

Review Article

Temporomandibular disorders: Current concepts in diagnosis and treatment**Joggeswar Kundu^{1*}, Pooja Sharma¹, Atul Singh¹, Abrin Ragland¹, Poonam Bharat Ghodke¹**¹Dept. of Orthodontics & Dentofacial Orthopaedics, K.D Dental College & Hospital, Mathura, Uttar Pradesh, India**Abstract**

Temporomandibular disorders (TMDs) represent a complex group of musculoskeletal conditions involving the temporomandibular joints (TMJs), masticatory muscles, and associated structures. These disorders can significantly impair quality of life, causing orofacial pain, jaw dysfunction, headaches, and psychological distress. Historically, the management of TMDs has ranged from conservative measures to irreversible and invasive surgical interventions. However, recent advances in research and clinical understanding have led to a paradigm shift in the approach to TMD care—one that emphasizes conservative, reversible, and multidisciplinary strategies rooted in evidence-based practice. This article aims to revisit traditional approaches and highlight the transition towards a more holistic and patient-centered model of care. We explore the growing body of literature supporting non-invasive therapies and review the expanding role of multidisciplinary teams—including dentists, physiotherapists, psychologists, and pain specialists—in the effective management of TMDs. The review also examines emerging treatment modalities and critically evaluates current clinical guidelines, positioning this shift within the broader context of modern musculoskeletal and pain management practices.

Keywords: Temporomandibular disorders, Conservative management, Multidisciplinary approach, Orofacial pain, Non-invasive therapy, Biopsychosocial model, TMJ dysfunction.

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1. Introduction

The temporomandibular joint (TMJ) is a complex synovial joint essential for oral function and is particularly vulnerable to hypermobility, subluxation, and dislocation due to its unique anatomy and the action of the lateral pterygoid muscle. Temporomandibular disorders (TMDs) involve degenerative musculoskeletal conditions marked by structural and functional abnormalities, significantly impacting oral health.^{1,2}

Though its pathophysiology is not fully understood, TMD is believed to have a multifactorial origin, with occlusal disturbances often recognised as a key contributing factor.³

Approximately 28% of adults have symptomatic TMJ dysfunction, with some experiencing severe functional issues. While internal derangement is the most common cause, other sources include cervical spondylosis and nearby

bone lesions. Trauma accounts for 25% of internal derangement cases, with 30% being iatrogenic, often due to procedures involving prolonged mouth opening, such as molar extractions or endoscopic surgeries.⁴

Interestingly, there is evidence that the prevalence of TMD appears to be on the rise in recent years.⁵⁻⁸ A recent systematic review and meta-analysis in 2021 concluded that the prevalence of TMD was 31% for adults and 11% for children and adolescents.⁹ Misdiagnosis of TMJ disorders is common in children and adolescents due to vague symptoms, often delaying treatment and leading to early joint degeneration. Internal derangement, typically caused by trauma, abnormal loading, or degenerative changes, involves disc-condyle displacement, most commonly anterior. Parafunctional habits contribute to muscle overuse and joint strain. These derangements alter TMJ function, causing joint sounds, pain, and restricted or deviated movement. Over

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time, they can lead to degenerative changes, disc perforation, or damage to the retrodiscal tissue.

Conventional radiographs reveal TMJ bone structure but lack soft tissue detail. Tomography offers improved resolution with higher radiation. MRI, CBCT, and ultrasound provide detailed multiplanar views, with MRI and ultrasound excelling in soft tissue assessment. DICOM software enables clinicians to efficiently review scans in-office, enhancing diagnostic accuracy and treatment planning.¹⁰

The relationship between orthodontic treatment and TMD remains debated. Some suggest orthodontics may trigger TMD, while others believe it alleviates symptoms. Both views often rely on anecdotal evidence and non-controlled studies. As understanding of the TMJ grows, so does recognition of its complexity and significance in oral function. Advancements in research and diagnostics are expected to enhance awareness and lead to more accurate diagnosis and management of TMJ-related disorders.

2. Etiology and Classification

Temporomandibular disorders (TMDs) comprise a group of musculoskeletal and neuromuscular conditions affecting the temporomandibular joint (TMJ), often accompanied by morphological or functional abnormalities.^{11,12} They involve disturbances in the position or structure of the intra-articular disc as well as dysfunction of the associated masticatory musculature.¹³

The TMJ can be affected by various conditions, but the most common are functional disorders causing pain, especially in women. Formerly known as TMJ pain dysfunction syndrome, these are now termed temporomandibular disorders (TMDs). Since 1978, understanding of their causes, diagnosis, and management has significantly evolved through ongoing research.¹³

Temporomandibular disorders (TMDs) are a subset of craniofacial pain conditions affecting the TMJ, masticatory muscles, and surrounding musculoskeletal structures. Symptoms include jaw pain, limited or asymmetric movement, and joint sounds, often accompanied by ear pain, tinnitus, dizziness, neck pain, and headaches. Onset may be acute and self-limiting or progress to chronic pain with physical, psychological, and behavioural components, resembling other chronic pain syndromes. TMDs require interdisciplinary care and are classified as secondary headache disorders by the International Headache Society. The American Academy of Orofacial Pain has expanded the classification of temporomandibular disorders (**Table 1**). In Japan, the Japanese Society for the Temporomandibular Joint (JSTMJ) developed a subtype-based classification system for TMJD, which is currently the most widely used in clinical practice (**Table 2**).

Table 1: Comprehensive classification of temporomandibular joint (TMJ) disorders based on the guidelines of the American Academy of Orofacial Pain (AAOP) and the International Headache Society (ICHD-II).¹⁴

Category	Disorders
Congenital or Developmental	- First and second branchial arch disorders (e.g., hemifacial microsomia) - Treacher Collins syndrome, bilateral facial microsomia - Condylar hyperplasia - Idiopathic condylar resorption (condylolysis)
Disc-Derangement Disorders	- Displacement with reduction - Displacement without reduction (closed lock) - Perforation
Degenerative Joint Disorders	- Inflammatory: capsulitis, synovitis, polyarthritides (rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis, Reiter’s syndrome, gout) - Non-inflammatory: osteoarthritis
Trauma	- Contusion - Intracapsular hemorrhage - Fracture
TMJ Hypermobility	- Joint laxity - Subluxation - Dislocation
TMJ Hypomobility	- Trismus - Postradiation therapy fibrosis - Ankylosis: true ankylosis (bony or fibro-osseous), pseudoankylosis - Infection - Neoplasia

Table 2: The subtype classification of TMJ disorder established by the Japanese society for the temporomandibular joint in 2001¹⁵

Type	Description
Type I: Masticatory muscle disorder	There is jaw movement pain in the muscle whose region can be identified.
Type II: Capsule-ligament disorder	There is movement pain in the TMJ with palpation tenderness. This category includes chronic and traumatic diseases of either the retrodiscal tissue, joint capsule, or ligament.
Type III: Disc disorder	
Type IIIa: Disc displacement with reduction	There is a clicking sound or temporal sticking motion when opening and closing the mouth.
Type IIIb: Disc displacement without reduction	There is trismus and jaw opening pain or clenching pain after the disappearance of clicking. A protrusive slide of the mandibular condyle is usually disturbed on the problem side.
Type IV: Degenerative joint diseases (osteoarthritis, osteoarthrosis)	There is at least one of: joint pain, trismus, or joint sound. A picture image reveals marginal proliferation (osteophyte), erosion, or a deformity of the mandibular condyle.
Type V:	Cases not included in Type I–IV

Table 3: Classification of temporomandibular joint disorders; Axis I (Dworkin and LeResche, 1992)¹⁶

Group I: Muscle disorders
a. Myofascial pain b. Myofascial pain with limitations in aperture
Group II: Disc displacement
a. Disc displacement with reduction b. Disc displacement without reduction and no limitations in aperture c. Disc displacement without reduction and with limitations in aperture
Group III: Arthralgia, arthritis, arthrosis
a. Arthralgia b. Osteoarthritis of the TMJ c. Osteoarthrosis of the TMJ

In 1992, Samuel Dworkin and Linda LeResche introduced the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD)¹⁶ (**Table 3**), aiming to establish standardized diagnostic guidelines for both clinical research and epidemiological studies, based on the available knowledge of TMJ pathology. Their objective was to enhance reliability and reduce variability in examination methods and clinical judgment. The RDC/TMD system is structured around two diagnostic axes: Axis I: Clinical conditions of TMD, categorized into three groups—(1) muscle disorders, (2) disc displacements, and (3) arthralgia, arthritis, and arthrosis.

Axis II: Disabilities related to pain and the psychological status of the patient.

3. Diagnosis

Temporomandibular disorders (TMD) often mimic other orofacial pain conditions, complicating diagnosis. A specific clinical diagnosis helps guide treatment but may be difficult to establish. A thorough patient history is essential, focusing on the primary complaint, aggravating factors, prior episodes, investigations, and any previous treatments to ensure accurate evaluation.

Pain intensity in TMD patients should be measured using tools like the visual analogue scale (VAS) for monitoring treatment outcomes. A complete medical history, including systemic conditions and medications, can reveal comorbidities. Behavioral habits (e.g., smoking, alcohol use), parafunctional activities (e.g., clenching, bruxism), stress,

and psychological factors should also be assessed. Life events such as bereavement or job loss may influence TMD symptoms. While many clinicians are skilled in physical assessments, psychosocial aspects may require standardized tools like Axis II of the DC/TMD, with referral for psychological evaluation if necessary.¹⁷

A thorough clinical examination is vital in diagnosing TMD. It includes palpation to locate pain, assessment of joint sounds like clicking or crepitus, and measuring mouth opening (pain-free, unassisted, assisted). Deviations may indicate condylar dysfunction. Intraoral evaluation helps rule out mucosal lesions and assess dentition, which may contribute to symptoms, ensuring a comprehensive diagnostic approach.

3.1. Imaging

Imaging of the temporomandibular joint (TMJ) assesses the condition of both hard and soft tissues, including the articular disc. Various imaging modalities help diagnose TMJ disorders, with their effectiveness relying on image quality and accurate interpretation. Due to the diverse causes of TMJ dysfunction, appropriate diagnostic tests guide targeted treatment.

The osseous portion of the TMJ is often assessed with plain radiographs, panoramic radiographs, axially corrected sagittal tomography, computed tomography (CT), and cone beam computed tomography (CBCT). It is relatively common for TMD patients to have some radiographic

osseous change,¹⁸ and changes typically begin on the condyle’s lateral pole.¹⁹

Osseous changes generally occur in response to TMJ inflammation,^{20,21} which is clinically identified by TMJ palpation tenderness or pain.²² The clinical symptoms are generally caused by TMJ overload from activities such as parafunctional habits.²³ As the TMJ pain and inflammation resolve, demineralization correspondingly stops.¹⁴ These radiographic changes lag behind the clinical symptoms by as much as 6 months.^{22,25} Therefore, a TMD patient’s most current status is generally best determined by the patient’s current signs and symptoms and not by the radiographic findings; similarly, TMD therapy needs to be directed toward the patient’s symptoms and not toward the radiographic findings.

There are many techniques available for imaging the temporomandibular joint (TMJ), including conventional radiography, conventional tomography, computed tomography (CT), arthrography, arthrotomography, arthroscopy, nuclear medicine imaging, magnetic resonance imaging (MRI), and ultrasonography (USG).

3.1.1. Conventional radiography

Conventional radiography uses a stationary X-ray source and film, showing only mineralized TMJ structures. Soft tissues and cartilage remain invisible, and overlapping anatomy can obscure details. It includes non-specific and specific TMJ views, with multiple angles improving overall visualization. Nonspecific: Submentovertex view, Reverse Town’s projection, Panoramic radiograph, PA cephalogram, Lateral cephalogram. Specific: Transcranial view, Transpharyngeal view, Transorbital view

3.1.2. Computed tomography

CT combines thin-layer radiography with computer-generated imaging, offering detailed views of hard and soft tissues. It eliminates superimposition by producing thin slices through the area of interest. CT can detect tissue density differences as small as 1–2%, and images can be reformatted in other planes without additional scans.⁴

CT routinely produces axial and cross-sectional images and can generate three-dimensional reconstructions from the original data. It is particularly valuable for diagnosing bony abnormalities such as fractures, dislocations, arthritis, ankylosis, and neoplasms.

3.1.3. Cone beam computed tomography

Cone-beam computed tomography (CBCT) is a newer imaging technology offering higher-resolution TMJ images than conventional medical CT, with lower radiation exposure comparable to a full-mouth periapical series. Specifically developed for dentistry, CBCT provides reliable visualisation

of TMJ osseous components. It enables image reconstruction along the condyle’s long axis, producing high-quality multiplanar views. With patients in a natural head position, CBCT allows more accurate evaluation of TMJ positional relationships than supine-position CT scans.⁴

3.1.4. Arthroscopy

It is a valuable adjunctive tool for TMJ imaging, allowing direct visualization of joint structures and providing both diagnostic and therapeutic benefits. It improves disc dynamics, reduces pain, and detects conditions like synovitis and arthritis. First described by Ohinishi and developed further by Murakami and Kino, arthroscopy surpasses CT in assessing disc integrity and offers more precise localization of perforations compared to arthrography.⁴

3.1.5. Magnetic resonance imaging (MRI)

MRI is a noninvasive imaging technique that employs magnetic fields and radiofrequency pulses, avoiding ionizing radiation. It provides detailed information on TMJ structures, including disc position in open and closed mouth views at multiple joint levels. MRI can detect medio-lateral, rotational, and straight anterior displacements, as well as soft tissue ingrowths, fibrosis, and joint effusion. While disc perforations and capsular tears are better identified with arthrography, MRI is valuable for recognizing early signs of TMJ dysfunction such as thickening of the anterior or posterior band, rupture of retrodiscal tissue, disc shape alterations, and joint effusion.²⁸

3.1.6. High-resolution ultrasonography (US)

Introduced by Nabeih et al. in 1991, ultrasound is a non-invasive, real-time, and cost-effective method for TMJ evaluation. It offers dynamic imaging of disc position and can detect displacement and effusion. Diagnostic accuracy improves with transducers ≥7.5 MHz, though results may vary with equipment and frequency used.²⁹

3.1.7. Nuclear medicine in TMJ imaging

Nuclear medicine, using radiopharmaceuticals, offers functional and structural insights in TMJ disorders. SPECT is particularly effective, detecting early bone changes, inflammation, or active condylar growth with high sensitivity. Though it lacks detailed anatomy, it is valuable for deep, small structures like the TMJ.⁴

Beyond imaging, additional investigations are typically reserved for specific cases of TMD. Blood tests may be indicated when systemic conditions such as rheumatoid arthritis or gout are suspected. In cases with uncertain diagnoses or when neoplasms are considered, tissue biopsies—via fine-needle aspiration, arthroscopy, or open joint approaches—may be performed for definitive diagnosis.

Table 4: Differential diagnosis of temporomandibular disorder by Kumar et al.³⁰

Condition	Signs and Symptoms
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Myofascial pain and local myalgia	- Regional pain in masticatory or cervical muscles on palpation - Fatigue or tightness in the muscles - Dull, throbbing, or aching pain - Aggravated by function or overuse - Trigger points or tight muscle bands may be present - Myospasm can reduce mouth opening - Chronic cases may involve diffuse or centrally mediated pain
Disc displacement with reduction	- Audible clicking or popping, especially on the affected side - May be asymptomatic or not painful - Deviation to the affected side during opening - Maximal mouth opening usually not limited
Disc displacement without reduction	- Limited mouth opening or locking - Deflection to affected side upon opening - Confirmed disc displacement on imaging - Reduced maximal mouth opening
Temporomandibular joint dislocation	- “Open lock” sensation - Condyle displaced anterior to articular eminence - May require manual reduction by a clinician
Osteoarthritis / Degenerative joint disease	- Pain during joint palpation or functional movement - Adaptive changes like condylar flattening or osteophytes on imaging - Deviation to affected side during opening - Crepitus may be present - May limit opening - Can result from prior trauma or systemic disease
Capsulitis / Synovitis / Retrodiscitis	- Localized joint pain worsened by movement - Difficulty occluding on the posterior teeth of the affected side - Minimal to no osteoarthritic changes on imaging

Identifying the cause of TMD pain—whether muscular or joint-related—is crucial for effective treatment. Management differs based on origin, and when no clear physical cause is present, especially with psychological factors, counseling or psychological therapy may provide the greatest benefit.

A key component of TMD diagnosis is differentiating common disorders from rare but serious conditions requiring urgent care. For example, chondrosarcoma of the TMJ may mimic TMD symptoms like preauricular pain and limited opening. Similarly, temporal arteritis can present with temporal pain and jaw stiffness but poses a risk of vision loss if untreated, making it a medical emergency. A list of alternative orofacial pain diagnoses resembling TMD is provided in **Table 4**.³⁰

4. Treatment Modalities

Diagnosing and treating temporomandibular joint disorders (TMDs) accurately is a complicated and intricate task and demands thorough knowledge, understanding, and experience.

Management of temporomandibular disorders (TMD) generally begins with conservative, non-surgical measures to reduce pain and improve function. Patient education, behavior modification, and lifestyle changes help address stress-related habits like bruxism and clenching.²⁵ Pharmacologic options include NSAIDs, muscle relaxants, and low-dose tricyclic antidepressants to manage pain and

spasms.¹⁶ Physical therapies such as jaw exercises, ultrasound, and TENS enhance mobility and relieve discomfort.³¹ Occlusal splints or night guards are used to reduce joint load and protect teeth.³² In chronic or psychosocially complex cases, cognitive behavioral therapy (CBT) may be beneficial.³³ If conservative treatment fails, minimally invasive options like arthrocentesis or intra-articular corticosteroid/hyaluronic acid injections may be indicated.³⁴ Arthroscopy offers direct visualization of intra-articular pathology before considering open surgery.³⁵ Open joint procedures are reserved for severe cases, including ankylosis, tumors, or deformities unresponsive to other treatments.³⁶ A multidisciplinary approach involving dental, medical, and psychological care ensures optimal outcomes.³⁷

4.1. Non-surgical therapy

Non-surgical therapy aims to reduce symptoms through patient education, physical therapy, appliance use, and stress management, though TMDs may fluctuate despite treatment.

4.1.1. Pharmacotherapy

Conservative non-surgical and pharmacological therapy is generally well accepted in the early stages of TMDs. TMDs encompass pain and dysfunction of the TMJ, masticatory muscles, and associated structures. The exact etiology is often unidentified but may involve trauma, parafunctional habits, joint overload, malocclusion, psychological factors, arthritis, or poor head-neck posture. After diagnosis, suitable therapy should aim to reduce pain and improve function. Non-surgical treatments resolve symptoms in over 80% of

cases.^{38,39} Therapies may be used alone or combined to reduce masticatory overload. Common drugs include analgesics, corticosteroids, muscle relaxants, antidepressants, anxiolytics, benzodiazepines, and anticonvulsants. Stress reduction and habit modification are also advised.

4.1.2. Occlusal splint therapy

It is a common, low-risk, non-invasive treatment for TMD, aiding in pain relief and improved mouth opening.⁴⁰ While some debate its biomechanical versus placebo effects,^{41,42} a review by Alkhutari et al. (2018) supports benefits beyond placebo.⁴³ Multiple splint types exist, but no design proves superior.⁴⁴ Pharmacologic management may include analgesics, NSAIDs, anxiolytics, or antidepressants, based on individual symptoms and needs.

4.1.3. Physiotherapy

It is effective in managing TMD, particularly myalgia and myofascial pain.^{45,46} It includes exercises and behavior changes, reducing symptoms like headaches, though more research is needed to confirm its efficacy.⁴⁵

4.1.4. Botox Injections

For myogenous forms of TMD, adjunctive therapies like botulinum toxin (Botox) injections and dry needling have been explored.^{48,49} While Botox is not yet a mainstream treatment for TMD, dry needling—akin to acupuncture—may relieve muscle tightness in selected patients. Emerging evidence also suggests extracorporeal shock wave therapy might offer symptom relief for myogenous TMD.^{50,51}

4.1.5. Psychotherapy

Psychosocial evaluation is increasingly recognized as key to predicting TMD treatment outcomes.^{52,53} Patients with psychological comorbidities benefit from counseling within multimodal care.^{16,53,54} Stress management, dietary changes, and avoiding irreversible procedures like occlusal adjustments are now standard.³²

4.2. Minimally invasive options

MRI, introduced in the 1980s, improved understanding of TMD-related structural abnormalities, initially increasing open joint surgeries with limited success. Clinical focus has since shifted to minimally invasive techniques for arthrogenous TMD, showing promising results and gaining wider clinical acceptance.

4.2.1. Arthroscopy & Arthrocentesis

Temporomandibular joint (TMJ) arthroscopy, first introduced in Japan in the 1970s^{55,56} and later developed further in the U.S.,^{57,58} is a minimally invasive technique enabling lavage, disc repositioning, adhesion removal, and arthroplasty. Literature supports its efficacy,^{59,60} primarily due to lavage and lysis effects rather than disc repositioning.⁶¹ Nitzan et al. introduced arthrocentesis in

1991—lavage without arthroscopic visualization—which has since been validated by multiple studies.⁶¹⁻⁶⁴ A recent review and meta-analysis by the authors showed arthrocentesis is effective regardless of timing, though further high-quality studies are needed to determine optimal intervention timing.⁶⁵

While both arthroscopy and arthrocentesis have demonstrated effectiveness in managing TMD, there remains debate over which yields superior outcomes. A systematic review and meta-analysis by Al-Moraissi indicated that arthroscopy may provide greater improvements in pain relief and jaw function, with complication rates comparable to those of arthrocentesis.³⁶ On the other hand, several studies have reported no significant difference in the outcomes of the two approaches.^{66,67} Despite this, arthrocentesis is often considered the preferred initial option due to its technical simplicity, cost-effectiveness, and similar or possibly reduced risk of complications.⁶⁷

Although arthroscopy and arthrocentesis show proven benefits with minimal risks,⁶⁸ their use remains limited. This is partly due to many TMD cases improving with conservative care or spontaneously. Additionally, TMD's multifactorial nature requires a comprehensive approach. Simpler methods like intra-articular corticosteroid injections are often tried first. Minimally invasive procedures are most appropriate for confirmed joint-related TMD unresponsive to conservative therapy and lacking significant psychosocial components.

4.3. Open joint surgery

Open joint surgery for TMD is now reserved for severe cases like ankylosis or tumors. Advances in minimally invasive arthroscopy have replaced many traditional procedures, including disc repositioning, osteophyte removal, tissue excision, and biopsies, improving outcomes and reducing morbidity.

Alloplastic joint prostheses have expanded TMJ reconstruction options, offering effective long-term outcomes for pain relief and function. Indicated for advanced joint pathology or failed surgeries, these prostheses use biocompatible materials and precision design, enhancing structural integrity, longevity, and prognosis in conditions like ankylosis, trauma, or developmental deformities.^{36,69-76}

Moreover, growing literature supports the integration of digital planning and CAD/CAM technology in TMJ prosthesis fabrication, which enhances surgical precision and custom fit, thereby minimizing complications and improving patient satisfaction.^{76,77} Given these advancements and successful clinical outcomes, a steady increase in the use of TMJ total joint replacement is anticipated in the coming years, especially in specialized centers.

5. Conclusions

Over the years, our understanding of temporomandibular disorders (TMD) has significantly evolved. The traditional mechanistic approach, which primarily viewed TMD through a dental lens, has gradually been replaced by a more comprehensive biopsychosocial medical model. This shift mirrors the evolving treatment paradigms observed in other musculoskeletal and joint-related conditions. Despite ongoing research, the precise etiology and sustaining mechanisms of TMD remain only partially understood, emphasizing the complexity and multifactorial nature of these disorders.

Clinicians must recognize that TMD treatments are not universally effective, and no single modality works best for all patients. Continued scientific inquiry into the biological underpinnings of temporomandibular joint dysfunction is essential to improve diagnostic and therapeutic strategies. Basic research, particularly in neuroscience and joint biology, holds promise in providing a solid foundation for individualized, evidence-based care.

Psychosocial factors—such as stress, anxiety, depression, anger, catastrophic thinking, maladaptive coping strategies, and persistent daytime parafunctional habits—are increasingly acknowledged for their role in aggravating TMD symptoms and hindering treatment outcomes. Patients who exhibit these psychosocial comorbidities may not respond adequately to standard conservative therapies alone.

In such cases, cognitive-behavioral interventions (CBT) serve as valuable adjuncts to physical and dental treatments. These techniques aim to modify detrimental behaviors and thought patterns and typically include habit reversal training, relaxation techniques, guided imagery, hypnosis, biofeedback, and cognitive restructuring. For patients struggling with high levels of psychological distress or entrenched behavioral patterns, collaboration with professionals trained in behavioral therapy is often necessary for optimal management and long-term symptom relief.

6. Source of Funding

None.

7. Conflict of Interest

None.

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