# **Hypnosis, Suggestion, and Quantum Probability: An In-Depth Exploration**

## **1. Literature Review: Hypnosis, Suggestion, and Cognition**

**Hypnosis and Cognitive Alterations:** Hypnosis is traditionally defined as a state in which focused attention, absorption, and heightened suggestibility lead to altered experiences of reality, memory, and sense of control ([Alterations of agency in hypnosis: A new predictive coding model](https://hal.science/ijn_03084098/file/Martin-Pacherie-Alterations-Agency-Hypnosis-PsychRev2019.pdf#:~:text=1,such%20is%20the%20case%20while)) ([Alterations of agency in hypnosis: A new predictive coding model](https://hal.science/ijn_03084098/file/Martin-Pacherie-Alterations-Agency-Hypnosis-PsychRev2019.pdf#:~:text=impossible,typically%20report%20a%20compelling%20experience)) ggestions can dramatically change a person’s perceptions, memories, and behaviors even with no change in external stimuli. A substantial body of re ([Alterations of agency in hypnosis: A new predictive coding model](https://hal.science/ijn_03084098/file/Martin-Pacherie-Alterations-Agency-Hypnosis-PsychRev2019.pdf#:~:text=Spanos%2C%201986%29,or%20to%20forget%20some%20material)) ([Alterations of agency in hypnosis: A new predictive coding model](https://hal.science/ijn_03084098/file/Martin-Pacherie-Alterations-Agency-Hypnosis-PsychRev2019.pdf#:~:text=impossible,typically%20report%20a%20compelling%20experience)) n can **alter perception** – for example, hypnotic suggestions can induce visual or auditory hallucinations and even analgesia (reduced pain perception) without drugs. Likewise, suggestions can **modify memory**, as in ([Alterations of agency in hypnosis: A new predictive coding model](https://hal.science/ijn_03084098/file/Martin-Pacherie-Alterations-Agency-Hypnosis-PsychRev2019.pdf#:~:text=impossible,typically%20report%20a%20compelling%20experience)) ([Pain affect encoded in human anterior cingulate but not somatosensory cortex - PubMed](https://pubmed.ncbi.nlm.nih.gov/9252330/#:~:text=affect%2C%20hypnotic%20suggestions%20were%20used,by%20early%20clinical%20lesion%20studies)) individuals temporarily forget information or events until a cancelling cue is given. Notably, such amnesia typically impairs explicit recall while leaving implici ( [Neuro-Hypnotism: Prospects for Hypnosis and Neuroscience - PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC3528837/#:~:text=involuntariness,subject%20is%20unaware%20of%20a) ) . priming effects) intact, highlighting a dissociation in memory systems under hypnosis. These phenomena demonstrate ( [Neuro-Hypnotism: Prospects for Hypnosis and Neuroscience - PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC3528837/#:~:text=posthypnotic%20amnesia%20impairs%20explicit%20memory%2C,suggestion%20has%20been%20canceled%20might) ) own influences\*\* (beliefs, expectations, suggestions) can strongly shape subjective experience and cognitive processes.

**Suggestive Alterations of Perception:** Classic studies illustrate how hypnosis and suggestion alter sensory processing. Kosslyn et al. (2000) showed that when highly hypnotizable subjects were instructed under hypnosis to see color where a grayscale image was present (and vice versa), brain activity in color-processing visual regions changed accordingly. In other words, the brain’s color regions became active if a person was *told* a gray pattern was col ([Hypnotic visual illusion alters color processing in the brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/10910791/#:~:text=Results%3A%20%20When%20subjects%20were,not%20subjects%20had%20been%20hypnotized)) ([Hypnotic visual illusion alters color processing in the brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/10910791/#:~:text=Conclusions%3A%20%20Among%20highly%20hypnotizable,These%20findings%20support%20the%20claim)) seen when actually viewing real colors. Conversely, those regions were suppressed when subjects were told to see a colorful image as grayscale. Importantly, these neural ([Hypnotic visual illusion alters color processing in the brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/10910791/#:~:text=Results%3A%20%20When%20subjects%20were,not%20subjects%20had%20been%20hypnotized)) ed in line with the *suggested* perception only during hypnosis, indicating that suggestion under hypnosis can override normal sensory inputs by imposing an imagined reality. Another line of research in pain perception found that hypnotic suggestions can selectively alter the *affective* dimension of pain. In a famou ([Hypnotic visual illusion alters color processing in the brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/10910791/#:~:text=Results%3A%20%20When%20subjects%20were,not%20subjects%20had%20been%20hypnotized)) ([Hypnotic visual illusion alters color processing in the brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/10910791/#:~:text=Conclusions%3A%20%20Among%20highly%20hypnotizable,These%20findings%20support%20the%20claim)) ants were given a suggestion to feel painful stimuli as less “unpleasant” (emotionally distressing) while the physical intensity remained the same. The result was a significant reduction of activity in the anterior cingulate cortex (ACC), a region encoding the suffering or affective aspect of pain, whereas primary sen ([Pain affect encoded in human anterior cingulate but not somatosensory cortex - PubMed](https://pubmed.ncbi.nlm.nih.gov/9252330/#:~:text=affect%2C%20hypnotic%20suggestions%20were%20used,by%20early%20clinical%20lesion%20studies)) ivity (coding intensity) was unchanged. This demonstrates that suggestion can reframe the interpretation of pain (making it less bothersome) without affecting raw sensation – effectively \*\*altering the brain’s appraisal of in ([Pain affect encoded in human anterior cingulate but not somatosensory cortex - PubMed](https://pubmed.ncbi.nlm.nih.gov/9252330/#:~:text=affect%2C%20hypnotic%20suggestions%20were%20used,by%20early%20clinical%20lesion%20studies)) \*.

**Suggestive Alterations of Memory:** Hypnotic suggestions can also produce striking memory effects. For instance, a suggestion for *post-hypnotic amnesia* might direct a subject to forget specific information (such as the content of a story or the events during hypnosis) until a cue is given to remember. Under such suggestions, individuals often cannot consciously recall the targeted information, yet tests show the memory is preserved implicitly (e.g. they might still show priming or preference influences). This implies that hypnosis can temporarily alter conscious access to memory without erasing the memory trace itself. Neuroimaging work supports this: studies have found that during post-hypnotic amne ( [Neuro-Hypnotism: Prospects for Hypnosis and Neuroscience - PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC3528837/#:~:text=match%20at%20L740%20posthypnotic%20amnesia,and%20implicit%20memory%20for%20studied) ) ( [Neuro-Hypnotism: Prospects for Hypnosis and Neuroscience - PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC3528837/#:~:text=posthypnotic%20amnesia%20impairs%20explicit%20memory%2C,suggestion%20has%20been%20canceled%20might) ) rontal brain activity (associated with inhibitory control) and patterns resembling those seen in psychogenic amnesia, suggesting that active suppression of recall is happening in the brain. When the suggestion is lifted, memory access returns, indicating a **reversible reconfiguration of memory retrieval processes** due to suggestion. Additionally, hypnotic suggestions can sometimes create false memories or co ( [Neuro-Hypnotism: Prospects for Hypnosis and Neuroscience - PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC3528837/#:~:text=posthypnotic%20amnesia%2C%20consistent%20with%20a,and%20underscore%20once%20again%20the) ) especially if leading questions are used – a reminder that memory under hypnosis is **highly malleable** and subject to distortion by expectations.

**Predictive Processing and the Bayesian Brain:** Recent cognitive neuroscience theories, especially **predictive processing (Bayesian brain) frameworks**, offer a lens to explain how suggestion alters perception and memory. In predictive processing models, the brain is seen as an **active inference machine** that constantly generates predictions (priors) about sensory inputs and updates them with incoming data. Perception is not a mere passive readout of the world, but rather a **combination of sensory evidence and prior expectations** (beliefs about what is likely). Under normal circumstances, there is a balance between bottom-up sensory sig ([Alterations of agency in hypnosis: A new predictive coding model](https://hal.science/ijn_03084098/file/Martin-Pacherie-Alterations-Agency-Hypnosis-PsychRev2019.pdf#:~:text=match%20at%20L258%20Predictive%20coding,Frith%20and)) ([Frontiers | Cognitive simulation along with neural adaptation explain effects of suggestions: a novel theoretical framework](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1388347/full#:~:text=the%20brain%20makes%20second,Auksztulewicz)) tions, weighted by their precision or certainty. Hypnosis appears to tilt this balance. Highly hypnotizable individuals are thought to enter a state where **t (**[**Frontiers | Cognitive simulation along with neural adaptation explain effects of suggestions: a novel theoretical framework**](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1388347/full#:~:text=the%20brain%20makes%20second,Auksztulewicz)**) (**[**Frontiers | Cognitive simulation along with neural adaptation explain effects of suggestions: a novel theoretical framework**](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1388347/full#:~:text=match%20at%20L714%20populations%29,been%20associated%20with%20mental%20action)**) gestions) carry exceptionally high weight**, and the precision of bottom-up sensory error signals is down-weighted (i.e. the brain deems them less “newsworthy”). This means that a suggested idea (e.g. “the pain will not bother you” or “you cannot see the color red”) becomes a strongly favored hypothesis in the brain’s model, and any sensory information contradicting it (the actual pain signals or the presence of the color red) is given low ([Frontiers | Cognitive simulation along with neural adaptation explain effects of suggestions: a novel theoretical framework](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1388347/full#:~:text=the%20brain%20makes%20second,Auksztulewicz)) ([Frontiers | Cognitive simulation along with neural adaptation explain effects of suggestions: a novel theoretical framework](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1388347/full#:~:text=match%20at%20L714%20populations%29,been%20associated%20with%20mental%20action)) portant error. As a result, perception and memory conform to the suggestion: the person truly feels less pain, or literally does not see the color, because the brain’s predictive model has been biased to explain away or block out the discrepant input.

Supporting this view, \*\*hypnosis has been compared to a state of aug ([Frontiers | Cognitive simulation along with neural adaptation explain effects of suggestions: a novel theoretical framework](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1388347/full#:~:text=the%20brain%20makes%20second,Auksztulewicz)) ([Frontiers | Cognitive simulation along with neural adaptation explain effects of suggestions: a novel theoretical framework](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1388347/full#:~:text=match%20at%20L714%20populations%29,been%20associated%20with%20mental%20action)) \*\* where priors (set by suggestions) dominate perception. Jamieson (2016), for example, argued that high-level representations of a hypnotic suggestion’s meaning can directly **“effect changes in experience”** by shaping lower-level processing. In essence, if you strongly believe (via suggestion) that “my arm is moving by itself” or “I cannot remember X”, the brain’s predictive hierarchy will fulfill that belief, altering motor signals or memory retrieval to match the expectation. The predictive processing account also aligns with phenomena like reduced conflict and al ([Alterations of agency in hypnosis: A new predictive coding model](https://hal.science/ijn_03084098/file/Martin-Pacherie-Alterations-Agency-Hypnosis-PsychRev2019.pdf#:~:text=suggestions%2C%20such%20as%20arm%20levitation%2C,the%20individual%20in%20such%20a)) ion under hypnosis (discussed below), which can be seen as the brain resolving prediction errors in favor of the suggestion-consistent interpretation. In summary, modern research portrays hypnosis as a condition where **suggestion powerfully alters cognitive priors and perceptual inference**, leading to genuine changes in how stimuli are perceived and remembered.

## **2. Theoretical Exploration**

### **2.1 Bayesian Cognitive Models Under Suggestion**

**Bayesian Brain Modulation:** Within a Bayesian framework of cognition, the mind combines prior beliefs with new evidence to arrive at perceptions or decisions. Under normal conditions, this combination follows Bayes’ rule, weighting information by its re ([Hypnotic suggestion and the modulation of Stroop interference - PubMed](https://pubmed.ncbi.nlm.nih.gov/12470132/#:~:text=Results%3A%20%20Whereas%20posthypnotic%20suggestion,reduction%20in%20the%20interference%20effect)) ([Hypnotic visual illusion alters color processing in the brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/10910791/#:~:text=Conclusions%3A%20%20Among%20highly%20hypnotizable,These%20findings%20support%20the%20claim)) a unique demonstration of what happens when **priors become exceptionally strong or overly precise**. A hypnotic suggestion can be viewed as an artificially implanted *prior belief* — for example, “the word you see is just a meaningless jumble” or “your hand is paralyzed and cannot move.” In highly suggestible individuals, the **credibility (precision) of this prior is dramatically elevated**, while the incoming sensory or motor signals that contradict it are given low precision (i.e. treated as noise). The result is a skewed Bayesian integration that favors the prior to an extreme degree. This theoretical idea finds support in cognitive models. Researchers have proposed that during hypnosis the brain may **attenuate the precision of sensory prediction errors** (the feedback that something doesn’t match expectations), effectively allowing predictions to dominate. One recent framework, the *Simulation-Adaptation Theory of Hypnosis (SATH)*, explicitly expands predictive coding to explain hypnosis: it posits that internally generated simulations (imagination guided by suggestion), combined with a top-down suppression of error signals, can account for the wide range of hypnotic effects. In this view, the hypnotic subject is \*not ([Frontiers | Cognitive simulation along with neural adaptation explain effects of suggestions: a novel theoretical framework](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1388347/full#:~:text=the%20brain%20makes%20second,Auksztulewicz)) ([Frontiers | Cognitive simulation along with neural adaptation explain effects of suggestions: a novel theoretical framework](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1388347/full#:~:text=match%20at%20L714%20populations%29,been%20associated%20with%20mental%20action)) ng instructions, but literally perceiving and cognizing in line with the suggestion because their brain’s Bayesian weighting has been commandeered by that suggestion.

**Altered Priors and Perception:** If we examine specific cognitive models, consider how a **Bayesian perceptual model** would behave under an extreme prior. ([Frontiers | Cognitive simulation along with neural adaptation explain effects of suggestions: a novel theoretical framework](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1388347/full#:~:text=predictions%20as%20a%20venue%20for,the%20change%20in%20the)) eption P(world∣input)P(\text{world}|\text{input}) is proportional to the likelihood of the sensory input given a hypothesis times the prior probability of that hypothesis. A hypnotic suggestion like “you will see a cat in the empty chair” gives the “there is a cat” hypothesis a huge prior probability in the subject’s mind. If the person is highly hypnotizable, their brain effectively treats this prior as so strong that even zero sensory evidence (an empty chair) doesn’t override it. The Bayesian machinery then favors the hypothesis and may actually produce a hallucination (the person sees a faint cat shape, or vividly imagines it). From their perspective, **the prediction (cat) has become the perception**, consistent with predictive coding notions that perception is *controlled hallucination* guided by expectations. Neurocognitive theories of hypnosis suggest that frontal and parietal networks (involved in attention and belief formation) exert top-down influence to enforce the suggested prior, while sensory areas are modulated to fit the expected pattern. In simpler terms, under hypnosis the brain “believes” the suggestion so strongly that it shapes lower-level processing to make reality conform to that belief.

**Bayesian Accounts of Cognitive Control:** Hypnosis and suggestion also shed light on **Bayesian models of cognitive control and attention**. Some findings indicate that after a hypnotic induction, the way the brain handles conflicting informatio ([Hypnotic suggestion reduces conflict in the human brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/15994228/#:~:text=reduces%20involuntary%20conflict%20and%20alters,highly%20hypnotizable%20subjects%20also%20showed)) ([Hypnotic visual illusion alters color processing in the brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/10910791/#:~:text=Results%3A%20%20When%20subjects%20were,not%20subjects%20had%20been%20hypnotized)) le, without hypnosis, seeing the word “RED” printed in blue ink creates conflict (Stroop effect) because an automatic reading prior (“it’s the word red”) conflicts with color-naming. A hypnotic suggestion to perceive all words as meaningless symbols essentially removes the “word reading” prior. Behavioral studies showed that highly hypnotizable individuals under such suggestion can eliminate the Stroop interference – they name the ink color without delay, as if the words truly have no meaning. Bayesian-wise, the suggestion changed the prior (now “words are gibberish, don’t read them”), so there is no conflict to resolve. The brain’s conflict-monitoring region, the ACC, correspondingly shows decreased activation when the suggestion is in effect. In one combined fMRI/EEG study, \*\*post-hypnotic suggestion to see words as nonsense led to reduced ACC activity and dampened visual cortex responses in highly hypnotizable subject ([Hypnotic suggestion and the modulation of Stroop interference - PubMed](https://pubmed.ncbi.nlm.nih.gov/12470132/#:~:text=Results%3A%20%20Whereas%20posthypnotic%20suggestion,reduction%20in%20the%20interference%20effect)) o normal reading conditions or to non-hypnotizable controls). This aligns with a Bayesian interpretation: the expected meaning of words was changed by top-down belief, so the usual prediction error (letters forming an English word) was effectively nullifi ([Hypnotic suggestion reduces conflict in the human brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/15994228/#:~:text=reduces%20involuntary%20conflict%20and%20alters,highly%20hypnotizable%20subjects%20also%20showed)) e need for conflict processing. Thus, we see that suggestion can flexibly alter priors in domains from low-level perception to high-level attention and executive function.

### **2.2 Quantum Cognition Frameworks and Hypnosis**

\**Quantum Cognition Overview:* ([Hypnotic suggestion reduces conflict in the human brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/15994228/#:~:text=reduces%20involuntary%20conflict%20and%20alters,highly%20hypnotizable%20subjects%20also%20showed)) ([Hypnotic suggestion reduces conflict in the human brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/15994228/#:~:text=associated%20with%20decreased%20ACC%20activation%2C,suggestion%20affects%20cognitive%20control%20by)) rging theoretical framework that applies the *mathematical formalism of quantum probability* to human thought processes. It does not claim the brain is literally a quantum computer, but rather uses quantum-like math to capture cognitive phenomena that defy classical probability logic. Notably, quantum models allow for states of **superposition** (a system can be in a combination of states until observed) and **interference effects** (the probabilities of outcomes can reinforce or cancel out, analogous to wave interference). These properties can explain puzzling findings like violations of the classical “sure thing” principle, order-of-question effects in surveys (answers depend on question context in a way reminiscent of measurement disturbance), or the **conjunction (**[**Quantum cognition - Wikipedia**](https://en.wikipedia.org/wiki/Quantum_cognition#:~:text=Quantum%20cognition%20uses%20the%20mathematical,5)**) (**[**Quantum cognition - Wikipedia**](https://en.wikipedia.org/wiki/Quantum_cognition#:~:text=Quantum%20cognition%20can%20be%20applied,10)**) . In essence, the quantum approach formalizes the idea that a person’s mental state can be *contextual and indeterminate* until a particular context or question causes a “collapse” to a specific thought or decision. It offers a way to model how different observations (questions, tasks) can yield different outcomes that aren’t easily reconciled with one static probability distribution, by instead treating the underlying state as context-sensitive and subject to change when measured (much like a quantum state collapse (**[**Quantum cognition - Wikipedia**](https://en.wikipedia.org/wiki/Quantum_cognition#:~:text=interference%20effect%20in%20a%20manner,modeled%20in%20terms%20of%20quantum)**) (**[**Quantum cognition - Wikipedia**](https://en.wikipedia.org/wiki/Quantum_cognition#:~:text=genuine%20quantum%20aspects%2C%20namely%2C%20superposition%2C,16)**) Mental Superposition and Suggestion:** One might ask whether a hypnotized mind could exhibit **quantum-like characteristics** such as superposition or interference between mental states. Consider that hypnosis oft ([Quantum cognition - Wikipedia](https://en.wikipedia.org/wiki/Quantum_cognition#:~:text=destructive%20interference%20effects,mathematical%20apparatus%20of%20quantum%20mechanics)) ([Quantum cognition - Wikipedia](https://en.wikipedia.org/wiki/Quantum_cognition#:~:text=genuine%20quantum%20aspects%2C%20namely%2C%20superposition%2C,16)) tradictory ideas separate from ordinary evaluation – for example, accepting the suggestion “you cannot feel your left hand” while the sensory pathways are in fact intact. In a non-hypnotized state, an attempt to believe this would cause cognitive dissonance (the evidence vs. the belief conflict). But a hallmark of hypnosis is the ability to compartmentalize: the suggested belief dominates conscious experience, and the contradictory knowledge is kept dissociated. We can draw an analogy to **superposition**, where the subject’s cognitive state might simultaneously represent two potential realities – one in which the left hand is numb (suggested reality) and one in which it is not (the actual sensory state) – but the suggested reality is the one that is consciously experienced unless “measured” in a way that forces the real sensory state to surface. In other words, under hypnosis the mind might be said to occupy a **hybrid state** influenced by both the suggestion and the physical input. Only when a specific operation or question is applied (analogous to a measurement, e.g. someone pinches the left hand and asks if it hurts) does the mental state “collapse” to either reporting no pain (maintaining the suggestion) or acknowledging pain (if the stimulation is too salient). In most cases with a good hypnotic suggestion, the report will align with the suggestion, implying the dominant component of the superposed state was the suggestion-altered one.

**Interference Effects in Cognition Under Hypnosis:** If the quantum cognition metaphor holds, we might expect **interference-like effects** – situations where two incompatible cognitive propositions (e.g. “the word has meaning” vs “the word is gibberish”) interfere with each other when both are partially active. Some theorists have indeed speculated that mental processes could show quantum-like interference, for instance in how ambiguous or conflicting information is handled. Under hypnosis, one could imagine designing an experiment where a subject is given two overlapping suggestions or a sequence of incompatible suggestions to see if order and context produce non-commutative (path-dependent) results. Although direct evidence of quantum probability effects in hypnosis is not yet available, the *contextuality* emphasized by quantum models resonates with hypnosis research. In quantum cognition, the outcome depends critically on context (the sequence of measurements or questions). Likewise, in hypnosis, the **context provided by th (**[**Quantum cognition - Wikipedia**](https://en.wikipedia.org/wiki/Quantum_cognition#:~:text=destructive%20interference%20effects,mathematical%20apparatus%20of%20quantum%20mechanics)**) (**[**Quantum cognition - Wikipedia**](https://en.wikipedia.org/wiki/Quantum_cognition#:~:text=genuine%20quantum%20aspects%2C%20namely%2C%20superposition%2C,16)**) ns and the framing of questions can completely determine the subject’s responses**, which might be entirely different under a different context or without the hypnotic state. This parallel suggests that a quantum cognitive model might be well-suited to describe how a hypnotized mind can be in a sort of potential state space that is resolved by suggestive context.

**Quantum Mind Perspectives:** A few authors have gone further to propose explicit quantum-based models of hypnosis and conscious states. For example, De Benedittis (2020) outlined a “quantum mind” view of hypnosis, suggesting that the mind–brain interface could behave like a **chaotic quantum system governed by probability principles** similar to quantum mechanics. He notes that neuronal activity can exhibit chaotic patterns, and speculates that trance states may tap into non-linear dynamics that quantum formalisms can describe. Quantum cognition, in his view, provides a framework to bridge mind and matter by treating cognitive processes with quantum probability, thereby overcoming some limitations of classical Cartesian dualism. While controversial, this perspective opens the door to thinking of hypnotic states as *special probability distributions* of consciousness that might involve entangled relationships between different mental subsys ([From Quantum Physics to Quantum Hypnosis: A Quantum Mind Perspective - PubMed](https://pubmed.ncbi.nlm.nih.gov/32835610/#:~:text=A%20novel%2C%20heuristic%20model%20based,that%20applies%20the%20formalism%20of)) rapid shifts (collapses) between states. In summary, the quantum framework is largely theoretical in this context, but it offers intriguing concepts like superpositio ([From Quantum Physics to Quantum Hypnosis: A Quantum Mind Perspective - PubMed](https://pubmed.ncbi.nlm.nih.gov/32835610/#:~:text=A%20novel%2C%20heuristic%20model%20based,that%20applies%20the%20formalism%20of)) tence of multiple potential experiences) and collapse (the domination of one experience when a “measurement” occurs) that could metaphorically map onto how hypnosis operates. It attempts to **formalize th (**[**From Quantum Physics to Quantum Hypnosis: A Quantum Mind Perspective - PubMed**](https://pubmed.ncbi.nlm.nih.gov/32835610/#:~:text=body%20interface%20represents%20a%20chaotic,shortcomings%20of%20cartesian%20dualism%20as)**) ext-dependence and non-linear changes** in cognition that occur with hypnosis.

## **3. Experimental Studies: Neural Correlates of Hypnosis**

### **3.1 fMRI Studies in Highly Hypnotizable Individuals**

Modern neuroimaging has provided clear evidence that hypnosis is accompanied by distinct patterns of brain activity. Notably, studies focusing on **highly hypnotizable (high susceptibility) individuals** show that hypnosis (and the suggestions given under hypnosis) produce changes in brain regions related to attention, conflict monitoring, sensory processing, and integration of information. One consistent theme is that **hypnosis modulates frontal–parietal networks** that are associated with top-down ([Quantum cognition - Wikipedia](https://en.wikipedia.org/wiki/Quantum_cognition#:~:text=destructive%20interference%20effects,mathematical%20apparatus%20of%20quantum%20mechanics)) ([Quantum cognition - Wikipedia](https://en.wikipedia.org/wiki/Quantum_cognition#:~:text=genuine%20quantum%20aspects%2C%20namely%2C%20superposition%2C,16)) For instance, a study by Egner et al. used fMRI during a Stroop task and found that after a hypnotic induction (even *without* a specific suggestion), highly hypnotizable subjects showed a functional decoupling between the anterior cingulate cortex (ACC) and the lateral prefrontal cortex. The ACC normally detects conflict (e.g., competing signals), and the lateral prefrontal cortex implements control to resolve it. Under hypnosis, these two processes became **dissociated**: high-hypnotizables had increased ACC conflict-signals but did not engage prefrontal control accordingly, compared to non-hypnotizable individuals. Additionally, EEG recorded simultaneously showed reduced gamma-band coherence between frontal regions, supporting the idea of a breakdown in communication between conflict monitoring and control circuits. Functionally, this may explain why under hypnosis people can accept incongruent ideas without engaging nor ([Hypnosis decouples cognitive control from conflict monitoring processes of the frontal lobe - PubMed](https://pubmed.ncbi.nlm.nih.gov/15964211/#:~:text=Employing%20event,EEG%20gamma%20band)) ([Hypnosis decouples cognitive control from conflict monitoring processes of the frontal lobe - PubMed](https://pubmed.ncbi.nlm.nih.gov/15964211/#:~:text=respect%20to%20subjects%20with%20low,conflict%20monitoring%20and%20cognitive%20control)) brain’s “alarm system” (ACC) might register a discrepancy but fails to recruit the usual corrective processes in the frontal cortex, allowing the suggested reality to persist unchecked.

When specific **hypnotic suggestions** are given, fMRI studies show targeted changes in brain activity that correlate with the content of the sugges ([Hypnosis decouples cognitive control from conflict monitoring processes of the frontal lobe - PubMed](https://pubmed.ncbi.nlm.nih.gov/15964211/#:~:text=Employing%20event,These)) ([Hypnosis decouples cognitive control from conflict monitoring processes of the frontal lobe - PubMed](https://pubmed.ncbi.nlm.nih.gov/15964211/#:~:text=data%20were%20complemented%20by%20a,monitoring%20and%20cognitive%20control%20processes)) estions about color or pain impact visual or pain-related cortices. Another striking example comes from the domain of vision and reading: In an fMRI/EEG experiment, highly hypnotizable subjects received a ([Hypnosis decouples cognitive control from conflict monitoring processes of the frontal lobe - PubMed](https://pubmed.ncbi.nlm.nih.gov/15964211/#:~:text=respect%20to%20subjects%20with%20low,conflict%20monitoring%20and%20cognitive%20control)) t written words would appear as meaningless symbols (as a way to disrupt reading). Under this suggestion, fMRI revealed decreased activity in visual word-processing areas and the ACC (which normally signals the conflict of not reading the word). In essence, the brain *acted as if* the words were just gibberish marks on ([Hypnosis decouples cognitive control from conflict monitoring processes of the frontal lobe - PubMed](https://pubmed.ncbi.nlm.nih.gov/15964211/#:~:text=Employing%20event,These)) ([Hypnosis decouples cognitive control from conflict monitoring processes of the frontal lobe - PubMed](https://pubmed.ncbi.nlm.nih.gov/15964211/#:~:text=data%20were%20complemented%20by%20a,monitoring%20and%20cognitive%20control%20processes)) isual cortical activation and less conflict monitoring\*\*. The EEG data from the same subjects showed reduced occipital (visual) potentials, further indicating that very early visual processing was altered by the suggestion. These neurophysiologi ([Hypnotic visual illusion alters color processing in the brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/10910791/#:~:text=Results%3A%20%20When%20subjects%20were,not%20subjects%20had%20been%20hypnotized)) ([Pain affect encoded in human anterior cingulate but not somatosensory cortex - PubMed](https://pubmed.ncbi.nlm.nih.gov/9252330/#:~:text=affect%2C%20hypnotic%20suggestions%20were%20used,by%20early%20clinical%20lesion%20studies)) oral outcome (the elimination of the Stroop effect), illustrating a brain basis for how suggestion can override an automatic cognitive skill.

**Attention and Default Mode Network:** Hypnosis is also associated with changes in large-scale brain networks that govern attention and self-related thinking. The *default mode network (DMN)*, particularly its anterior (medial prefrontal) node, is nor ([Hypnotic suggestion reduces conflict in the human brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/15994228/#:~:text=reduces%20involuntary%20conflict%20and%20alters,highly%20hypnotizable%20subjects%20also%20showed)) ([Hypnotic suggestion reduces conflict in the human brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/15994228/#:~:text=associated%20with%20decreased%20ACC%20activation%2C,suggestion%20affects%20cognitive%20control%20by)) ering, self-reflection, and internally focused thought. Research has found that inducing hypnosis can **suppress activity in the anterior default mode regions** in highly hypnotizable individuals. One study had participants simply rest in the scanner, either normally or in hypnosis, and observed that highly suggestible peopl ([Hypnotic suggestion reduces conflict in the human brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/15994228/#:~:text=associated%20with%20decreased%20ACC%20activation%2C,suggestion%20affects%20cognitive%20control%20by)) howed significantly decreased activation in anterior DMN hubs compared to resting wakefulness. Interestingly, low-suggestible individuals did not show this pattern – their DMN stayed about the same, or they deactivated other regions related to alertness instead. This suggests that hypnosis in susceptible subjects produces a unique brain state: **less self-referential/DMN activity and possibly a shift toward more externally focused or suggestion-focused processing**. The reduction of DMN activity might correspond to the subjective reports of diminished self-consciousness or absorption in imagination during hypnosis. In tandem, some studies report increased functio ([Hypnotic induction decreases anterior default mode activity - PubMed](https://pubmed.ncbi.nlm.nih.gov/19782614/#:~:text=relevant%20areas,The%20findings)) ([Hypnotic induction decreases anterior default mode activity - PubMed](https://pubmed.ncbi.nlm.nih.gov/19782614/#:~:text=regions,activation%20in%20highly%20suggestible%20subjects)) n in attentional networks (like dorsolateral prefrontal and dorsal anterior cingulate, which are part of a task-positive network) when specific tasks or suggestions are being executed under hypnosis. The overall picture from fMRI is that ([Hypnotic induction decreases anterior default mode activity - PubMed](https://pubmed.ncbi.nlm.nih.gov/19782614/#:~:text=relevant%20areas,The%20findings)) ([Hypnotic induction decreases anterior default mode activity - PubMed](https://pubmed.ncbi.nlm.nih.gov/19782614/#:~:text=regions,activation%20in%20highly%20suggestible%20subjects)) ep-like” reduction in brain activity, but rather a **reconfiguration of network dynamics**: certain networks (self-monitoring, conflict detection) are toned down, whil ([Hypnotic induction decreases anterior default mode activity - PubMed](https://pubmed.ncbi.nlm.nih.gov/19782614/#:~:text=regions,activation%20in%20highly%20suggestible%20subjects)) ed attention, imagery, and the suggested scenario’s relevant sensory areas) are activated in service of the suggestion.

**Sensory Integration:** A core question in hypnosis research is how the brain integrates or segregates sensory information under the influence of suggestion. Typically, our senses provide a unified picture of reality, but hypnotic suggestions can effectively filter this integration. For example, in a hypnotic *negative hallucination*, a person might be told “you will not see X” (say, a particular object or person). If successful, the individual will report that X is not present, effectively ignoring visual in ([Hypnotic suggestion reduces conflict in the human brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/15994228/#:~:text=reduces%20involuntary%20conflict%20and%20alters,highly%20hypnotizable%20subjects%20also%20showed)) ([Hypnotic suggestion reduces conflict in the human brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/15994228/#:~:text=associated%20with%20decreased%20ACC%20activation%2C,suggestion%20affects%20cognitive%20control%20by)) h scenarios is challenging, but case studies and PET/fMRI results indicate that early visual areas still receive the input, yet higher-level integration areas (like parts of the temporal-parietal cortex or frontal regions that construct conscious perception) may fail to bind that information into awareness. In the previous color hallucination study by Kosslyn et al., we saw that visual cortex activity was modulated in line with the hallucinated color. Another PET study by McGeown et al. (2012) reported that when subjects (not even in hypnosis) were given a strong suggestion to hallucinate a visual stimulus, activity in some visual areas increased as if the stimulus were really there. Under hypnosis, such effects are typically stronger and more consistent, implying that the **brain’s sensory integration can be “re-wired” by suggestion**, routing information in unusual ways or gating it out entirely from conscious consideration.

### **3.2 EEG Studies and Neural Dynamics**

Electroencephalography (EEG) provides complementary insights into the **temporal dynamics** of the hypnotized brain. While fMRI gives spatial detail, EEG can track rapid changes as suggestions are given and responded to. Historically, many EEG studies attempted to find a “signature” of the hypnotic state (such as more alpha waves or theta waves), but results were mixed. There is no ([Hypnotic visual illusion alters color processing in the brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/10910791/#:~:text=Results%3A%20%20When%20subjects%20were,not%20subjects%20had%20been%20hypnotized)) nt frequency pattern that defines hypnosis for all individuals. That said, certain trends have been observed in highly hypnotizable subjects. Some studies found increases in lower-frequency alpha or theta power during hypnosis, possibly ([Hypnotic induction decreases anterior default mode activity - PubMed](https://pubmed.ncbi.nlm.nih.gov/19782614/#:~:text=,visual%20areas%20of%20the%20brain)) relaxed but focused state (somewhat akin to meditation). Others noted changes in **hemispheric asymmetry** or coherence: for example, one report found that highs showed greater task-specific EEG lateralization when following hypnotic suggestions, as if their brain devoted the appropriate hemisphere more fully to the task at hand compared to lows. This could relate to the idea that hypnotized individuals narrow their attention (activating only relevant neural circuits) and inhibit extraneous processing.

More direct evidence of hypnosis altering brain communication came from studies combining EEG with tasks. As mentioned, Egner et al. observed a **decreas (** [**Neuro-Hypnotism: Prospects for Hypnosis and Neuroscience - PMC**](https://pmc.ncbi.nlm.nih.gov/articles/PMC3528837/#:~:text=2011%3B%20Vaitl%20et%20al,they%20would%20yield%20interesting%20results) **) (** [**Neuro-Hypnotism: Prospects for Hypnosis and Neuroscience - PMC**](https://pmc.ncbi.nlm.nih.gov/articles/PMC3528837/#:~:text=gamma%20band%20of%20the%20EEG,1990) **) ence** after hypnosis induction in highs, suggesting the frontal attention system was operating more independently of the usual networks. Event-related potential (ERP) studies (which measure brain responses to specific stimuli) have also been informative. For instance, ERPs have shown that under post-hypnotic suggestion, the brain’s ( [Neuro-Hypnotism: Prospects for Hypnosis and Neuroscience - PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC3528837/#:~:text=increased%20density%20of%20alpha%20activity,Similar%20considerations%2C%20as%20well%20as) ) e to a stimulus can be reduced. In a scenario where a subject was told “you will not hear a particular word,” the ERP components that normally signify auditory processing of that word can be diminished, indicating the suggestion took effect at a relatively early stage of sensory processing. ( [Neuro-Hypnotism: Prospects for Hypnosis and Neuroscience - PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC3528837/#:~:text=match%20at%20L330%20Perhaps%20the,activate%20the%20left%20hemisphere%20when) ) ( [Neuro-Hypnotism: Prospects for Hypnosis and Neuroscience - PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC3528837/#:~:text=Perhaps%20the%20most%20provocative%20EEG,activate%20the%20left%20hemisphere%20when) ) s hypnotically instructed to feel no pain in one hand, the *somatosensory evoked potential* from that hand’s stimulation might be smaller, reflecting decreased cortical response to the input. These EEG findings support the idea that **hypnosis isn’t just changing decisions or reports, but actually modulating the ongoing processing of stimuli in real time**.

One especially in ([Hypnosis decouples cognitive control from conflict monitoring processes of the frontal lobe - PubMed](https://pubmed.ncbi.nlm.nih.gov/15964211/#:~:text=respect%20to%20subjects%20with%20low,conflict%20monitoring%20and%20cognitive%20control)) RP observation is how hypnosis might alter the sense of agency in real time. When a hypnotic *motor suggestion* is given (e.g. “your arm will lift by itself”), individuals often initially make a voluntary effort which then transforms into a feeling that the movement is happening involuntarily. Some EEG studies have tried to capture this moment-by-moment change. They find that the normal readiness potentials (brain signals preceding voluntary movement) can be present at movement onset, but the brain’s interpretation circuits (perhaps in parietal cortex) fail to label the movement as self-initiated, leading to an experience of passivity. This kind of **neural timing issue – where an action is initiated but awareness of intention is altered – might be illuminated by high-temporal-resolution EEG**, and has been theorized as a result of predictive processing changes (the motor command is issued, but if the brain’s predictive model is that “this will happen on its own,” it doesn’t register the action as volitional). Although fine-grained EEG and MEG research on this is ongoing, such experiments reinforce that hypnosis involves dynamic changes in how neural events are assembled into conscious experience.

**Summary of Neural Patterns:** Across fMRI and EEG studies, a pattern emerges that **suppo (** [**Neuro-Hypnotism: Prospects for Hypnosis and Neuroscience - PMC**](https://pmc.ncbi.nlm.nih.gov/articles/PMC3528837/#:~:text=particularly%20useful%20for%20studying%20the,these%20changes%20in%20experienced%20voluntariness) **) (** [**Neuro-Hypnotism: Prospects for Hypnosis and Neuroscience - PMC**](https://pmc.ncbi.nlm.nih.gov/articles/PMC3528837/#:~:text=interest%20in%20this%20respect%20is,these%20changes%20in%20experienced%20voluntariness) **) cognition under hypnosis**. The brain seems to **reweight information processing** in favor of expectations (suggestions) over external inputs, consistent with a Bayesian shift toward prior-dominance. Neuroimaging shows decreased activity in conflict detection (ACC) and self-monitoring networks (DMN), which would normally signal “this is unusual”. Concurrently, there is sustained or enhanced activity in regions that represent the suggested content (sensory or motor areas engaged by imagination). This combination suggests the brain under hypnosis adopts a unique functional regime: it is *less likely to flag or update errors* (since error signals are suppressed or ignored) and *more likely to maintain internally generated representations*. In a sense, it behaves as if operating with a different **set of probabilistic rules** – one might say the “likelihood” of the suggestion being true is treated as very high, and the “likelihood” of the actual sensory data is treated as low, effectively inverting normal reality weighting. This neural evidence dovetails with both the Bayesian and quantum perspectives: it shows extreme context dependency (the context of suggestion reshapes processing), and a kind of **collapse to a single interpretation** (the suggested one) at the expense of integrating competing inputs, much like a wavefunction collapse yields one reality out of many pos ([Hypnotic suggestion reduces conflict in the human brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/15994228/#:~:text=reduces%20involuntary%20conflict%20and%20alters,highly%20hypnotizable%20subjects%20also%20showed)) ([Hypnotic induction decreases anterior default mode activity - PubMed](https://pubmed.ncbi.nlm.nih.gov/19782614/#:~:text=relevant%20areas,The%20findings)) n and Implications

### **4.1 Bayesian vs Quantum Models: Which Fits Hypnosis-Induced Shifts?**

The cognitive shifts seen in hypnosis – where perception ([Hypnotic visual illusion alters color processing in the brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/10910791/#:~:text=Results%3A%20%20When%20subjects%20were,not%20subjects%20had%20been%20hypnotized)) re guided more by suggestion than by external reality – can be interpreted through both classical Bayesian and quantum-like models. **On the Bayesian side**, as we’ve described, hypnosis seems to exemplify an extreme case of Bayesian belief updating where the prior dominates. The predictive processing account provides a coherent explanation for most findings: by **adjusting the precision of priors and sensory inputs**, the brain under hypnosis can be biased to follow top-down suggestions slavishly. This explains phenomena like analgesia (prior expectation of no pain overrides nociceptive input) or hallucinations (prior expectation of a stimulus creates a percept in absence of input) in a straightforward manner. Importantly, Bayesian models are supported by a wealth of neuroscience evidence from hypnosis studies (fMRI, EEG) that show changes consistent with altered top-down vs bottom-up influence (e.g. reduced error signaling, enhanced imagery, etc.). Thus, one could argue that **hypnosis does not require new physics or exotic formalisms to understand – it can be framed as a natural (if extreme) operation of the brain’s Bayesian inference system**.

**On the quantum cognition side**, the appeal is in capturing the contextual and seemingly non-rational aspects of hypnotic cognition. Hypnosis can produce **non-linear changes** in response based on context – a slight rephrasing of a suggestion or a different cue can lead to a very different outcome (akin to how a quantum measurement’s outcome can depend on the measurement basis). For instance, asking a hypnotized pe ([Frontiers | Cognitive simulation along with neural adaptation explain effects of suggestions: a novel theoretical framework](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1388347/full#:~:text=the%20brain%20makes%20second,Auksztulewicz)) ([Frontiers | Cognitive simulation along with neural adaptation explain effects of suggestions: a novel theoretical framework](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1388347/full#:~:text=match%20at%20L714%20populations%29,been%20associated%20with%20mental%20action)) versus “How is the pain?” might yield different responses because the first question embeds an expectation of absence that reinforces the suggestion. Quantum probability theory might formalize such context effects and the way certain mental states under hypnosis don’t follow classical logic (someone might sincerely hold two inconsistent beliefs in different contexts without noticing the contradiction, which is analogous to a superposition resolved by context). If we take the quantum analogy seriously, one could say the hypnotized mind **exists in a superposed state of “normal” and “suggested” interpretations**, and the act of querying or testing the person collapses them into one. Some researchers have indeed speculated that quantum models could help analyze brain states and decision-making under strong contextual influence. In practice, however, the empirical support for quantum-like effects in hypnosis is not yet evident – it remains an intriguing theoretical lens.

When assessing alignment, **hypnosis-induced cognitive shifts currently align more clearly with Bayesian updating (albeit with unusual parameter settings) than with quantum probability models**. The reason is that Bayesian/predictive coding frameworks have been directly applied to hypnosis with success: they predict things like reduced prediction error signaling, which matches neuroimaging data, and they account for individual differences in hypnotizability via differences in how priors vs. sensory evidence are weighted. Quantum models, while compelling in principle, have not yet been concretely tested in hypnotic phenomena; they might be better at inspiring new experiments than explaining known results. One could imagine future experiments explicitly designed to test “quantum-like” predictions (for example, violations of the sure-thing principle in decision-making under hypnosis, or interference patterns in responses when two suggestions are combi ([Can quantum probability help analyze the behavior of functional ...](https://pubmed.ncbi.nlm.nih.gov/23673025/#:~:text=Can%20quantum%20probability%20help%20analyze,be%20used%20in%20cognitive%20modeling)) ([Quantum cognition - Wikipedia](https://en.wikipedia.org/wiki/Quantum_cognition#:~:text=genuine%20quantum%20aspects%2C%20namely%2C%20superposition%2C,16)) ). If such quantum cognitive effects were found, it would suggest that the hypnotized mind doesn’t just behave like a Bayes-optimal system with tweaked priors, but perhaps uses a different mode of information processing altogether.

It’s possible that **the truth is a bit of both**: the Bayesian view might describe the continuous, mechanistic side of hypnotic cognition (how neural connections adjust weighting, etc.), while the quantum view could describe the *emergent probabilistic behavior* of the whole cognitive system in certain paradi ([Hypnotic suggestion reduces conflict in the human brain - PubMed](https://pubmed.ncbi.nlm.nih.gov/15994228/#:~:text=reduces%20involuntary%20conflict%20and%20alters,highly%20hypnotizable%20subjects%20also%20showed)) those involving context-sensitive questioning or ambiguous mental states). In any event, both perspectives underscore the idea ([Hypnosis decouples cognitive control from conflict monitoring processes of the frontal lobe - PubMed](https://pubmed.ncbi.nlm.nih.gov/15964211/#:~:text=Employing%20event,These)) ([Hypnosis decouples cognitive control from conflict monitoring processes of the frontal lobe - PubMed](https://pubmed.ncbi.nlm.nih.gov/15964211/#:~:text=data%20were%20complemented%20by%20a,monitoring%20and%20cognitive%20control%20processes)) ons shape reality for the mind\*\* – hypnosis just happens to be a domain where this is exceedingly apparent.

### **4.2 Implications and Applications**

Understanding hypnosis through these advanced theoretical lenses has both scientific and practical implications. **Theoretically**, if we view hypnosis as a state of altered Bayesian inference, it becomes a valuable model for studying how priors and prediction errors function in the brain. It’s like having a dial we can turn to shift the brain from data-driven to expectation-driven processing. This can shed light on other phenomena: for instance, psychiatric conditions like *psychosis* or *hallucinations* might also involve overly strong priors or beliefs (patients perceive things that fit their delusions rather than reality). Hypnosis could be used in research as a **safe, temporary way to induce hallucination-like states or delusory beliefs** and study how the brain activity changes, informing our understanding of those clinical conditions. In fact, historically, hypnosis has been used as a model for dissociation and hysteria for similar reasons. If we confirm that hypnosis works by tuning predictive coding parameters, it validates the Bayesian brain hypothesis more broadly and provides extreme test cases for it.

On the other hand, if elements of quantum cognition are found relevant, it could revolutionize how we think about mental states, suggesting that the brain might harness quantum-like information processing at a higher level of abstraction. That could imply new computational models for artificial intelligence inspired by the brain – for example, AI that can enter a “hypnotic mode” to rapidly recontextualize information could be useful for certain tasks that require thinking outside usual constraints.

**Therapeutically**, the insights from these models can enhance clinical hypnosis techniques. Hypnosis is already an effective treatment for pain, anxiety, phobias, and even as an adjunct in depression or habit control. If we know that hypnosis operates by adjusting the brain’s weighting of expectations and sensory inputs, therapists can more deliberately craft suggestions that target ( [Neuro-Hypnotism: Prospects for Hypnosis and Neuroscience - PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC3528837/#:~:text=methods%2C%20most%20neuroscientific%20research%20has,study%20of%20delusions%20and%20psychodynamic) ) ( [Neuro-Hypnotism: Prospects for Hypnosis and Neuroscience - PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC3528837/#:~:text=dimension%20of%20personality%20,relations%20between%20the%20cognitive%20and) ) t. For example, chronic pain often involves a persistent expectation of pain and hyper-attention to symptom ( [Neuro-Hypnotism: Prospects for Hypnosis and Neuroscience - PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC3528837/#:~:text=research%20and%20,The%20search%20for%20correlates%20of) ) ( [Neuro-Hypnotism: Prospects for Hypnosis and Neuroscience - PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC3528837/#:~:text=dimension%20of%20personality%20,relations%20between%20the%20cognitive%20and) ) n aim to reduce the precision of those pain predictions (teaching the brain to filter out pain signals) and increase the expectation of comfort. The Bayesian view thus suggests a mechanism for how hypnosis can break the cycle of pain: by updating the brain’s model to expect less pain, the actual experience of pain is diminished. In conditions like anxiety or PTSD, patients have strong priors of threat or negative outcomes. Hypnosis might help **recalibrate those priors** by providing powerful positive experiences or new associations in a trance state that the brain then accepts as evidence against the old fear expectation. Essentially, hypnotic suggestion can be used to **embody a therapeutic prediction error** – presenting the mind with an alternative reality (safety, calm, control) in such a compelling way that it adjusts its prior beliefs.

From a quantum perspective, if one ente ([Frontiers | Cognitive simulation along with neural adaptation explain effects of suggestions: a novel theoretical framework](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1388347/full#:~:text=Valentine%20et%20al,suggestions%20are%20frequently%20employed%20to)) hypnosis could allow therapists to help clients reach a mental “superposition” of different self-concepts or narratives and then gently guide which one “collapses” into their identity. For instance, a client stuck in a rigid self-view (“I cannot quit smoking”) might under hypnosis entertain the *possibility* (“I am a non-smoker”) without immediately rejecting it. In the hypnotic state, that alternate identity can be strengthened (through suggestion, visualization, etc.) until it becomes the dominant state when “measured” in real life, i.e., when the person faces a cigarette. While this is a metaphorical way to describe it, in practice many hypnotherapy techniques do involve getting clients to imagine new behaviors or beliefs as if they were true, effectively planting a potential state that later guides their actions.

**Ethical and Practical Considerations:** As we deepen our understanding of how suggestion manipulates cognition, it also raises responsibility. Knowing that the brain can be “rewired” on the fly by strong priors highlights the importance of *how* suggestions are given. Clinicians should formulate suggestions in a positive, adaptive manner, since negative or inadvertent suggestions could equally alter perception in harmful ways. Additionally, if the quantum-like view gained traction, it might imply there are delicate “context effects” – for example, what a clinician says first versus second might matter more than we realize, or the exact phrasing might induce different cognitive trajectories. This could lead to more refined hypnotherapy protocols that account for sequence and context to avoid undesirable interference effects.

**Future Directions:** Going forward, interdisciplinary research at the intersection of neuroscience, cognitive modeling, and quantum theory could further illuminate hypnosis. Brain imaging combined with computational modeling might test whether a Bayesian model (with altered prior weights) quantitatively fits subject behavior and brain data better than a quantum model (with state vectors and interference terms) or vice versa. Tools like virtual reality during hypnosis could create controlled multi-sensory environments to test how far suggestion can bend perception. If quantum cognitive principles apply, we might even find certain **“non-commutative” results in experiments – e.g., the order of two different suggestions leads to different outcomes, violating classical expectations**, which would be a thrilling finding bridging psychology and quantum theory notions.

In conclusion, hypnosis offers a compelling case study of the power of mind over body – or more precisely, the power of top-down *beliefs over bottom-up data*. The current evidence strongly supports a view of the brain as a prediction machine that can be tuned by suggestion, as formalized in Bayesian terms. There is also room for more adventurous quantum-inspired theories to describe the fluid and contextual nature of hypnotic states, though these remain speculative for now. What is clear is that the intersection of hypnosis, neuroscience, and advanced cognitive theories enriches our understanding of consciousness and cognition. By leveraging both classical and quantum models, researchers and clinicians can gain a more **holistic understanding of suggestion**, potentially leading to novel applications that improve mental health and reveal the deeper workings of the human mind.