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# *Neural Differences Between Prosocial and Self-Serving Lies: A Review of Evidence from Cognitive Neuroscience*

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***Abstract.*** There has been numerous evidence from neuroimaging and electrophysiological studies that suggest overlapping but distinct networks between self-serving lies and prosocial lies. On the basis of current research, self-serving lies engage the dorsolateral prefrontal cortex and anterior cingulate cortex, reflecting heightened cognitive control and moral conflict, while prosocial lies recruit the temporoparietal junction and medial prefrontal cortex, which emphasizes empathy and social cognition. Researchers also attach importance to the interplay between executive control, social processing, and emotional regulation in deception. By understanding these neural differences, we can make contributions to developmental psychology, cross-cultural research, forensic applications, and the design of socially adaptive artificial intelligence systems.

***Keywords:*** Prosocial Lies, Self-Serving Lies, Neural Mechanisms

## 1. Introduction

Deliberate deception differs from simple errors or omissions. It requires strong needs to inhibit truthful responses, generate alternative narratives, and anticipate others' beliefs. Lying has been a focus of research for a long time in psychology, neuroscience, and philosophy, which integrates multiple cognitive and emotional processes. Recent research in cognitive neuroscience enables the investigation of the neural substrates of deception. They offer insights into the brain mechanisms. These mechanisms allow individuals to manipulate the truth in different social contexts.

Not all lies stem from the same motives. They do not serve the same functions. A growing body of research distinguishes between prosocial lies and self-serving lies. Prosocial lies aim to benefit others or maintain social harmony. Self-serving lies primarily seek personal gain. Telling a friend their performance was good to spare their feelings exemplifies a prosocial lie. Concealing a mistake to avoid punishment reflects a self-serving one. Behavioral studies indicate these two types of lies differ in moral evaluation, cognitive demands, and emotional load. This raises the question. Do they rely on distinct neural mechanisms?

Cognitive neuroscience provides a valuable framework for addressing this question. Functional neuroimaging and electrophysiological studies have begun mapping the brain regions. These regions engage in different forms of deception. They highlight the role of the prefrontal cortex, anterior cingulate cortex and temporoparietal junction, among others. Emerging evidence suggests prosocial

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and self-serving lies may recruit overlapping but partially divergent neural networks. This reflects differences in cognitive control, social cognition, and emotional processing.

The present review synthesizes current findings. It focuses on the neural basis of prosocial versus self-serving deception from a cognitive neuroscience perspective. It specifically addresses three key aspects. These are the differential activation of brain regions, the role of executive control mechanisms, and the contribution of affective and social-cognitive processes. This review compares evidence across neuroimaging and electrophysiological studies. It clarifies how the human brain supports two functionally distinct yet closely related forms of lying.

## 2. Theoretical background

Deception does not function as a unitary construct. It encompasses behaviors. These behaviors vary in motivation, social function, and moral evaluation. Researchers commonly distinguish between prosocial lies and self-serving lies within this spectrum. Prosocial lies qualify as intentional falsehoods. They aim to benefit others or maintain social relationships. Reassuring a friend with a compliment to protect their feelings serves as an example. Self-serving lies primarily aim to advance one's own interests. Denying responsibility for a mistake to avoid blame or punishment offers an example. This distinction reflects different motivational systems from a psychological perspective. Prosocial lies often stem from empathy and social cohesion. Self-serving lies are linked to self-protection and reward-seeking behaviors.

Behavioral studies reveal differences between the two forms of deception. They differ in purpose, cognitive profiles, and temporal profiles. Self-serving lies tend to require stronger inhibitory control. Individuals must suppress truthful responses under conditions of personal accountability. They connect to longer reaction times. This aligns with the higher cognitive load from self-related risk evaluation. Prosocial lies may emerge more fluently in socially adaptive contexts. This holds especially true when they align with cultural norms of politeness or altruism. Moral appraisal creates further differentiation. Prosocial lies frequently receive judgment as more acceptable or even virtuous. Self-serving lies evoke stronger moral conflict and guilt responses.

Several theoretical frameworks explain these behavioral patterns. They provide a foundation for examining their neural basis. Moral psychology offers a lens. It helps understand how value-based decision-making guides lying behavior. It highlights the interplay between self-interest, social norms, and emotional regulation. Conflict monitoring theory and broader cognitive control models make propositions. Deception—particularly self-serving lies—engages neural systems. These systems detect and resolve response conflicts. The anterior cingulate cortex and dorsolateral prefrontal cortex count among them. Dual-process models of moral cognition suggest further details. Prosocial and self-serving lies may recruit automatic affective processes and deliberative control mechanisms differently. This depends on the degree of moral conflict and social context.

These perspectives underscore key points. Prosocial and self-serving deception do not exist merely as two points on a behavioral continuum. They represent qualitatively distinct strategies. Different motivational, cognitive, and moral processes underpin them. This conceptual distinction forms the basis for investigation. It targets their corresponding neural mechanisms within cognitive neuroscience.

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## 3. The mechanism of lying on two different occasions

### 3.1. The overall mechanism of lying

Deception involves a distributed neural network that integrates executive control, conflict monitoring, emotional regulation, and social-cognitive processes. The prefrontal cortex holds a central role here. Functional imaging studies show consistent increased activation in the dorsolateral prefrontal cortex (DLPFC) and ventrolateral prefrontal cortex (VLPFC) during lying tasks. This activation reflects their involvement in suppressing truthful responses and maintaining task-relevant representations of the fabricated narrative [1, 2]. This matches the view that deception places high demands on cognitive control and working memory.

The anterior cingulate cortex (ACC) often engages when individuals lie. This happens particularly under conditions involving moral or social conflict. Its activation serves as a marker of response conflict and error monitoring. This highlights the need to detect and resolve competition between truthful and deceptive responses [3].

The amygdala and related limbic structures support emotional and motivational aspects of lying. These regions react to the affective salience of deception. This is especially true when personal risk or anticipated punishment is involved. They link emotional arousal with strategic behavior [4].

Components of the default mode network (DMN) include the medial prefrontal cortex and posterior cingulate cortex. These components connect to self-referential processing and perspective-taking during deception. Their engagement indicates that lying requires constructing mental models of others' beliefs and intentions. This is especially the case in social contexts [5]. These findings together show that deception emerges from the dynamic interplay between executive, emotional, and social-cognitive neural systems. It does not come from a single "lie center" in the brain.

### 3.2. The neural mechanism of self-serving lies

Self-serving lies is closely related to executive control, conflict monitoring, and value-based decision-making. Functional imaging studies have shown consistent enhanced activation in the right dorsolateral prefrontal cortex (DLPFC) in self-benefiting deception. This region inhibits truthful responses but maintains deceptive representations under high cognitive demand [2, 6]. Other studies show that the ventromedial prefrontal cortex (VMPFC) also contributes to this process. This part of the brain evaluates personal outcomes and integrates reward-related information when weighing the costs and benefits of deception [6].

When people tell self-serving lies, the anterior cingulate cortex (ACC) shows prominent activity level as well. This happens particularly when moral norms are violated or personal risk is high. This pattern fits conflict monitoring models. The ACC detects competition between the prepotent truthful response and the deceptive alternative. It detects emotional tension between moral values and self-interest as well [3]. Researchers also found that increased ACC activation in self-serving deception suggests these lies can bring greater cognitive and moral conflict than prosocial lies.

In summary, self-serving lies depend heavily on top-down cognitive control and self-referential valuation systems. The combined use of the right DLPFC and VMPFC emphasizes the need to suppress truth, build a convincing alternative, and calculate potential gains. The ACC's involvement highlights the intrinsic moral and cognitive tension that marks deception for personal benefit. This tension distinguishes it from lies told for socially oriented motives.

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### 3.3. The neural mechanism of prosocial lies

Prosocial lies are linked to social cognition, empathy, and moral reasoning. Functional neuroimaging studies show that temporoparietal junction (TPJ) activity increases reliably during prosocial deception; this reflects the need to adopt another person's perspective and anticipate their emotional state [7]. The medial prefrontal cortex (MPFC) and posterior cingulate cortex (PCC) also engage more strongly when individuals tell lies intended to benefit others. These regions form key components of the social brain and the default mode network; they support self-referential processing and mentalizing about others' beliefs and intentions.

Electrophysiological evidence also supports these findings. In event-related potential studies, prosocial lies elicit weaker conflict-related signals in the anterior cingulate cortex than self-serving deception, which means that "white lies" generate less moral and cognitive dissonance. Increased activity in the left prefrontal cortex across studies tells us that even prosocial deception requires cognitive control to inhibit truthful responses and maintain a fabricated narrative.

The neural pattern tied to prosocial lies thus reflects a balance between executive regulation and social-cognitive processing. Reduced conflict signals relative to self-serving lies indicate that social approval and altruistic intent may ease moral tension; heightened TPJ and MPFC activation highlights the central role of empathy and perspective-taking. These findings establish prosocial deception as a distinct form of lying. It engages networks specialized for maintaining social harmony while still relying on core executive mechanisms for truth suppression and response selection.

### 3.4. Comparison

Prosocial and self-serving lies share the same core executive demands but rely on partially divergent neural systems. These systems reflect the lies' distinct motivational and moral contexts. Self-serving lies consistently cause stronger activation in the right dorsolateral prefrontal cortex (DLPFC) and anterior cingulate cortex (ACC). The DLPFC supports suppression of truthful responses under high cognitive load. The ACC indexes heightened conflict between moral norms and self-interest; it signals the need for increased cognitive control [3]. This pattern indicates that self-benefiting deception involves stronger inhibitory and conflict-monitoring demands.

Prosocial lies involve greater activity in the temporoparietal junction (TPJ), medial prefrontal cortex (MPFC), and posterior cingulate cortex (PCC). These regions link to social cognition and perspective-taking [7, 8]. This activity reflects the need to model another person's beliefs and emotional states when creating a lie to benefit them. Reduced ACC activation compared to self-serving lies matches behavioral findings. "White lies" generate less moral dissonance, likely because they align with prosocial motives and social approval.

In all, self-serving lies depend more on executive and conflict-monitoring circuits. Prosocial lies mainly use social-cognitive and empathy-related networks. Both types use prefrontal regions to suppress truth. Their neural signatures differ based on underlying motivational and moral demands.

## 4. Future expectations

Although substantial progress has been made in identifying the neural substrates of prosocial and self-serving deception, several avenues still remain open for future research. One critical direction examines developmental trajectories. Evidence from developmental cognitive neuroscience shows that the ability to lie and the associated neural control systems mature gradually across childhood

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and adolescence [9]. Investigations into whether prosocial and self-serving lies follow distinct developmental patterns could illuminate how social cognition and moral reasoning shape deception across the lifespan.

Another promising tendency of inquiry is related to cross-cultural studies. Cultural norms strongly influence the moral evaluation of lies, particularly prosocial ones. Neuroimaging work shows that cultural context can modulate activity in regions such as the medial prefrontal cortex and temporoparietal junction [10]. Systematic cross-cultural comparisons could clarify how societal values alter the neural balance between cognitive control and social-cognitive networks during deception.

Methodologically, the field would benefit from multimodal approaches. These approaches combine techniques such as fNIRS with EEG or integrate brain imaging with eye-tracking. They capture the temporal and ecological dynamics of lying in more naturalistic settings [11]. Bridging the gap between laboratory paradigms and real-world behavior prediction remains essential. Developing experimental designs that mimic authentic social interactions and longitudinally tracking deception-related neural markers may enhance the ability to predict dishonest behavior in applied contexts, such as legal or organizational settings.

## 5. Conclusion

Self-serving deception contains the right dorsolateral prefrontal cortex and anterior cingulate cortex more strongly, reflecting high demands for cognitive control and the resolution of moral conflict [2, 3]. However, Prosocial lies rely more heavily on the temporoparietal junction and medial prefrontal cortex—regions central to social cognition and perspective-taking; this reliance indicates that empathy and theory of mind processes are critical for generating altruistic deception [7, 8].

These neural distinctions highlight the interplay between cognitive control, social cognition, and emotional regulation as key components of lying behavior. These studies that explain the brain mechanisms behind different types of lies have significant implications across fields. In judicial settings, differentiating intentional self-serving deception from socially motivated lies helps us refine lie-detection paradigms. In education and developmental psychology, we can map the maturation of these neural systems and inform approaches to moral development. In artificial intelligence and human–machine interaction, we will have more insights into the neural basis of prosocial versus self-serving deception can guide the design of socially adaptive AI. Such AI would navigate complex moral contexts effectively.

Current evidence supports the view that prosocial and self-serving lies share a common foundation in executive control and truth inhibition but depend on partially distinct neural systems. By distinguishing the neural architecture of these two forms of deception, we can not only advance cognitive neuroscience, but it can also connect basic research with applied domains where truth, trust, and morality intersect.

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