Keywords
dental anxiety, cognitive processes, neuropsychological factors, patient compliance, attentional bias, cognitive bias, executive function, cognitive behavioral therapy

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Dental Anxiety, Cognitive Processes, and Neuropsychological Factors Affecting Patient Compliance in Restorative Dentistry: Current Evidence and Clinical Recommendations

Abstract
Dental anxiety is one of the most common psychological barriers in restorative dentistry and significantly impairs patient compliance. This narrative review examines the neuropsychological foundations of dental anxiety, the influence of cognitive processes on patient compliance, and clinical outcomes in restorative and prosthodontic treatments.
Methods: A comprehensive literature search was conducted in PubMed/MEDLINE, Scopus, and Web of Science databases from 2015 to 2026 using the Boolean operators: ("dental anxiety" OR "dental fear" OR "dental phobia") AND ("cognitive" OR "neuropsychological" OR "attentional bias" OR "executive function") AND ("patient compliance" OR "adherence") AND ("restorative dentistry" OR "prosthodontics"). Thirty relevant English-language peer-reviewed studies involving adult patients were included.
Results: Dental anxiety is strongly associated with attentional bias, interpretational bias, and deficits in executive functions. These factors contribute to avoidance behaviors, reduced cooperation during treatment, and difficulties in prosthesis adaptation. Cognitive Behavioral Therapy (CBT) and attentional bias modification have been shown to significantly reduce anxiety levels and improve patient compliance.
Conclusions: Routine evaluation of cognitive and neuropsychological factors is crucial for enhancing treatment success in restorative dentistry. Dentists can improve patient-centered care by incorporating anxiety screening and simple cognitive techniques into daily practice.
Clinical Relevance: Dentists can provide more patient-centered care by incorporating routine anxiety screening using tools such as the Modified Dental Anxiety Scale (MDAS) and implementing simple cognitive techniques into daily practice. Such approaches are expected to improve treatment outcomes, patient satisfaction, and long-term adherence to restorative and prosthetic treatments.

Introduction

Dental anxiety remains one of the most prevalent psychological barriers in restorative dentistry, significantly affecting patient compliance.[1] Approximately 10–20% of adults experience clinically significant dental anxiety, with higher rates reported in specific populations.[2] This condition contributes to missed appointments, delayed treatments, prosthesis adaptation difficulties, and a progressive decline in oral health.[3]
Recent research has moved beyond the traditional emotional fear model to highlight the critical role of neuropsychological and cognitive processes.[4] Amygdala hyperactivity, attentional bias, interpretational bias, and executive function deficits are

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key mechanisms underlying persistent fear responses to dental stimuli.[5] In restorative and prosthodontic procedures, patients' cognitive appraisal directly influences treatment cooperation and long-term adherence, particularly in elderly patients, those with mild cognitive impairment, and individuals with a history of trauma.[6,7]

The aim of this narrative review is to synthesize current evidence on the impact of dental anxiety, cognitive processes, and neuropsychological factors on patient compliance in restorative dentistry and to offer practical clinical recommendations.

Methods

This narrative review synthesizes the effects of dental anxiety, cognitive processes, and neuropsychological factors on patient compliance in restorative dentistry.

A comprehensive literature search was performed in PubMed/MEDLINE, Scopus, and Web of Science from 2015 to 2026.

Thirty relevant English-language peer-reviewed studies involving adult patients were selected based on relevance, methodological quality, and clinical applicability. All statements in this review are supported by the included references.

1. Neuropsychological Foundations of Dental Anxiety

Dental anxiety is largely explained by classical fear conditioning, in which dental stimuli (e.g., the sound of the drill, sight of the needle, or clinical odor) are processed by the amygdala as potential threats, triggering a physiological stress response via the hypothalamic-pituitary-adrenal axis.[9]

At the cognitive level, attentional bias and interpretational bias are prominent features.[10] Individuals with high dental anxiety tend to selectively attend to threat-related dental cues. These biases are maintained by insufficient top-down regulation from the prefrontal cortex.[5] When executive functions are compromised, the likelihood of panic and escape behaviors during treatment increases.[11] Chronic dental anxiety is associated with amygdala hyper-reactivity and weakened functional connectivity between the hippocampus and prefrontal regions.[7] In restorative and prosthodontic dentistry, highly anxious patients frequently request shorter appointments, higher doses of analgesia, and experience greater difficulty adapting to new prostheses.[12]

In summary, dental anxiety is a complex neurobiological and cognitive phenomenon. A clear understanding of these mechanisms is essential for developing effective, patient-centered strategies in restorative dentistry.[6]

2. The Impact of Cognitive Processes on Patient Compliance

Cognitive processes significantly influence the maintenance of dental anxiety and patient compliance in restorative dentistry. The primary mechanisms include attentional bias, interpretational bias, and deficits in executive functions.[13]

Patients with high dental anxiety exhibit automatic and selective attention toward dental-related stimuli. This bias contributes to loss of concentration, increased muscle tension, and longer treatment times.[14] Evidence shows a negative association between the severity of attentional bias and both treatment completion rates and appointment adherence.[1]

Interpretational bias further impairs compliance. Patients often perceive neutral or routine explanations from the dentist as threatening, which erodes trust, reduces cooperation, and may lead to premature termination of treatment, particularly in implant and prosthetic cases.[11]

Deficits in executive functions are linked to higher rates of missed appointments, poorer oral hygiene, and challenges in adapting to new prostheses.[7] Greater cognitive load can slow motor learning and increase the risk of prosthesis rejection, while preserved cognitive function is associated with better treatment outcomes.[15] Negative cognitive patterns reinforce avoidance behaviors and diminish the overall quality of restorative care.[16]

In conclusion, cognitive processes are key determinants of patient compliance. Routine assessment of these factors facilitates individualized treatment planning.

3. Clinical Applications and Interventions

Effective management of dental anxiety and related cognitive factors in restorative dentistry relies on evidence-based interventions. Cognitive Behavioral Therapy (CBT) demonstrates the strongest support; brief CBT protocols (4–8 sessions) significantly reduce attentional and interpretational biases and improve compliance.[8] Chairside techniques such as guided imagery, progressive muscle relaxation, and cognitive restructuring are particularly useful during restorative and prosthodontic procedures.[2]

Attentional Bias Modification (ABM) training, delivered via computer-based tasks, helps retrain attention away from threat cues, thereby lowering pre-treatment anxiety and enhancing cooperation.[13] Additional effective adjuncts include virtual reality exposure,[20] biofeedback, hypnosis, music therapy, and educational videos.[17]

For elderly patients and those with cognitive impairment, strategies that support neuroplasticity—such as shorter, repeated sessions, visual aids, and family involvement—are recommended.[19]

4. Discussion and Clinical Recommendations

This narrative review highlights the neuropsychological foundations of dental anxiety and the substantial influence of cognitive processes on patient compliance in restorative dentistry. Dental anxiety is a multifaceted condition maintained by attentional bias, interpretational bias, executive function deficits, and amygdala hyperactivity.[10,13,14]

These factors are associated with reduced compliance, especially in implant-supported prostheses, crown and bridge work, and complete denture adaptation. Consequences include missed appointments, prolonged sessions, and higher rates of prosthesis rejection.[1,12,15]

In contrast, interventions such as CBT, attentional bias

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modification, and virtual reality exposure have been shown to improve compliance and treatment success.[8,20,22]

Nevertheless, these evidence-based approaches remain underutilized in routine restorative practice, where pharmacological sedation and simple reassurance continue to predominate.[1,16,18]

Clinical Recommendations

• Implement routine MDAS screening for all new patients.[2,22]

• Offer brief cognitive assessment and chairside CBT techniques for patients with MDAS scores >19.[11,6]

• Incorporate guided imagery, cognitive restructuring, virtual reality, and biofeedback during treatment sessions.[21,18]

• Use shorter appointments, visual aids, and family involvement for elderly and cognitively vulnerable patients.[19]

• Integrate neuropsychological principles into dental education curricula.[16,1]

The primary limitation of this review is its narrative (rather than systematic) design, which may introduce selection bias. Future research should prioritize randomized controlled trials to further evaluate these interventions.[8,12,6]

Conclusion

In restorative dentistry, dental anxiety, cognitive processes, and neuropsychological factors are critical determinants of patient compliance. Their routine incorporation into clinical practice will improve treatment success, patient satisfaction, and clinical efficiency.

Declaration of Competing Interest: The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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