequisites for "alignment of understanding," thereby enhancing perceived understanding, predictability of others, and perceptions of reliability (dimensions of trust). At the level of cognitive representation, this process narrows social distance and increases the level of self-other overlap. This process is further amplified by the cognitive effects of shared attention. Furthermore, mentalizing processes under conditions of shared attention typically unfold with lower cognitive load and higher stability, which further reinforces the persistence and consistency of the aforementioned cognitive judgments. (2) Affective Pathway: On one hand, shared attention promotes interpersonal attraction through positive reinforcement by systematically optimizing individual emotional experiences, and

further supports interpersonal affective experiences such as intimacy, emotional closeness, and affective bonding. On the other hand, the psychological costs of the occurrence and maintenance of empathy are reduced in shared attention contexts, thereby improving the efficiency of forming and sustaining emotional connections. (3) Motivational-Behavioral Pathway: By supporting structural cognitive conditions such as mutual knowledge and common ground, shared attention provides a more predictable and low-uncertainty psychological foundation for interpersonal coordination and cooperation. Positive emotional experiences and interpersonal attraction during interaction can activate and strengthen approach motivation, making individuals more inclined toward proximity and initiating interaction on the social approach-avoidance continuum. The positive

interactive experiences supported by shared attention can enhance relationship satisfaction and further promote relational commitment, thereby driving relationship maintenance and sustained investment. The immediate gratification of individual needs during the shared attention process can also enhance the attractiveness of the interaction partner in the sense of social exchange.

Furthermore, the preceding section (3.

4) provides cross-level supportive evidence for the aforementioned psychological pathways from a neural perspective. This evidence is not regarded as an independent causal mechanism, but rather as neural representations that accompany cognitive, affective, and motivational-behavioral processes, serving to provide support and constraints for the operational modes of the psychological pathways within this model.

4.2 模型的核心运行特征

Based on the established structure of the interpersonal effect model of shared attention, this section further examines the operational mechanisms of the model. The following discussion characterizes the overall operational features of the model from two perspectives: cross-path synergy and temporal dynamics.

4.2.1 跨路径协同的整合运行方式

The cross-path synergy emphasized in this model is not a simple post-hoc concatenation of multiple mechanistic pathways; rather, it is an operational characteristic endogenously derived from the conceptual structure of "shared attention" as a psychological state. Shared attention differs from general attentional processing in that it is a state of social attention centered on a first-person plural perspective, embedding relational cues and directed toward shared subjective states [**?**, **?**, **?**]. In this sense, shared attention does not reside at a low-level processing stage isolated from interpersonal processes; instead, it is situated at the interface between internal individual psychological processing and interpersonal relational structures.

Once a state of shared attention is established, an individual' s information processing, emotional experiences, and readiness for relationally oriented behavior no longer unfold as independent psychological processes. Instead, they become collectively embedded within a single, persistent socio-psychological context and are subject to systemic regulation by that context.

Under this integrated framework, although the three mechanistic pathways can be distinguished at an analytical level, they do not operate independently or exert their effects in isolation during actual functioning.

On the contrary, they form a tightly coupled functional system within the common socio-psychological background constructed by shared attention. For example, the common knowledge and shared background supported by shared

attention provide not only the cognitive foundation for understanding others and forming stable expectations but also the necessary safety framework for emotional investment and affective bonding [?, ?, ?, ?]. Furthermore, the improvement of emotional experiences and the resulting interpersonal attraction can reinforce the significance of the interaction itself at a value level, providing sustained momentum for approach motivation and relationally oriented behaviors [?, ?, ?]. Finally, relationally oriented behaviors and their positive outcomes repeatedly validate and consolidate existing shared premises over time, allowing common knowledge, shared backgrounds, and trust judgments to continuously accumulate and remain stable [?, ?, ?]. Thus, these three pathways are not linearly connected or simply additive; rather, under the regulation of shared attention as a superordinate socio-psychological state, they constitute a mutually supportive and reinforcing functional system that collectively drives the holistic improvement of multiple interpersonal components.

4.2.2 关系增益的动态循环

In the field of relationship science, interpersonal relationships are conceptualized as relational structures that gradually form and stabilize through ongoing interaction processes, rather than being a simple summation of one-off interaction outcomes (Back et al., 2023; Hinde, 1976; Huxhold et al., 2022).

Building upon this foundation, the present model emphasizes that the impact of shared attention on interpersonal relationships is not limited to immediate changes within a single interaction. Instead, it may unfold across a temporal dimension, establishing a dynamic cycle of relational enhancement.

As previously discussed, shared attention can facilitate improvements in interpersonal relationships; conversely, positive changes at the relational level can influence the probability of formation and the intensity of effects of shared attention in subsequent interactions. In this sense, the improvement of an interpersonal relationship is not the linear endpoint of the effects of shared attention, but rather a vital dynamic factor that constitutes its long-term impact. Consequently, the interpersonal effects of shared attention may exhibit a developmental trajectory that gradually accumulates and amplifies across successive interaction units.

The relational improvement brought about by shared attention, coupled with the reciprocal shaping of the shared attention process by the relationship itself, may constitute a self-reinforcing loop of relational gain when these elements recur over time. Within this loop, even low levels of shared attention can trigger limited but positive relational changes in the early stages of interaction. Once these changes are continuously validated and accumulated, they gradually reduce the psychological costs of forming and maintaining shared attention in the future. This allows shared attention to emerge more frequently and stably during interactions, thereby continuously elevating the level of the interpersonal relationship between individuals.

This dynamic cycle is not a deterministic developmental trajectory but rather a probabilistic process moderated by multiple factors, including relationship type, interaction context, individual differences, and chance events. Nevertheless, this perspective helps explain why seemingly brief and minor episodes of shared attention can exert long-term influences on interpersonal relationships that exceed the effects of a single instance during repeated interactions. This provides an important supplement to our understanding of the systemic role of shared attention in the evolution of interpersonal relationships.

4.3.1 模型的解释优势

The theoretical framework of shared attention proposed by Shteynberg (2015) established a solid foundation for understanding the fundamental psychological functions of shared attention, primarily focusing on its immediate impact on an individual' s various psychological processes. The present model is not a simple extension of this original theory; rather, it builds upon previous research to systematically examine how interpersonal relationships—complex structures encompassing diverse psychological elements that rely on repeated interaction and gradual accumulation—are integrally influenced and long-term shaped by shared attention.

The primary advantage of this model lies in its explanatory transition from a mere "collection of effects" to an "integrative influence." Existing research has accumulated substantial evidence demonstrating that shared attention can produce a range of psychological effects [**?**, **?**]; however, without an integrative framework focused on interpersonal relationship change, these effects often remain parallel psychological outcomes. This makes it difficult to explain why and how they collectively point toward the improvement of interpersonal relationships at a higher level. By reorganizing the effects of shared attention into an integrative framework of multi-component synergy, this model allows previously scattered psychological effects to gain functional unity at the relationship level. A second key advantage of this model is that it extends the explanation of shared attention effects from the instantaneous level to the temporal dimension necessary for relationship evolution. Most existing studies on shared attention are based on short-term experimental paradigms, focusing on the immediate psychological changes brought about by a single instance of synchronous joint attention; in contrast, the evolution of interpersonal relationships is a dynamic process that depends on repeated interactions and gradual accumulation.

If one focuses solely on the psychological reactions triggered by a single instance of shared attention, it becomes difficult to explain how these reactions translate into relatively stable interpersonal relationship evolution.

By conceptualizing shared attention as a socio-psychological state that can be repeatedly entered and continuously exerted during long-term interactions, this model emphasizes its sustained role in shaping interpersonal relationships across multiple encounters. This approach bridges the explanatory gap between short-

term effects and long-term relationship evolution. This expansion across the temporal dimension enables the model to more effectively explain the potential role of shared attention in cumulative relational outcomes—such as interpersonal intimacy, trust, and relationship maintenance—while providing a clear theoretical fulcrum for future longitudinal and ecological examinations of the interpersonal effects of shared attention.

4.3.2 模型的边界与可检验性

This model does not assume that shared attention automatically or unconditionally promotes the improvement of interpersonal relationships in all circumstances. Whether the interpersonal effects of shared attention occur, and the specific manner in which they manifest, is constrained by a series of explicit boundary conditions.

The first category of boundary conditions operates during the formation stage of shared attention. Shared attention is not automatically triggered by the mere presence of others or the alignment of attention; its establishment depends on whether the interacting other can be incorporated into a "we-frame." In other words, shared attention is established only when the other is perceived as having at least a minimal degree of relational proximity and is viewed as a potential partner. Otherwise, even if objective attentional alignment exists, it may be insufficient to enter a state of shared attention in a true psychological sense.

The second category of boundary conditions operates during the intermediate mechanistic phase following the formation of shared attention. Shared attention toward any arbitrary stimulus does not necessarily produce stable interpersonal facilitation. A potential implicit prerequisite is that the content must be capable of being integrated into a shared mental space—one that "we can jointly understand and jointly endure." When a shared stimulus is structurally difficult to integrate communally, or if it continuously triggers individual psychological defense reactions, the intermediate psychological mechanisms supporting relational improvement may be disrupted, even if shared attention is formally established. Within these disruptive boundaries, belief threats provide a representative example [**?**, **?**].

The third category of boundary conditions operates during the consolidation stage of relational effects, determining whether the psychological effects triggered by shared attention can be transformed over time into a relatively stable interpersonal relationship structure. Even if shared attention is formed and relevant psychological mechanisms are activated, its interpersonal effects do not automatically evolve into long-term relational changes. If the interaction lacks sufficient repetition and stability, the impact brought about by shared attention may remain only at an immediate or short-term level.

Based on these structured boundary settings, the present model possesses clear testability and is capable of generating differentiated empirical predictions. Different types of shared attention manipulations, situational structures, and inter-

action frequencies should produce distinguishable psychological and relational outcomes at the various stages indicated by the model. Furthermore, the model supports testing across multiple timescales, including immediate psychological reactions, cumulative changes across interactions, and longitudinal relational development trajectories.

If the phenomenon of relational improvement fails to appear, or if relevant relational indicators do not show cumulative changes despite the conditions for shared attention formation being met and relevant psychological mechanisms being activated, the core hypotheses of this model regarding the interpersonal effects of shared attention will face empirical challenges.

5 总结与展望

This paper focuses on the core scientific question of "how shared attention promotes the improvement of interpersonal relationships," systematically reviewing and integrating relevant theoretical and empirical evidence. Based on the "cognitive-affective-motivational-behavioral"tripartite framework of interpersonal relationships, this article progresses from phenomenological description to mechanistic analysis. Furthermore, it constructs an interpersonal effect model of shared attention and reveals its holistic operational characteristics, including cross-path synergy and temporal dynamics. This integrated understanding also suggests that current research on the interpersonal effects of shared attention still leaves room for further clarification and expansion regarding several key issues.

In the following sections, we provide a brief outlook on future research directions, incorporating current research progress.

5.1 共享注意人际效应模型的拓展与检验

Future research can expand and test the interpersonal effect model of shared attention from both temporal and conditional dimensions.

5.1.1 共享注意人际效应在时间维度上的拓展与检验

Existing research on the interpersonal effects of shared attention has primarily focused on immediate outcomes within single or short-term interaction contexts (see [**?**] for details). These studies typically examine how synchronized focus on a common object influences social cognition and behavior in the moment. However, there is a notable scarcity of longitudinal research investigating the enduring impact of repeated shared attention experiences on long-term relationship dynamics.

Current literature suggests that shared attention serves as a foundational mechanism for social bonding, facilitating mutual understanding and emotional alignment between participants. While the immediate prosocial benefits—such as

increased trust and enhanced cooperation—are well-documented, the developmental trajectory of these effects remains under-explored. Specifically, it is unclear whether the prosocial advantages of shared attention accumulate over time to foster stable interpersonal bonds or if these effects diminish without continuous reinforcement.

Furthermore, the cognitive and neural mechanisms underlying the transition from transient shared attention to sustained interpersonal rapport require further clarification. Most experimental paradigms utilize controlled, brief interactions that may not fully capture the complexity of real-world social development. Future research should aim to bridge this gap by employing longitudinal designs and ecologically valid settings to determine how shared attention contributes to the formation and maintenance of long-term social relationships.

第二章)。这些研究为理解共享注意的基本社会效应提供了重要线索，但不足以解释共享注

How shared attention influences interpersonal relationships—a social structure characterized by temporal extension and relative stability—remains a critical question. Based on the interpersonal effect model of shared attention, this paper emphasizes that shared attention exerts a dynamic influence that unfolds over long-term interactions (see Section 4.2.2 for details). Consequently, it is necessary for future research to shift its analytical perspective from asking whether a single instance of shared attention produces an effect to investigating whether and how shared attention functions across a temporal dimension. In other words, future studies should situate the interpersonal effects of shared attention within a broader longitudinal framework to examine whether it exhibits temporal characteristics distinct from its short-term effects.

A core testable question is whether the short-term interpersonal effects brought about by shared attention maintain a consistent direction across multiple interactions and exert a sustained influence on the evolution of interpersonal relationships. If shared attention indeed participates in the process of relationship evolution, its effects should manifest temporally as cumulative changes in relationship-related variables or as differences in developmental trajectories. To address this issue, future research could employ repeated measures or longitudinal designs to compare the stability and evolutionary patterns of interpersonal relationship indicators across multiple interactions. This would allow researchers to test whether shared attention possesses long-term effects or "sedimentation effects" at the relational level.

Furthermore, examining the temporal dimension helps distinguish the different roles shared attention may play at various stages of an interpersonal relationship. Specifically, regarding the relationship formation stage, future research could focus on whether shared attention influences the relationship priming process during initial encounters—for instance, by accelerating the formation of positive relational judgments or reducing interactional uncertainty. In contrast,

during the relationship maintenance stage, the research focus could shift toward the stabilizing function of shared attention in long-term interactions. For example, researchers might investigate whether shared attention helps buffer the impact of negative events, maintain existing levels of trust and intimacy, or reduce the risk of relational deterioration and interaction breakdown. By distinguishing between different stages of relationship development in research designs and specifically examining the relational indicators and change patterns associated with each stage, we can more precisely characterize the specific functions of shared attention throughout the developmental process of interpersonal relationships.

5.1.2 共享注意人际效应模型的边界条件检验

Another critical research task regarding the interpersonal effect model of shared attention lies in testing its boundary conditions. As previously noted, this model does not presuppose that shared attention exerts a universal, automatic, or unconditional facilitative effect on interpersonal interaction. On the contrary, it explicitly assumes that the occurrence of shared attention and its subsequent interpersonal effects depend on a series of prerequisites and contextual constraints (see Section 4.3.2 for details). Future research could empirically test these boundaries through systematic conditional controls and comparative perspectives, thereby further clarifying the scope and limitations of the model.

First, a fundamental test of boundary conditions involves whether shared attention is truly established at the psychological level. Future studies could examine whether shared attention itself constitutes a necessary condition for its interpersonal effects by distinguishing between "objective attentional alignment" and "subjective shared attention." Adopting this comparative perspective would also prevent the simple attribution of shared attention effects to mere social presence or interpersonal synchrony, thus enhancing the conceptual precision of the model testing. Second, regarding the boundary settings in the model concerning the nature of shared stimuli, future research could conduct conditional tests focusing on whether the stimuli support relationship improvement. For instance, researchers could systematically compare different types of shared stimuli to investigate their differentiated roles in relational outcomes.

By incorporating instances where the effects of shared attention "fail" or are "interrupted" into the analytical framework, future work can treat these cases as vital evidence for establishing model boundaries rather than merely dismissing them as anomalies or invalid results. Finally, regarding the boundary issue of whether the interpersonal effects of shared attention can accumulate across interactions and settle into stable relational outcomes, it is necessary to further distinguish between different modes of interaction extension. By comparing structured interaction contexts—characterized by stable interaction partners and clear relational cues—with contexts where relational cues are weakened and

interaction experiences are highly fragmented, future research can further clarify under what conditions shared attention effects are more likely to translate into relational evolution over time.

5.2 共享注意人际效应的情境拓展与实践应用

The interpersonal effect model of shared attention holds significant potential for application across various practical contexts. Educational settings, in particular, possess structural characteristics such as relatively stable interaction partners and high-frequency, long-duration interactions. these features provide a highly compatible contextual foundation for the repeated formation and maintenance of shared attention states. During the teaching process, the synchronous joint focus continuously formed between teachers and students around the same instructional content is more easily mentalized by individuals as the shared attention experience of "we are attending to this together," thereby providing a stable prerequisite for the occurrence of interpersonal effects.

As previously mentioned, a mutually reinforcing gain cycle exists between the intensity of shared attention and the quality of interpersonal relationships; this operational characteristic holds true in educational contexts as well. Stronger states of shared attention help further promote information processing, memory retention, and learning outcomes, while higher interpersonal relationship quality facilitates increased learning engagement and academic performance [**?**, **?**, **?**]. Positive interpersonal relationships and learning effectiveness are not independent of one another; rather, they are bidirectional benefits co-generated within the virtuous cycle supported by shared attention.

Virtual reality (VR) technology provides a more "pure" contextual soil for shared attention. In virtual spaces, individuals are less disturbed by various explicit social factors associated with physical co-presence, offering ideal conditions for testing shared attention as an independent state of social attention. Simultaneously, virtual reality environments possess high technical controllability [**?**, **?**, **?**], allowing researchers to flexibly manipulate key influential variables —such as stimulus presentation, character modeling, and scene settings—to systematically investigate the patterns, characteristics, and boundary conditions of the interpersonal effects of shared attention.

Compared to general remote shared attention contexts, shared attention in virtual reality environments often exhibits higher effect intensity [**?**, **?**, **?**]. From a practical perspective, this characteristic provides important insights for immersive online learning and Metaverse-related applications.

When shared attention is sustained within a virtual space, its interpersonal relationship promotion effects—generated through cognitive, emotional, and motivational-behavioral pathways—can unfold effectively even under remote conditions without physical co-presence. This provides a theoretical basis for understanding learning engagement, collaborative efficiency, and relationship building in technology-mediated environments.

Beyond education and virtual reality, the interpersonal effect model of shared attention can serve as a theoretical reference for various social practice domains. For example, in parent-child interactions, shared attention may constitute an early form of the relationship gain cycle, supporting the development of mutual understanding and emotional bonds through repeated synchronous joint focus. Among the elderly, activities related to shared attention may serve as a relational resource to alleviate social isolation and reduce feelings of loneliness [**?**, **?**, **?**]. In clinical and counseling contexts, shared attention can also be viewed as a potential mechanism for interpersonal intervention, offering a new perspective for improving the quality of partner relationships or family interactions.

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The promoting effect of shared attention on interpersonal relationships and its underlying mechanisms YUAN Shengfeng1, LIU Juntong2, XIA Yi1, ZHANG Yarui1,3, LEI Yi1,3 (1 Institute of Brain and Psychological Sciences, Sichuan Normal University, Chengdu 610066, China) (2 School of Psychology, Shenzhen University, Shenzhen 518060, China) (3 Sichuan Student Mental Health Education Research Center, Chengdu 610066, China)

Abstract

Shared attention refers to a state in which individuals attend to an object while perceiving that others are simultaneously attending to it, thereby generating a momentary attentional experience from a first-person-plural perspective. Recent research suggests that shared attention not only influences cognitive processing, affective experience, and motivational states, but may also systematically facilitate improvements in interpersonal relationships. However, the relevant evidence remains scattered across diverse research contexts, and the underlying mechanisms have yet to be integratively clarified. Based on a systematic synthesis of empirical studies on shared attention and interpersonal relationship outcomes, the present article integrates the primary mechanism pathways of shared attention at the cognitive, affective, and motivational—behavioral levels, and discusses their corresponding neural representations drawing on evidence from electrophysiological and neuroimaging research. On this basis, we propose an Interpersonal Effects Model of Shared Attention, highlighting how shared attention operates through the coordinated functioning of multiple pathways to promote holistic, multi-component improvements in interpersonal relationships, potentially giving rise to a dynamic cycle of relational gains. Finally, implications of this model for applied contexts, including education and virtual reality, are discussed.

Keywords

shared attention, interpersonal relationships, common knowledge, common ground, interpersonal attraction