Yes, the dorsolateral prefrontal cortex (dlPFC) is **crucial for overriding existing beliefs** when presented with strong evidence by supporting **belief updating, cognitive control, and flexible decision-making**.

1. Introduction

The dorsolateral prefrontal cortex (dlPFC) is a central hub for executive functions, including cognitive control, working memory, and adaptive decision-making. A growing body of research demonstrates that the dlPFC plays a pivotal role in overriding existing beliefs when individuals are confronted with strong, contradictory evidence. This process involves integrating new information, suppressing prior biases, and flexibly updating internal models of the world (Bartolo & Averbeck, 2020; Schulreich & Schwabe, 2020; Benoit et al., 2015; Presti et al., 2025; Jamali et al., 2019; Baumgartner et al., 2011; Prado & Noveck, 2007; Donahue & Lee, 2015; Chawke & Kanai, 2016; Parris et al., 2009; Panidi et al., 2022; Aydogan et al., 2018; Dixon & Christoff, 2014; Xia et al., 2021; Kobayashi et al., 2021; Carter & Veen, 2007; Gerchen et al., 2024; Lin et al., 2020; Philiastides et al., 2011; Qureshi et al., 2020; Wang et al., 2023). Both neuroimaging and causal intervention studies (e.g., transcranial magnetic stimulation, tDCS) show that dlPFC activity increases during belief revision, especially under uncertainty or when prior beliefs are challenged (Bartolo & Averbeck, 2020; Schulreich & Schwabe, 2020; Baumgartner et al., 2011; Prado & Noveck, 2007; Chawke & Kanai, 2016; Parris et al., 2009; Panidi et al., 2022; Hu et al., 2022; Xia et al., 2021; Carter & Veen, 2007; Philiastides et al., 2011; Qureshi et al., 2020; Wang et al., 2023). The dlPFC interacts with other prefrontal and cingulate regions to detect conflict, accumulate evidence, and implement top-down control, enabling individuals to adaptively revise beliefs and make decisions aligned with new evidence (Bartolo & Averbeck, 2020; Schulreich & Schwabe, 2020; Baumgartner et al., 2011; Prado & Noveck, 2007; Donahue & Lee, 2015; Chawke & Kanai, 2016; Parris et al., 2009; Panidi et al., 2022; Dixon & Christoff, 2014; Xia et al., 2021; Carter & Veen, 2007; Philiastides et al., 2011; Qureshi et al., 2020; Wang et al., 2023). This review synthesizes the literature on the dlPFC's mechanisms in belief updating and highlights its importance for rational thought and behavioral flexibility.

2. Methods

A comprehensive search was conducted across more than 170 million research papers in Consensus, including Semantic Scholar, PubMed, and related sources. The search targeted the dlPFC's role in belief updating, cognitive control, and overriding prior beliefs in the face of strong evidence. In total, 1001 papers were identified, 609 were screened, 293 were deemed eligible, and the 46 most relevant papers were included in this review.

Search Strategy

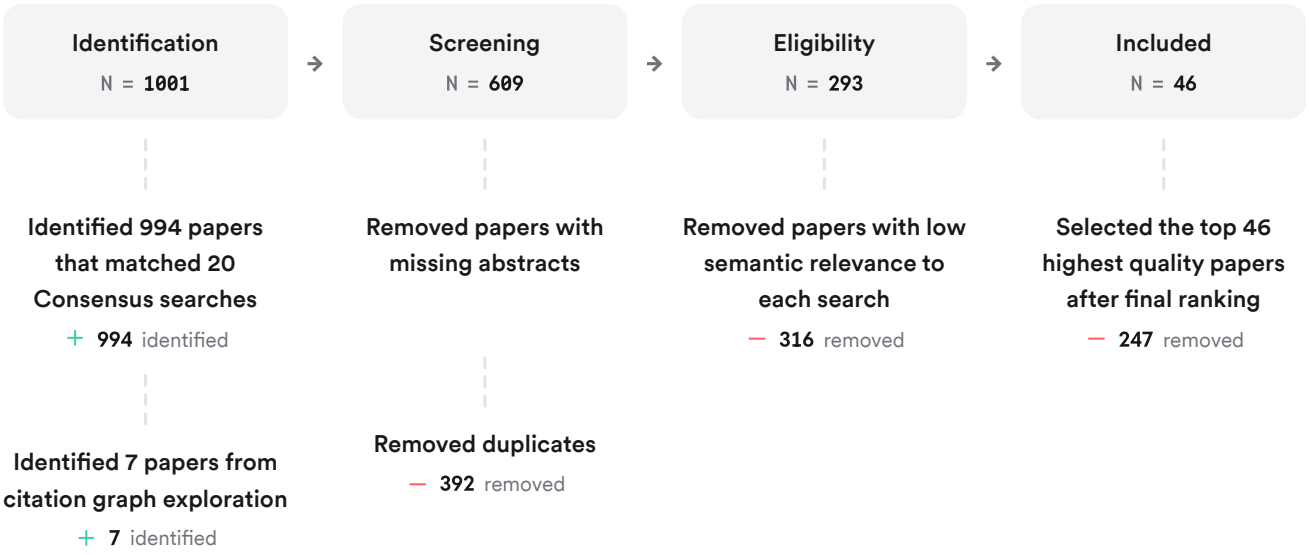

FIGURE 1 Flow diagram of the literature search and selection process.

Eight unique search groups were executed, focusing on foundational dlPFC frameworks, belief updating, cognitive control, null findings, and interdisciplinary perspectives.

3. Results

3.1. dlPFC and Belief Updating Under Uncertainty

The dlPFC is consistently activated during tasks requiring belief updating, especially in uncertain or changing environments. Causal studies using tDCS and TMS demonstrate that stimulating the right dlPFC enhances normative belief updating and adaptive decision-making, supporting a direct role in integrating new evidence and revising prior beliefs (Bartolo & Averbeck, 2020; Schulreich & Schwabe, 2020; Baumgartner et al., 2011; Chawke & Kanai, 2016; Panidi et al., 2022; Philiastides et al., 2011; Qureshi et al., 2020; Wang et al., 2023).

3.2. Cognitive Control and Conflict Resolution

The dlPFC is engaged when individuals must override automatic or habitual responses, resolve conflict between prior beliefs and new evidence, and inhibit cognitive biases such as confirmation bias or belief perseverance (Prado & Noveck, 2007; Donahue & Lee, 2015; Chawke & Kanai, 2016; Parris et al., 2009; Aydogan et al., 2018; Dixon & Christoff, 2014; Xia et al., 2021; Carter & Veen, 2007; Gerchen et al., 2024; Lin et al., 2020). Neuroimaging studies show increased dlPFC activity during logical reasoning, conflict detection, and tasks that require breaking away from perceptual or belief-based cues (Prado & Noveck, 2007; Donahue & Lee, 2015; Chawke & Kanai, 2016; Parris et al., 2009; Aydogan et al., 2018; Dixon & Christoff, 2014; Xia et al., 2021; Carter & Veen, 2007; Gerchen et al., 2024; Lin et al., 2020).

3.3. Flexible Decision-Making and Value Integration

The dlPFC supports flexible decision-making by dynamically integrating task-relevant information, updating value representations, and guiding choices that deviate from prior expectations when warranted by new evidence (Bartolo & Averbeck, 2020; Schulreich & Schwabe, 2020; Jamali et al., 2019; Donahue & Lee, 2015; Panidi et al., 2022; Dixon & Christoff, 2014; Kobayashi et al., 2021; Lin et al., 2020). Single-neuron and population-level recordings reveal that dlPFC activity tracks subjective value, evidence accumulation, and the transition between belief states (Bartolo & Averbeck, 2020; Jamali et al., 2019; Donahue & Lee, 2015; Kobayashi et al., 2021; Lin et al., 2020).

3.4. Individual Differences and Network Interactions

Individual differences in dlPFC structure and function predict the ability to update beliefs and resist bias (Turnbull et al., 2019; Presti et al., 2025; Jamali et al., 2019; Aydogan et al., 2018; Xia et al., 2021; Zhong et al., 2017). The dlPFC interacts with the anterior cingulate cortex (ACC), ventromedial prefrontal cortex (vmPFC), and other regions to coordinate cognitive control, conflict monitoring, and belief revision (Prado & Noveck, 2007; Donahue & Lee, 2015; Chawke & Kanai, 2016; Parris et al., 2009; Dixon & Christoff, 2014; Xia et al., 2021; Carter & Veen, 2007; Gerchen et al., 2024; Lin et al., 2020; Wang et al., 2023).

Key Papers

Paper	Methodology	Focus	Key Results
(Schulreich & Schwabe, 2020)	tDCS, behavioral modeling	Causal role in belief updating	Right dlPFC stimulation enhances normative belief updating under uncertainty
(Bartolo & Averbeck, 2020)	Neural recording (macaques), Bayesian modeling	Belief updating in reversal learning	dlPFC encodes belief switches and subjective value during state inference
(Prado & Noveck, 2007)	fMRI	Logical reasoning, conflict resolution	Right mid-dlPFC engaged in overcoming perceptual and belief-based conflict
(Chawke & Kanai, 2016)	tRNS, behavioral	Political belief change	dlPFC activation linked to belief alteration in response to new information
(Philiastides et al., 2011)	rTMS, behavioral modeling	Perceptual decision-making	Disruption of dlPFC impairs evidence accumulation and belief updating

FIGURE 2 Comparison of key studies on dlPFC and belief updating.

Top Contributors

Type	Name	Papers
Author	V. Nejati	(Nejati et al., 2025; Nejati et al., 2021)
Author	Daeyeol Lee	(Donahue & Lee, 2015)
Author	E. Fehr	(Baumgartner et al., 2011; Ruff et al., 2013)
Journal	*Nature Neuroscience*	(Bartolo & Averbeck, 2020; Rouault et al., 2019; Baumgartner et al., 2011; Donahue & Lee, 2015)
Journal	*Scientific Reports*	(Nejati et al., 2025; Huang et al., 2023; Nejati et al., 2021; Panidi et al., 2022; Aydogan et al., 2018; Nejati et al., 2021)
Journal	*Cerebral Cortex*	(Schulreich & Schwabe, 2020; Comte et al., 2016; Mansouri et al., 2019; Kim et al., 2020; Fleck et al., 2005)

FIGURE 3 Authors & journals that appeared most frequently in the included papers.

4. Discussion

The evidence strongly supports a central role for the dlPFC in overriding existing beliefs when presented with strong evidence. The dlPFC enables flexible updating of internal models by integrating new information, suppressing prior biases, and exerting top-down cognitive control (Bartolo & Averbeck, 2020; Schulreich & Schwabe, 2020; Baumgartner et al., 2011; Prado & Noveck, 2007; Donahue & Lee, 2015; Chawke & Kanai, 2016; Parris et al., 2009; Panidi et al., 2022; Dixon & Christoff, 2014; Xia et al., 2021; Carter & Veen, 2007; Gerchen et al., 2024; Lin et al., 2020; Philiastides et al., 2011; Qureshi et al., 2020; Wang et al., 2023). Causal intervention studies confirm that dlPFC stimulation enhances belief updating and adaptive decision-making, while disruption impairs these processes (Schulreich & Schwabe, 2020; Chawke & Kanai, 2016; Panidi et al., 2022; Philiastides et al., 2011; Qureshi et al., 2020; Wang et al., 2023). The dlPFC's function is supported by its interactions with other prefrontal and cingulate regions, forming a network for conflict detection, evidence accumulation, and behavioral adaptation (Prado & Noveck, 2007; Donahue & Lee, 2015; Chawke & Kanai, 2016; Parris et al., 2009; Dixon & Christoff, 2014; Xia et al., 2021; Carter & Veen, 2007; Gerchen et al., 2024; Lin et al., 2020; Wang et al., 2023). However, some studies highlight individual variability and context dependence, suggesting that dlPFC contributions may be modulated by task demands, emotional salience, and personal relevance (Turnbull et al., 2019; Presti et al., 2025; Jamali et al., 2019; Aydogan et al., 2018; Xia et al., 2021; Zhong et al., 2017). Methodological limitations include variability in stimulation protocols, task designs, and the challenge of isolating dlPFC-specific effects from broader executive networks.

Claims and Evidence Table

Claim	Evidence Strength	Reasoning	Papers
dlPFC is crucial for belief updating and overriding prior beliefs	 Strong	Strong convergent evidence from neuroimaging, causal, and behavioral studies	(Bartolo & Averbeck, 2020; Schulreich & Schwabe, 2020; Baumgartner et al., 2011; Prado & Noveck, 2007; Donahue & Lee, 2015; Chawke & Kanai, 2016; Parris et al., 2009; Panidi et al., 2022; Dixon & Christoff, 2014; Xia et al., 2021; Carter & Veen, 2007; Gerchen et al., 2024; Lin et al., 2020; Philiastides et al., 2011; Qureshi et al., 2020; Wang et al., 2023)
dlPFC supports cognitive control and conflict resolution during belief change	 Strong	dlPFC activity increases during tasks requiring suppression of prior beliefs and bias	(Prado & Noveck, 2007; Donahue & Lee, 2015; Chawke & Kanai, 2016; Parris et al., 2009; Aydogan et al., 2018; Dixon & Christoff, 2014; Xia et al., 2021; Carter & Veen, 2007; Gerchen et al., 2024; Lin et al., 2020)
dlPFC dynamically integrates new evidence and value signals	 Strong	Single-neuron and population studies show dlPFC tracks evidence and value updates	(Bartolo & Averbeck, 2020; Jamali et al., 2019; Donahue & Lee, 2015; Kobayashi et al., 2021; Lin et al., 2020)
dlPFC interacts with ACC, vmPFC, and other regions for belief revision	 Moderate	Network-level studies show coordinated activity during belief updating	(Prado & Noveck, 2007; Donahue & Lee, 2015; Chawke & Kanai, 2016; Parris et al., 2009; Dixon & Christoff, 2014; Xia et al., 2021; Carter & Veen, 2007; Gerchen et al., 2024; Lin et al., 2020; Wang et al., 2023)
Individual differences in dlPFC predict belief flexibility	 Moderate	Structural and functional variability linked to updating ability	(Turnbull et al., 2019; Presti et al., 2025; Jamali et al., 2019; Aydogan et al., 2018; Xia et al., 2021; Zhong et al., 2017)
Some null or context-dependent findings exist	 Moderate	Not all studies find direct dlPFC effects; context and task matter	(Huang et al., 2023; Prutean et al., 2021; Wang et al., 2023)

FIGURE Key claims and support evidence identified in these papers.

5. Conclusion

The dlPFC is essential for overriding existing beliefs in the face of strong evidence, supporting belief updating, cognitive control, and flexible decision-making. Its function is supported by both causal and correlational evidence, with important implications for rational thought, learning, and behavioral adaptation.

5.1. Research Gaps

Despite robust evidence, gaps remain in understanding the precise mechanisms, individual variability, and real-world generalizability of dlPFC-mediated belief updating.

Research Gaps Matrix

dlPFC Function	Belief Updating	Conflict Resolution	Value Integration	Individual Differences	Causal Manipulation
Human fMRI	10	8	7	5	6
Animal Models	7	5	6	2	4
Lesion/TMS	6	5	3	2	7

FIGURE Matrix of research topics and study attributes highlighting gaps in dlPFC research on belief updating.

5.2. Open Research Questions

Future research should address the following questions to advance understanding of the dlPFC's role in belief updating:

Question	Why
How does dlPFC-mediated belief updating operate in real-world, ecologically valid contexts?	Laboratory tasks may not capture the complexity of belief change in everyday life.
What are the neural mechanisms underlying individual differences in belief flexibility?	Understanding variability can inform interventions for maladaptive rigidity or bias.
How do dlPFC interactions with other brain regions support belief revision under emotional or motivational salience?	Real-world belief change often involves emotionally charged or personally relevant information.

FIGURE Open research questions for future studies on dlPFC and belief updating.

In summary, the dlPFC is a key neural substrate for overriding existing beliefs when presented with strong evidence, but further research is needed to clarify its mechanisms, individual variability, and real-world relevance.

These papers were sourced and synthesized using Consensus, an AI-powered search engine for research. Try it at https://consensus.app

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