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Effect of Pelvic Floor Down-Training on Women with Idiopathic Overactive Bladder: Literature Review

AYATULLAH F. SOLIMAN, M.Sc.*; DOAA A. OSMAN, Ph.D.*; SAMER S. MORSY, M.D.** and AMIRA N. ABDELLATIF, Ph.D.*

The Department of Physical Therapy for Women's Health, Faculty of Physical Therapy, Cairo University and Department of Urology, Faculty of Medicine, Cairo University***

Abstract

Background: Overactive Bladder (OAB) syndrome, a common and debilitating condition, significantly impacts women's quality of life. It is characterized by urinary urgency, frequency, nocturia, with or without urgency urinary incontinence (UUI) in the absence of other identifiable pathologies. Conventional treatments include behavioral interventions, pharmacotherapy, neuromodulation, and pelvic floor muscle training (PFMT), but each has limitations, particularly regarding adherence and long-term effectiveness.

Aim of Study: This literature review aims to evaluate the effectiveness of pelvic floor down-training, a conservative management strategy for women with idiopathic OAB.

Material and Methods: A comprehensive literature search was conducted of studies published up to 2024. The searches were conducted across PubMed, Scopus, Web of Science, Cochrane Library, Clinical Trials, Science Direct, Pedro, and Google Scholar databases. The reviewed literature was analyzed descriptively and summarized.

Results: The analysis of existing studies suggests that pelvic floor down-training can effectively reduce urgency episodes, frequency of urination, and UUI by retraining the pelvic floor muscles and inhibiting detrusor overactivity. Some studies also report improvements in bladder compliance and reduced sensory signaling contributing to urgency perception. Additionally, biofeedback-guided down-training interventions appear to enhance patient adherence and symptom relief compared to unsupervised exercises. However, variations in training protocols and follow-up durations pose challenges in establishing standardized clinical guidelines.

Conclusion: Pelvic floor down-training offers a promising non-pharmacological and cost-effective approach to managing idiopathic OAB in women. Although preliminary evidence supports its efficacy, further high-quality RCTs with standardized methodologies and long-term follow-up are essential to confirm its clinical applicability.

Correspondence to: Dr. Ayatullah F. Soliman, The Department of Physical Therapy for Women's Health, Faculty of Physical Therapy, Cairo University

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Introduction

Brief History of OAB:

Overactive Bladder (OAB) syndrome is a prevalent and debilitating condition that disproportionately affects women, with symptoms including urinary urgency, frequency, nocturia, and urgency urinary incontinence (UUI) in the absence of urinary tract infections or other identifiable pathologies **[1]**. Epidemiological studies indicate that OAB affects approximately 17% of women globally, with prevalence rates increasing significantly with age, particularly among those over 40 years **[2,3]**. The condition not only disrupts daily activities but also negatively impacts psychological well-being, contributing to social isolation, anxiety, and a diminished quality of life **[4]**.

Managing OAB is challenging due to the chronic nature of the disorder, requiring ongoing interventions to alleviate symptoms and improve patient outcomes. Conventional treatment approaches typically involve a combination of behavioral interventions, pharmacotherapy, neuromodulation, and pelvic floor muscle training (PFMT) **[5]**. Behavioral strategies, including bladder training and fluid management, aim to modify voiding habits and reduce urinary urgency, while pharmacological treatments focus on medications such as anticholinergics or beta-3 agonists to inhibit detrusor overactivity **[6]**. However, these interventions are often limited by side effects, such as dry mouth, constipation, and cognitive impairments, which may reduce adherence and long-term efficacy **[7]**.

In response to these limitations, there has been growing interest in non-pharmacological interventions, particularly PFMT. Traditionally used for managing stress urinary incontinence (SUI), PFMT has gained attention in recent years for its potential to modulate bladder function in OAB. The goal of PFMT in OAB is to improve neuromuscular control and coordination of the pelvic floor muscles, which can help suppress involuntary detrusor contractions and reduce urgency *[8,9]*. While PFMT generally focuses on strengthening the pelvic floor muscles, some patients, particularly those with hypertonic pelvic floor muscles, may benefit from a different approach: pelvic floor down-training *[10]*.

Pelvic floor down-training differs from conventional PFMT by emphasizing muscle relaxation and neuromuscular re-education rather than strengthening. This method is especially beneficial for women with OAB who exhibit pelvic floor hypertonicity, a condition where excessive muscle tension contributes to increased bladder sensitivity and reduced bladder compliance, thereby exacerbating urgency and frequency *[11]*. Down-training aims to address these issues by promoting muscle relaxation, improving neuromuscular control, and reducing sensory hyperactivity, which can help alleviate symptoms of OAB and improve overall bladder function *[12]*.

In addition to its immediate effects, PFMT may also induce long-term neuromuscular adaptations that stabilize bladder function and reduce symptom severity over time. Repeated training is believed to enhance the coordination between the pelvic floor muscles and the detrusor, leading to improved bladder control and a reduction in urgency episodes *[13]*. Furthermore, PFMT has the advantage of being a non-invasive, cost-effective intervention with minimal side effects, making it an attractive option for patients seeking alternatives to pharmacotherapy or surger. Despite these potential benefits, the application of PFMT in OAB remains understudied compared to its use in SUI, necessitating further research to establish evidence-based guidelines for its implementation *[14,15]*.

Given the potential of pelvic floor down-training to address the multifactorial aspects of OAB, this literature review seeks to evaluate its effectiveness as a conservative, non-pharmacological treatment strategy. By synthesizing findings from recent randomized controlled trials (RCTs), systematic reviews, and observational studies, the review aims to assess the impact of pelvic floor down-training on key OAB symptoms such as urgency, frequency, nocturia, and UUI. Furthermore, it will explore the challenges in implementing this approach, including variability in training protocols and adherence rates, while highlighting areas for future research to refine treatment protocols and establish clinical guidelines.

Pathophysiology of overactive bladder:

The pathophysiology of OAB involves a dysfunction of the bladder's storage and emptying phases, which are governed by a delicate interplay between the bladder, the pelvic floor muscles, and the central and peripheral nervous systems *[16]*.

Several mechanisms contribute to the development of OAB. First, impaired bladder afferent signaling plays a critical role in this condition. Normally, afferent nerves transmit sensory information from the bladder to the brain, helping to regulate the timing of urination. In individuals with OAB, these sensory pathways may become hyperactive, leading to heightened bladder sensation and an exaggerated urge to urinate, even with a partially filled bladder. This abnormal signaling is believed to result from peripheral afferent hypersensitivity as well as dysfunction in the central nervous system, particularly in regions that modulate bladder control *[17,18,19]*.

Additionally, Pelvic floor muscle overactivity, often seen in OAB patients, can contribute to further sensitizing bladder afferent pathways and decreasing bladder compliance, exacerbating symptoms of urgency and frequency *[16,17,18]*. This overactivity is typically associated with hypertonicity or excessive tension in the pelvic floor muscles, which interfere with the normal coordination required for bladder control. The bladder and pelvic floor muscles work in a coordinated manner to maintain continence. During bladder filling, the pelvic floor muscles contract to support the bladder neck and urethra, facilitating continence. However, in individuals with OAB, this coordination is disrupted, leading to involuntary detrusor contractions and the onset of urgency and incontinence *[16,19]*.

Evidence acquisition:

In this review, we searched PubMed, Scopus, Web of Science, Cochrane Library, Clinical Trials, Science Direct, Pedro, and Google Scholar databases using Medical Subject Headings (MeSH) keywords as shown in Appendix 1. The review process spanned two months (October 2024 to November 2024) and focused on articles published up to 2024, including only those written in English. Additionally, references from the selected studies were examined to identify further relevant articles. To ensure a comprehensive understanding, studies involving the PFMT in females or downtraining in females with OAB were extracted.

Results

The goal of this review is to thoroughly explore research examining the effect of PFM down-training on women with idiopathic OAB. A summary of the reviewed studies is provided in (Table 1).

Table (1): The characteristics of the studies investigating the effect of PFM down-training on women with idiopathic OAB.

Authors/ Year	Study design	Participants	Treatment	Assessment	Outcome	Conclusion
Shafik A, Shafik IA, (2003)	- Randomized controlled trial	- Women with overactive bladder (OAB)	- Pelvic floor muscle exercises	- Bladder control, urgency, frequency	- Significant improvement in bladder control and reduction in urgency and frequency	- Pelvic floor muscle exercises are effective for reducing OAB symptoms
Chuang F., Lin C.& Chen C, (2014)	- Randomized controlled trial	- Patients with overactive bladder (OAB)	- Diaphragmatic breathing	- Bladder control, urgency, frequency	- Reduction in urgency and improved bladder control	- Diaphragmatic breathing is effective in reducing OAB symptoms
Smith K, Baugh T & Moore R, (2018)	- Pilot study	- Individuals with OAB	- Progressive muscle relaxation (PMR)	- Frequency and urgency of urination	- Reduction in frequency and urgency of urination	- PMR is effective in reducing OAB symptoms and improving bladder control
Chia 7, Vining R & Collings A, (2019)	- Randomized controlled trial	- Individuals with OAB	- Mindful breathing and pelvic floor awareness	- Urgency and bladder control	- Improved bladder control and reduction in urgency	- Mindful breathing and pelvic floor awareness improve bladder control and reduce urgency
Burgio KL, Goode PS, Locher 7L, et al., (2002)	- Randomized controlled trial	- Older women with urge incontinence	- Behavioral training with and without biofeedback	- Incontinence episodes, bladder control	- Improved bladder control and reduction in incontinence episodes	- Behavioral training with biofeedback significantly improves bladder control and reduces incontinence
Tikkinen K, Auvinen A & Vikat A, (2015)	- Systematic review	- Studies on relaxation techniques for OAB	- Visualization and relaxation techniques	- OAB symptoms, bladder control	- Reduction in urgency and improvement in blader control	- Visualization and relaxation techniques can reduce OAB symptoms
Alves P, Silva A, Costa T, et al. (2015)	- Systematic review	- Studies on pelvic floor muscle training for OAB	- Pelvic floor muscle training (PFMT)	- Bladder control, urgency, incontinence	- Effective in reducing OAB symptoms	- PFMT is effective in treating OAB
Wolff BJ, 7oce C7, McAlarnen LA, et al., (2020)	- Exploratory study	- Individuals with OAB	- Pelvic floor myofascial release (MFR)	- Bladder control, pelvic floor muscle function	- Potential benefit for OAB, but further research needed	- MFR could complement other treatments for OAB, requiring further research

Discussion

Pelvic Floor Down-Training for OAB:

Down-training, a therapeutic approach focused on muscle relaxation, aim to reduce excessive pelvic muscle tension, optimize neuromuscular coordination, and mitigate sensory hyperactivity, thereby improving bladder control. A growing body of evidence suggests that pelvic floor relaxation techniques, when implemented alongside behavioral therapies, may lead to sustained symptom relief in patients with OAB **[20].**

Urge Suppression as Reciprocal Inhibition for Pelvic Floor Muscles:

Shafik et al. **[10]** has shown urge suppression provides a valuable, non-invasive tool for managing bladder urgency and improving the overall quality of life for individuals dealing with this condition. Urge suppression is a strategy that has been explored in the management of overactive bladder (OAB) symptoms, particularly in relation to the pelvic floor muscles. The concept of urge suppression is closely linked to the principle of reciprocal inhi-

bition, which refers to the physiological process by which the activation of one muscle group leads to the relaxation of an opposing muscle group. In the case of the pelvic floor, this involves the inhibition of the bladder's detrusor muscle while activating the pelvic floor muscles to prevent unwanted contraction and urgency. When a person experiences an urge to urinate, the detrusor muscle contracts, triggering the feeling of urgency. To suppress this urge, the pelvic floor muscles are consciously contracted, which leads to the relaxation of the detrusor muscle through reciprocal inhibition. This process can help delay urination, allowing the individual to gain better control over their bladder and reduce the frequency of urgency episodes **[11].**

While urge suppression through reciprocal inhibition can be highly effective, it requires practice and proper guidance to master. Individuals must learn to identify the urge, activate the pelvic floor muscles promptly, and maintain the contraction until the urge subsides. In this way, urge suppression becomes a form of conditioning, gradually training both the bladder and pelvic floor muscles to function more harmoniously **[10].**

Biofeedback therapy:

Biofeedback therapy is a first-line intervention in pelvic floor rehabilitation, allowing patients to monitor and regulate pelvic muscle activity through real-time feedback from electromyographic (EMG) sensors. This method has been shown to significantly improve bladder control and reduce urgency episodes in women with OAB **[21,22]**. The mechanism underlying biofeedback efficacy involves enhancing cortical awareness of pelvic muscle function, leading to improved voluntary control over detrusor contractions. However, despite its benefits, biofeedback requires specialized equipment, trained personnel, and patient engagement, which may limit accessibility and increase healthcare costs. Further research is warranted to determine the long-term effectiveness and optimal biofeedback parameters for OAB management **[21].**

Burgio et al. **[22]** examined biofeedback in females with OAB. The treatment involved four clinic visits over an 8-week period, with a focus on biofeedback and pelvic floor muscle training to manage urinary incontinence. During each visit, bladder diaries were reviewed, and interventions were implemented by nurse practitioners. In the first visit, anorectal biofeedback helped patients identify and learn to selectively contract and relax pelvic floor muscles. The second visit focused on teaching urge suppression strategies to manage urgency, encouraging patients to pause and relax their body while contracting pelvic floor muscles to inhibit detrusor contraction. The third visit involved combined bladder-sphincter biofeedback for patients with less than 50% improvement, helping them contract pelvic floor muscles against increasing bladder volume and urgency. The fourth visit reviewed progress, fine-tuned home practice, and motivated continued effort.

Myofascial release therapy:

Myofascial release therapy (MRT) involves manual techniques that target hypertonic pelvic floor muscles and myofascial trigger points to alleviate detrusor overactivity **[23,24]**. The study by Wolff et al. **[23]** explored the potential benefits of pelvic floor myofascial release (MFR) for managing overactive bladder (OAB) symptoms. The authors reviewed existing literature and clinical evidence to assess whether MFR, a manual therapy technique aimed at releasing tension in the pelvic floor muscles, could be an effective treatment for OAB. They discussed how myofascial restrictions in the pelvic floor might contribute to bladder dysfunction and suggested that MFR could help alleviate symptoms by improving muscle function, reducing pain, and enhancing relaxation. The paper highlights the need for more research to determine the efficacy of MFR as part of a comprehensive treatment plan for OAB, particularly in combination with other therapies like pelvic floor exercises or behavioral interventions **[23]**. The proposed mechanism involves reducing neuromuscular hyperactivity, improving vascular perfusion, and decreasing afferent sensory signaling, which may contribute to urgency symptoms **[24].** However, methodological limitations in existing randomized controlled trials (RCTs), such as small sample sizes and heterogeneous outcome measures, necessitate further investigation to validate its efficacy across diverse patient populations.

Relaxation exercises:

Breathing and relaxation exercises have shown promise as complementary interventions for managing OAB. These techniques focus on calming the body, reducing stress, and promoting pelvic floor relaxation, which can help alleviate symptoms such as urgency, frequency, and incontinence **[25,26]**. Here are some key exercises:

Diaphragmatic breathing:

Diaphragmatic breathing, also known as deep breathing, is a technique that involves slow and deep breaths to engage the diaphragm and promote relaxation. Several studies have suggested that diaphragmatic breathing can be beneficial in reducing the sensation of urgency and preventing bladder overactivity. A study by Chuang et al. **[27]** demon-

strated that deep breathing exercises can help reduce symptoms of OAB by activating the parasympathetic nervous system, which promotes bladder relaxation and reduces urgency. Diaphragmatic breathing has been found to reduce the hyperactivity of the bladder muscle (detrusor), which contributes to the sensation of urgency and frequent urination.

Progressive Muscle Relaxation (PMR):

This technique has been used in managing a variety of conditions that involve muscle tension, including OAB. The pilot study by Smith et al. *[29]* investigated the effectiveness of progressive muscle relaxation (PMR) in improving bladder control in individuals with OAB. The study aimed to assess whether PMR could help reduce the frequency and urgency associated with OAB symptoms. Participants were trained in PMR techniques, which involve tensing and then relaxing different muscle groups, with a focus on reducing pelvic floor tension. The results indicated that PMR was beneficial in improving bladder control, reducing urgency episodes, and enhancing overall bladder function. The study concluded that PMR could be a useful adjunctive therapy for individuals with OAB, providing a non-pharmacological approach to managing symptoms. The relaxation phase helps to reduce stress-induced bladder urgency, and the focus on pelvic floor relaxation helps prevent involuntary bladder contractions. PMR is particularly useful for individuals who experience bladder urgency linked to emotional stress or physical tension. However, the authors noted that further research with larger sample sizes and longer follow-up periods is needed to confirm these findings and better understand the long-term effects of PMR on bladder health.

Mindful breathing with pelvic floor awareness:

Mindful breathing with pelvic floor awareness combines deep breathing techniques with a focus on the pelvic floor muscles, which is critical for individuals managing OAB. The study by Chia et al. *[30]* explored the effectiveness of mindful breathing and pelvic floor awareness techniques in managing OAB symptoms. The research focused on how combining deep breathing exercises with increased awareness of pelvic floor muscle activation could help individuals with OAB reduce symptoms like urgency and frequency. The results suggested that these techniques were effective in improving bladder control by promoting relaxation, reducing pelvic floor tension, and increasing the individual's ability to manage urgency. The authors concluded that mindful breathing and pelvic floor awareness could be valuable non-pharmacological interventions for OAB, helping patients gain better control over their bladder symptoms without relying solely on medication or invasive treatments.

Visualization techniques:

Visualization, or guided imagery, involves mentally picturing a calming and peaceful environment to promote relaxation and reduce stress. Several studies have explored its use in conjunction with other relaxation techniques for bladder control. A study by Tikkinen et al. *[30]* highlighted that visualization, when combined with relaxation techniques like diaphragmatic breathing, can alleviate symptoms of OAB. The study suggested that mental relaxation can reduce the frequency of OAB episodes by lowering psychological stress, which is often a trigger for bladder urgency. Visualization helps shift focus away from the urge and can help suppress the urge to urinate by calming the nervous system.

Limitations and future directions:

Despite promising findings, several limitations persist in the current review. The primary challenge lies in the heterogeneity of exercise protocols and outcome measures across studies. Different methodologies, including variations in contraction-relaxation patterns, training durations, and assessment tools, make it difficult to compare findings and draw consistent conclusions.

The lack of standardization hinders the ability to establish clear clinical guidelines for implementing down-training as a therapeutic intervention. Some studies included home-based exercises, while others required supervised training sessions, leading to differences in patient adherence and outcomes. Furthermore, variations in outcome measures, such as reliance on patient-reported symptom diaries versus urodynamic assessments, contribute to inconsistencies in reported effectiveness. Addressing this variability requires the establishment of evidence-based guidelines for down training implementation in OAB management.

Another significant limitation in the current literature is the small sample sizes often found in studies evaluating down training for OAB. Many studies are limited to small cohorts, reducing statistical power and generalizability of findings. For example, sample sizes in some trials fall below the recommended number for adequate power to detect meaningful differences.This limitation restricts the external validity of results and makes it difficult to determine the extent to which down training can be generalized across diverse patient populations, particularly in terms of age, comorbidities, and disease severity.

Moreover, a significant concern is the insufficiency of long-term follow-up data. While short-term improvements in bladder control are well-documented, there is limited research on the sustainability of these benefits. In addition, there is a lack of studies that directly compare down training with pharmacological treatments. This gap prevents a clear understanding of how down training measures up against medications in terms of symptom reduction, adherence, and quality of life improvements. Such comparisons are crucial for establishing down training as an equivalent or complementary alternative to pharmacological therapies.

To overcome these limitations, future research should focus on establishing standardized down training protocols tailored specifically for OAB management. Developing consensus guidelines on the optimal duration, intensity, and frequency of down-training exercises would help ensure consistency across clinical practice and research. Additionally, more robust investigations should explore the potential benefits of combining down-training with other therapeutic modalities, such as behavioral therapy, electrical stimulation, or pharmacological interventions, to enhance overall treatment efficacy. Long-term follow-up studies are also essential to assess the sustainability of benefits and determine the need for maintenance programs to prevent symptom recurrence.

Clinical Implications:

- Down-training should be considered a first-line conservative therapy for OAB, particularly in patients who prefer non-pharmacological interventions or have contraindications to medication.
- Urge suppression strategies should be incorporated into PFMT protocols to enhance bladder control and improve patient outcomes.
- Long-term follow-up studies are necessary to evaluate treatment sustainability and inform clinical guidelines for ongoing management of OAB.

Conclusion:

Pelvic floor down-training has shown promise as a non-pharmacological intervention for managing overactive bladder (OAB). Current evidence suggests that this approach can effectively reduce urgency, frequency, and episodes of incontinence, potentially improving overall bladder control and quality of life. By emphasizing relaxation and retraining of the pelvic floor muscles, down-training provides a conservative and effective alternative to pharmacological treatments.

However, despite its potential, existing research is hindered by methodological variability, small sample sizes, and a lack of long-term data. These limitations prevent the formulation of definitive conclusions and widespread clinical adoption. To strengthen clinical recommendations, high-quality randomized controlled trials (RCTs) with standardized methodologies are needed. Future studies should focus on refining treatment protocols, determining optimal intervention durations, and evaluating the long-term sustainability of down-training's effects.

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تأثير ارخاء عضلات قاع الحوض لدى السيدات المصابات بفرط نشاط المثانة مجهول السبب

الخلفية: متلازمة فرط نشاط المثانة (OAB) هي حالة شائعة ومزعجة تؤثر بشكل كبير على جودة حياة النساء، وتتميز بالحاجة الملحة للتبول، وزيادة تكرار التبول، والتبول الليلي، وسلس البول الإلحاحي (UUI) في غياب التهابات المسالك البولية أو أي أمراض أخرى يمكن تحديدها. تشمل العلاجات التقليدية التدخلات السلوكية، العلاج الدوائي، التنبيه العصبي، وتدريب عضلات قاع الحوض (PFMT)، لكن لكل منها قيود، خاصة فيما يتعلق بالالتزام والفعالية طويلة المدى.

الهدف: تهدف هذه المراجعة الأدبية إلى تقييم فعالية تدريب إرخاء قاع الحوض كنهج علاجي محافظ للنساء المصابات بفرط نشاط المثانة مجهول السبب (OAB). على عكس التدريب التقليدي لعضلات قاع الحوض الذي يركز على التقوية، فإن تدريب الإرخاء يركز على الاسترخاء وإعادة التأهيل العصبي العضلي لعضلات قاع الحوض لتخفيف أعراض OAB.

الطرق: تم إجراء مراجعة للتجارب العشوائية المضبوطة (RCTs)، والمراجعات المنهجية، والدراسات الرصدية المنشورة بين عامي ٢٠٠٣ و٢٠٢٤. وشملت الدراسات التي قامت بتقييم تأثير تدريب إرخاء قاع الحوض على الحاجة الملحة للتبول، وتكرار التبول، والتبول الليلي، وسلس البول الإلحاحي لدى النساء المصابات بـ OAB مجهول السبب. كما تم فحص معدلات الالتزام، والفعالية طويلة المدى، والقيود المحتملة للتدخل.

النتائج: تشير تحليلات الدراسات الحالية إلى أن تدريب إرخاء قاع الحوض يمكن أن يقلل بشكل فعال من نوبات الإلحاح، وتكرار التبول، وسلس البول الإلحاحي من خلال إعادة تدريب عضلات قاع الحوض وتثبيط فرط نشاط العضلة النافصة. كما أفادت بعض الدراسات بتحسن في مرونة المثانة وتقليل الإشارات الحسية المساهمة في الإحساس بالإلحاح. بالإضافة إلى ذلك، يبدو أن التدخلات المعتمدة على التغذية الراجعة البيولوجية تعزز التزام المرضى وتخفيف الأعراض مقارنة بالتمارين غير الخاضعة للإشراف. ومع ذلك، فإن التباين في بروتوكولات التدريب ومدد المتابعة يمثل تحديًا في وضع إرشادات سريرية موحدة.

الاستنتاج: يمثل تدريب إرخاء قاع الحوض نهجًا واعدًا غير دوائي وفعال من حيث التكلفة لإدارة OAB مجهول السبب لدى النساء. في حين أن الأدلة الأولية تدعم فعاليته، هناك حاجة إلى تجارب عشوائية مضبوطة عالية الجودة بمنهجيات موحدة ومتابعات طويلة المدى لتأكيد تطبيقه السريري.