

Clinical Hypnosis and Executive Control: Effects on Attention, Inhibition, and Cognitive Flexibility

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Abstract

Background: Clinical hypnosis has been used therapeutically and studied experimentally for decades, yet its effect on executive functions, attention, inhibition, and cognitive flexibility, remains scientifically contested.

Objective: This narrative review synthesizes the available cognitive, behavioral, and neuropsychological evidence on the effects of hypnosis and hypnotizability on executive control.

Methods: A structured search of academic databases and search engines was conducted for primary empirical studies and systematic reviews/meta-analyses examining the relationship between hypnosis or hypnotic suggestion and hypnotizability with attentional (e.g., Stroop) and set-shifting/flexibility tasks (e.g., the Wisconsin Card Sorting Test). Nine primary studies and two systematic reviews/meta-analyses met inclusion criteria.

Results: The strongest and most consistently replicated findings concern the Stroop task: posthypnotic suggestion of "word blindness" reduces or eliminates Stroop interference in high-hypnotizable individuals, a finding corroborated by functional neuroimaging studies (reduced anterior cingulate cortex activation) and by a recent systematic review with meta-analysis. Regarding cognitive flexibility, trait hypnotizability is associated with lower perseveration on the Wisconsin Card Sorting Test, and a recent controlled intervention found that a single hypnosis session significantly improved performance on a complex executive-planning task under conditions of stress. However, neuroimaging findings remain heterogeneous, with some studies describing a decoupling, rather than a simple enhancement, between cognitive control and conflict monitoring under hypnosis.

Discussion: The evidence supports a model of selective, suggestion-dependent modulation of executive control, consistent with dissociated control and cold control theories of hypnosis, rather than a general "enhancement" of executive function.

Conclusion: Clinical hypnosis appears to modulate specific aspects of executive control, particularly inhibition under conflict, in a manner contingent on an individual's hypnotizability and the nature of the suggestion given, while larger randomized, adequately powered studies are needed before firm clinical conclusions can be drawn.

Keywords: clinical hypnosis; hypnotizability; executive function; attention; inhibition; cognitive flexibility; stroop task

Introduction

Clinical hypnosis is among the oldest psychotherapeutic approaches and is used today in a wide range of settings, from the management of anxiety and pain to the cognitive preparation of healthcare professionals working under pressure. Despite its long clinical tradition, the precise mechanism by which hypnosis affects higher-order cognitive functions remains scientifically debated.

Executive functions, according to the widely accepted model of Miyake and colleagues, comprise three core components: updating of working memory, inhibition of automatic or task-irrelevant responses, and cognitive flexibility/shifting between mental sets or tasks. Attention, particularly executive or selective

attention, is considered closely linked to inhibition and constitutes a central focus of hypnosis research, since the clinical definition of hypnosis itself describes a state of focused attention and reduced peripheral awareness, with an enhanced capacity for response to suggestion.

Two theoretical models dominate the contemporary literature. Dissociated control theory proposes that hypnosis disrupts the normal coupling between an action "contention-scheduling" system and a "supervisory attentional system" that ordinarily regulates executive functions, such that suggestions can override automatic, well-established responses without the usual executive mediation. Cold control theory, by contrast, focuses on the metacognitive representation of intention, proposing that the

hypnotic experience corresponds to the accurate execution of an intention without the accompanying awareness of that intention. Both models predict that hypnosis does not simply "switch off" executive control, but selectively reorganizes it.

The Stroop task has emerged as the paradigmatic experimental tool for studying the effect of hypnosis on inhibition and selective attention, since it allows precise quantification of the conflict between automatic (word reading) and controlled (colour naming) processing. In parallel, tasks such as the Wisconsin Card Sorting Test are used to study cognitive flexibility as a trait associated with hypnotizability independent of an active hypnotic state. This review aims to synthesize the available findings along these two axes, behavioral/experimental data and neuroimaging data, and to evaluate the methodological maturity of the field.

Methods

This is a narrative review rather than a formally registered PRISMA systematic review. A structured search was conducted across academic search engines combining terms related to hypnosis ("hypnosis," "hypnotic suggestion," "hypnotizability," "clinical hypnosis") with terms related to the executive functions under study ("executive function," "attention," "inhibition," "cognitive flexibility," "Stroop," "Wisconsin Card Sorting Test," "prefrontal," "anterior cingulate"). Reference lists of retrieved systematic reviews were also hand-searched.

Inclusion criteria comprised studies that (a) reported primary empirical data (behavioral, electrophysiological, or neuroimaging) or were themselves systematic reviews/meta-analyses; (b) examined the relationship between hypnosis, hypnotic suggestion, or trait hypnotizability and at least one executive function (attention, inhibition, cognitive flexibility); and (c) were available in English. Opinion pieces, non-scientific texts, and studies concerned exclusively with hypnotic analgesia or memory without a direct executive-function outcome were excluded.

Nine primary studies and two systematic reviews/meta-analyses met inclusion criteria and form the basis of the synthesis below (Table 1). For each study, the following were extracted: authorship and year, design, sample, outcome measure(s), and the direction or nature of the key finding. Given heterogeneity in design, population, and

measurement tools, a narrative rather than a meta-analytic synthesis was undertaken, organized around two main axes: (a) behavioral and experimental findings on the Stroop task and related inhibition paradigms, and (b) neuroimaging findings and cognitive flexibility.

Results

Attention and Inhibition: Evidence from The Stroop Task

The foundational series of studies by Raz and colleagues constitutes the most consistently replicated finding in the field. In an experimental study using posthypnotic suggestion in high- and low-hypnotizable individuals, a "word-blindness" suggestion, the belief that words would appear as meaningless symbols, completely eliminated Stroop interference in high-hypnotizable participants, with no change whatsoever in low-hypnotizable participants (Raz et al., 2002). This finding was corroborated in a subsequent neuroimaging study: using fMRI and ERP, the same research group showed that the suggestion significantly reduced activation of the anterior cingulate cortex (ACC), a region associated with conflict monitoring, as well as visual areas, exclusively in high-hypnotizable individuals (Raz, Fan & Posner, 2005).

A related but conceptually distinct study investigated what happens when the Stroop task is performed under an active hypnotic state, without a specific word-blindness suggestion. Using fMRI, this study found that the hypnotic state itself decoupled cognitive control from the normal frontal-lobe processes of conflict monitoring (Egner, Jamieson & Gruzelier, 2005), suggesting that hypnosis does not simply enhance inhibition but alters how executive control is organized. More recently, a study using event-related potentials (ERP) compared two types of suggestion, perceptual (focusing only on the central letter) and semantic (perceiving meaningless symbols), and found that both improved Stroop accuracy, but through distinct neurocognitive mechanisms, with no change in reaction time (Perri, Bianco, Facco & Di Russo, 2021).

The accumulated literature on hypnotic modulation of Stroop interference was recently synthesized in a systematic review with meta-analysis of 19 studies, 14 of which examined the effect of suggestion on Stroop interference and 6 on accuracy (Raturi, Narayanan & Jena, 2024). The meta-analysis confirmed a statistically significant overall effect of suggestion in

reducing Stroop interference, with significant heterogeneity depending on suggestion type (e.g., "word blindness" versus perceptual suggestions).

Cognitive Flexibility and Trait Hypnotizability

An early neuropsychological study compared high- ($n = 9$) and low-hypnotizable ($n = 7$) individuals on four tests of executive function outside the hypnotic state, finding that high-hypnotizable individuals performed significantly better on the Wisconsin Card Sorting Test (WCST) at baseline, a finding the authors interpreted as evidence for the role of cognitive flexibility as a component of hypnotizability (Aikins & Ray, 2001). This finding was corroborated and extended in a larger and more recent sample: in a study of 72 healthy adults, higher hypnotizability was significantly associated with lower perseveration on the WCST, even after controlling for age and education, though it did not predict set-shifting ability per se (Faerman & Spiegel, 2021).

At the neuroimaging level, a systematic review with meta-analysis of neuroimaging studies of hypnosis examined the involvement of broader brain networks, including the executive-control network, the salience

network, and the default-mode network (Landry, Lifshitz & Raz, 2017). While the review confirmed the involvement of regions associated with executive control, it did not identify a consistent activation pattern across studies, underscoring the field's substantial methodological heterogeneity.

Clinical Application Under Conditions of Stress

The most recent and clinically oriented study examined whether a single, personalized hypnosis session could improve executive performance in final-year medical students under acute stress (Queirolo et al., 2026). In a controlled (non-randomized) design with 49 participants, the hypnosis group showed significantly greater improvement on the Tower of London-Revised (TOL-R), a measure of planning, problem solving, and inhibitory control, compared with a breath-focused attention control group (effect size $d = 0.62$), alongside reduced subjective stress, reduced anxiety, and increased parasympathetic recovery (heart-rate variability).

Table 1 summarizes the design, sample, outcome measures, and key findings of the nine primary studies included in this review.

Table 1: Characteristics of Included Studies on Clinical Hypnosis and Executive Control.

Study (Authors, Year)	Design	Sample	Outcome Measure(s)	Key Finding
Aikins & Ray (2001)	Experimental group comparison (high vs. low hypnotizability)	$n = 16$ (9 high, 7 low hypnotizability)	Wisconsin Card Sorting Test (WCST), verbal fluency, reaction time, vigilance	High-hypnotizable individuals outperformed lows on the WCST at baseline, supporting a role for cognitive flexibility in hypnotizability. Positive (flexibility)
Raz, Shapiro, Fan & Posner (2002)	Experimental, within/between-subjects, posthypnotic suggestion	High- and low-hypnotizable adults (Stroop task)	Stroop colour-naming task (reaction time, accuracy)	A posthypnotic "word-blindness" suggestion eliminated Stroop interference in high-hypnotizable participants, with no effect in lows. Positive (inhibition)
Raz, Fan & Posner (2005)	Experimental, fMRI and ERP	High- and low-hypnotizable individuals	Anterior cingulate cortex (ACC) activation, visual areas, event-related potentials (ERP)	Posthypnotic suggestion reduced ACC and visual-area activation in high-hypnotizable individuals, consistent with reduced cognitive conflict. Positive (inhibition/conflict)
Egner, Jamieson & Gruzelier (2005)	Experimental, fMRI	High-hypnotizable individuals, Stroop task under hypnosis	ACC and dorsolateral prefrontal cortex activation	Hypnosis decoupled cognitive control from frontal-lobe conflict-monitoring processes, indicating altered – not simply enhanced – executive function under hypnosis. Mixed/modulatory
Perri, Bianco, Facco & Di Russo (2021)	Experimental, within-subject, EEG/ERP	High-hypnotizable adults, Stroop task	Reaction time, accuracy, event-related potentials (ERP)	Both perceptual and semantic hypnotic suggestions improved Stroop accuracy through distinct neurocognitive mechanisms, with no change in reaction time. Positive (inhibition/accuracy)
Faerman & Spiegel (2021)	Cross-sectional, correlational	$n = 72$ healthy adults	Wisconsin Card Sorting Test (perseveration/set-shifting),	Higher hypnotizability was associated with lower perseveration on the WCST, supporting a shared mechanism with

			Trail Making Test, Hypnotic Induction Profile	cognitive flexibility; it did not predict set-shifting. Positive (flexibility)
Queirolo et al. (2026)	Controlled (non-randomised) intervention	n = 49 final-year medical students	Tower of London-Revised (TOL-R), stress/anxiety scales, heart-rate variability (HRV), electrodermal activity	A single personalised hypnosis session significantly improved executive performance ($d = 0.62$) relative to a breath-focused attention control, while reducing stress and anxiety. Positive (planning/inhibition)
Raturi, Narayanan & Jena (2024)	Systematic review with meta-analysis	19 studies (14 on Stroop interference, 6 on accuracy)	Stroop interference effect size (Hedges' g), EEG/ERP data	Significant overall effect of hypnotic suggestion in reducing Stroop interference and improving accuracy, with heterogeneity by suggestion type. Positive (inhibition)
Landry, Lifshitz & Raz (2017)	Systematic review with neuroimaging meta-analysis	Neuroimaging studies of hypnosis (multiple paradigms)	Activation-likelihood estimation (ALE) meta-analysis of brain activation/deactivation	Hypnosis was associated with activation of executive-control, salience, and default-mode networks, but without a consistent activation pattern across studies. Inconclusive/heterogeneous

Note: ACC = anterior cingulate cortex; ERP = event-related potentials; WCST = Wisconsin Card Sorting Test.

Discussion

The synthesis of findings reveals a clear distinction between two levels of analysis. At the state level, where the effect of a specific hypnotic suggestion during or after hypnosis is examined, findings are highly consistent: the "word-blindness" suggestion reduces or eliminates Stroop interference exclusively in high-hypnotizable individuals, a finding confirmed both behaviorally (Raz et al., 2002) and via neuroimaging (Raz et al., 2005; Perri et al., 2021), as well as meta-analytically (Raturi et al., 2024). At the trait level, where hypnotizability is examined as a stable individual characteristic independent of an active hypnotic state, findings show a consistent association with greater cognitive flexibility, particularly lower perseveration on the WCST (Aikins & Ray, 2001; Faerman & Spiegel, 2021).

The finding of Egner and colleagues (2005), that the hypnotic state itself decouples rather than simply enhances cognitive control from conflict monitoring, is critical for interpreting the body of evidence as a whole. It suggests that hypnosis does not function as a general "enhancing" intervention on executive function, but as a selective reorganization of the relationship between control systems, consistent with both dissociated control theory and cold control theory. Viewed through this lens, the performance improvement observed by Queirolo et al. (2026) likely does not reflect an enhancement of executive capacity per se, but rather a reduction of interference from stress and anxiety, factors known to impair prefrontal function, achieved through hypnotic relaxation and increased parasympathetic regulation.

Hypnotizability emerges as the most consistent moderating factor across nearly all included studies: effects on inhibition are almost exclusively confined to high-hypnotizable individuals (Raz et al., 2002, 2005), whereas the relationship with cognitive flexibility is observed across the full range of hypnotizability as a continuous variable (Faerman & Spiegel, 2021). This has important clinical implications: suggestion-based interventions are likely to be effective primarily in highly hypnotizable patients, and clinicians may need to calibrate expectations of efficacy based on preliminary hypnotizability assessment.

The methodological maturity of the field, however, remains limited. Many of the foundational Stroop studies have small samples (e.g., Aikins & Ray, 2001, $n = 16$), constraining statistical power and generalizability. The neuroimaging meta-analytic review (Landry et al., 2017) did not identify a consistent activation pattern, indicating that the neural correlates of hypnosis depend heavily on the specific experimental paradigm, suggestion type, and neuroimaging method used, a limitation for deriving a unified neurobiological model. Moreover, the single clinically oriented, controlled study with a clear executive-performance endpoint (Queirolo et al., 2026) was not randomized, lacked a no-intervention control arm, and involved a specific population (medical students), limiting generalizability to broader clinical populations.

Priorities for future research include: (a) randomized controlled trials with adequate sample sizes comparing hypnosis with active control conditions in clinical populations with documented executive

dysfunction (e.g., attention-deficit/hyperactivity disorder, chronic stress, posttraumatic stress disorder); (b) systematic investigation of hypnotizability as a moderator in clinical, not only laboratory, settings; (c) standardized neuroimaging protocols that would allow comparable meta-analyses across paradigms; and (d) experimental designs that separate effects attributable to the hypnotic state itself from effects attributable to the stress/anxiety reduction that frequently accompanies it.

Conclusion

The available cognitive and neuropsychological evidence indicates that clinical hypnosis does not uniformly affect all executive functions, but selectively modulates specific aspects of them. The effect on inhibition, particularly within the Stroop paradigm, is the most well-documented finding, though it depends almost exclusively on high hypnotizability and the nature of the suggestion given. Trait hypnotizability is associated with greater cognitive flexibility, while neuroimaging findings remain heterogeneous and do not yet permit a unified neurobiological model. Evidence from clinically oriented research suggests a possible benefit of hypnosis for executive performance under conditions of acute stress, a benefit that may, however, be mediated more by stress reduction than by direct enhancement of executive capacity. Larger randomized trials, standardized protocols, and a clear distinction between state and trait effects are needed before clinical hypnosis can be confidently recommended as an intervention targeting executive control.

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