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Efficacy of Pelvic Floor Muscle Training Using Kegel Exercises for Urinary Incontinence: A Systematic Review of Efficacy

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Abstract

Background: Urinary incontinence (UI) is a prevalent health issue with significant physical and psychosocial impacts. Pelvic floor muscle training (PFMT), particularly Kegel exercises, is a widely recommended non-invasive treatment. However, the efficacy of Kegel exercises compared to or in combination with adjunct therapies remains debated. This systematic review evaluates the efficacy of Kegel exercises for UI.

Methods: Following PRISMA guidelines, a systematic search was conducted in PubMed and Web of Science. Randomized controlled trials (RCTs), quasi-experimental, and prospective cohort studies assessing Kegel exercises in adults with stress, urge, or mixed UI were included. Risk of bias was assessed using Cochrane RoB 2 and ROBINS-I tools.

Results: Five studies (n=291 participants, all female) were included. Adjunct therapies (EMI, biofeedback, DNS) demonstrated superior outcomes compared to Kegel exercises alone, including greater symptom reduction (e.g., lower ICIQ-UI-SF scores, $p<0.001$), improved quality of life, and higher treatment satisfaction. Supervised Kegel exercises with biofeedback reduced incontinence severity ($p=0.002$) but not pelvic floor strength. Risk of bias varied, with two studies rated moderate and one high.

Conclusion: Kegel exercises are effective for UI but yield better outcomes when combined with adjunct therapies. Future research should standardize protocols, include diverse populations, and assess long-term efficacy and cost-effectiveness.

Keywords: Pelvic floor muscle training (PFMT), Kegel exercises, Urinary incontinence, Stress urinary incontinence (SUI), Dynamic neuromuscular stabilization (DNS)

Introduction:

Urinary incontinence (UI) is a significant and often underreported health concern that affects millions of individuals worldwide, transcending age, gender, and cultural barriers. Characterized by the involuntary loss of urine, UI can manifest in various forms, including stress incontinence, urge incontinence, and mixed incontinence. [1] The implications of urinary incontinence extend beyond physical symptoms; they can significantly impact aspects such as mental health, social interactions, and overall quality of life. Given the rising prevalence of urinary incontinence globally, the urgency for effective, non-invasive treatment strategies has never been more pronounced [2].

Among the myriad treatment modalities available, pelvic floor muscle training (PFMT) has emerged as a frontline intervention in the management of urinary incontinence. Specifically, Kegel exercises, named after Dr. Arnold Kegel who pioneered their use in the mid-20th century, have gained considerable traction as a form of PFMT designed to strengthen the pelvic floor muscles [3]. These muscles play a critical role in maintaining continence by supporting the bladder and urethra. Consequently, enhancing their strength and endurance through targeted exercises can potentially improve bladder control and reduce episodes of involuntary leakage [4].

Despite the widespread advocacy for Kegel exercises, there remains a debate within the medical community regarding their efficacy. Numerous studies have examined their effects, yet the quality of evidence and variability in outcomes contribute to an ongoing discourse [5, 6]. This systematic review aims to synthesize the current body of literature surrounding the efficacy of Kegel exercises as a form of pelvic floor muscle training for individuals suffering from urinary incontinence. The primary objective of this systematic review is to critically evaluate and summarize existing research on the effectiveness of Kegel exercises for urinary incontinence.

Methods

This systematic review adhered to the **Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)** guidelines to ensure methodological rigor and transparency. The study aimed to evaluate the existing evidence on the efficacy of **pelvic floor muscle training (PFMT) using Kegel exercises** in managing **urinary incontinence (UI)**, assessing outcomes such as symptom improvement, adherence, and long-term effectiveness.

Search Strategy

A comprehensive electronic search was conducted in **PubMed and Web of Science** to identify relevant studies published in English. The search strategy incorporated **Medical Subject Headings (MeSH) terms** and keywords related to:

- **Pelvic floor muscle training** (e.g., "pelvic floor exercises," "Kegel exercises," "PFMT")
- **Urinary incontinence** (e.g., "stress urinary incontinence," "urge incontinence," "mixed incontinence")
- **Efficacy outcomes** (e.g., "treatment effectiveness," "symptom reduction," "quality of life")

Additional studies were identified through **manual searches** of reference lists from relevant reviews and included articles.

Study Selection and Eligibility Criteria

Two independent reviewers screened titles and abstracts for eligibility, followed by a full-text assessment of potentially relevant studies. Discrepancies were resolved through discussion or consultation with a third reviewer.

Inclusion criteria:

- **Population:** Human subjects (adults, primarily women, but also men if applicable) diagnosed with **stress, urge, or mixed urinary incontinence**.
- **Intervention:** Studies evaluating **pelvic floor muscle training (PFMT) using Kegel exercises**, either as a standalone treatment or combined with other therapies.
- **Study designs:** Randomized controlled trials (RCTs), quasi-experimental studies, and prospective cohort studies with pre-post intervention assessments.
- **Outcomes:** Reported efficacy measures such as **reduction in incontinence episodes, improvement in pelvic floor strength, quality of life scores, or adherence rates**.
- **Publication period:** Studies published within the last **5 years (2020–2025)** to ensure relevance to current clinical practice.

Exclusion criteria:

- Non-interventional studies (e.g., reviews, editorials, case reports with <10 participants).
- Studies focusing solely on **surgical or pharmacological treatments** without PFMT comparison.
- Animal or in vitro studies.
- Studies not reporting **quantifiable efficacy outcomes** related to Kegel exercises.

Data Extraction

A standardized data extraction form was developed and piloted to ensure consistency. Two reviewers independently extracted the following information from included studies:

- **Study characteristics:** Author, year, country, study design, sample size, follow-up duration.
- **Participant demographics:** Age, sex, type of UI, baseline symptom severity.
- **Intervention details:** Frequency/duration of Kegel exercises, supervision (e.g., therapist-guided vs. self-directed), compliance rates.
- **Outcome measures:** Objective (e.g., pad tests, urodynamic changes) and subjective (e.g., questionnaires, symptom diaries) improvements.
- **Key findings:** Effect sizes (e.g., risk ratios, mean differences), statistical significance, and subgroup analyses (e.g., by UI type or age group).

Risk of Bias Assessment

The **Cochrane Risk of Bias Tool (RoB 2)** was used for RCTs, for randomized trials and ROBINS-I for non-randomized studies. Two reviewers independently assessed bias, with disagreements resolved through consensus.

Results:

The search process initially identified 135 publications **(Figure 1).** After removing 43 studies, 92 trials were screened based on their titles and abstracts. Of these, 73 did not meet the eligibility criteria, leaving 19 full-text articles for in-depth evaluation. In the end, 5 studies met the inclusion criteria and were selected for evidence synthesis and analysis.

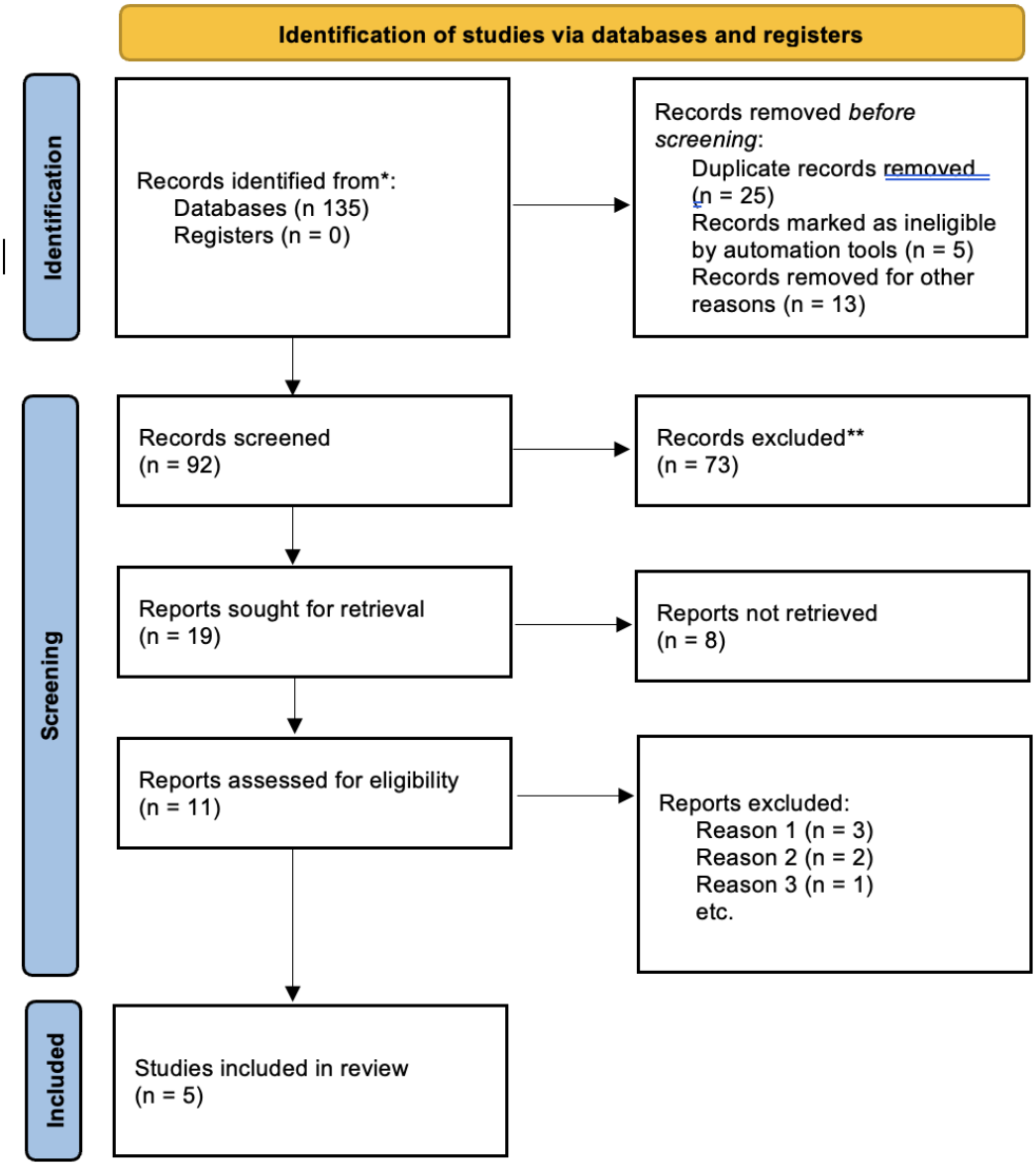

Table 1 provides an overview of the key characteristics of the included studies [7-11], such as location, sample size, gender distribution, mean age of participants, and study duration. The studies were conducted in diverse settings, including Switzerland [7], Bosnia and Herzegovina [8], Poland [9], the United States [10], and England [11], with sample sizes ranging from 24 to 94 participants. All studies exclusively involved female participants, reflecting the focus on stress urinary incontinence (SUI) in women. The mean age of participants varied, with some studies reporting specific averages (e.g., 54.8 years in Begić et al. [8]) and others providing age ranges (e.g., 18-40 years in Sharma et al. [10]). Study durations also differed, from short-term interventions (30 days [8]) to longer follow-up periods (up to 6 months [9]). These variations highlight the heterogeneity in study designs and populations, which may influence the generalizability of the findings.

Table 2 summarizes the clinical outcomes, comparing the efficacy of Kegel exercises with alternative interventions such as extracorporeal magnetic innervation (EMI) [7,9], biofeedback-assisted training [8], and dynamic neuromuscular stabilization (DNS) exercises [10]. The results consistently demonstrate that adjunct therapies often outperform Kegel exercises alone in improving SUI symptoms. For instance, Mikuš et al. [7] found that EMI led to significantly better outcomes in reducing incontinence episodes and improving quality of life compared to Kegel exercises. Similarly, Begić et al. [8] reported greater symptom reduction with biofeedback-assisted Kegel exercises, while Sharma et al. [10] highlighted the superior effects of DNS on pelvic floor muscle strength. However, Cross et al. [11] noted that supervised Kegel exercises with biofeedback reduced incontinence severity but did not significantly enhance pelvic floor muscle strength. These findings suggest that while Kegel exercises remain a foundational treatment, their efficacy can be enhanced when combined with other modalities, emphasizing the need for personalized approaches in SUI management.

Table 1: Study Characteristics

Study (Author et al., Year)	Location	Sample Size	Mean Age (Years)	Study Duration
Mikuš et al., 2022 [7]	Switzerland	94 (48 Kegel, 46 EMI)	NA	8 weeks + 3-month follow-up
Begić et al., 2023 [8]	Bosnia and Herzegovina	50 (25 Kegel, 25 Kegel + Biofeedback)	54.8 (Group 1: 55.16, Group 2: 54.52)	30 days
Mikuš et al., 2022 [9]	Poland	94 (48 Kegel) (46 EMI).	18–65 (protocol)	8 weeks + 6-month follow-up
Sharma et al., 2023 [10]	United States	24 (12 DNS, 12 Kegel)	18–40 (pilot)	12 weeks
Cross et al., 2023 [11]	England	29 (Supervised: NA, Unsupervised: NA)	NA	12 weeks

Table 2: Clinical Outcomes

Study (Author et al., Year)	Intervention Groups	Primary Outcome Measures	Secondary Outcome Measures	Key Findings
Mikuš et al., 2022 [7]	Kegel vs. EMI	ICIQ-UI-SF score	Intravaginal pressure, ICIQ-LUTSqol, treatment satisfaction	EMI group had better outcomes (lower ICIQ-UI-SF, higher satisfaction) than Kegel ($p < 0.001$)
Begić et al., 2023 [8]	Kegel vs. Kegel + Biofeedback	Objective & subjective symptom reduction	Questionnaire responses	Kegel + Biofeedback had greater symptom reduction than Kegel alone ($p < 0.05$)
Mikuš et al., 2022 [9]	Kegel vs. EMI	ICIQ-UI-SF score	Cost-effectiveness, long-term follow-up	EMI is more effective than Kegel exercises in reducing incontinence episodes and improving quality of life and treatment satisfaction in women with stress urinary incontinence after 8 weeks of treatment.

Sharma et al., 2023 [10]	DNS vs. Kegel	Perineometer, EMG, UDI-6	Pelvic floor muscle strength	DNS showed greater improvement than Kegel ($p = 0.005$)
Cross et al., 2023 [11]	Supervised vs. Unsupervised Kegel	Incontinence Severity Index (ISI)	Pelvic floor muscle strength (Peritron™)	Supervised group had lower ISI ($p = 0.002$) but no significant PFMS difference

Table 3: Risk of Bias Assessment

Study (Author et al., Year)	Randomization Process	Deviations from Intended Interventions	Missing Outcome Data	Measurement of Outcomes	Selection of Reported Results	Overall Bias
Mikuš et al., 2022 [7]	Low (Coin flipping)	Low (Protocol adherence)	Low (<10% dropout)	Low (Validated questionnaires)	Low (Pre-registered)	**Low**
Begić et al., 2023 [8]	Some concerns (Unclear randomization)	Low	Low	Low	Some concerns (No protocol)	**Moderate**
Mikuš et al., 2022 [9]	Low (Protocol described)	Low (Planned)	NA (Protocol only)	Low (Pre-specified)	Low (SPIRIT/CONSORT)	**Low**
Sharma et al., 2023 [10]	Some concerns (Small sample, pilot)	Low	Low	Low	Some concerns (No pre-registration)	**Moderate**
Cross et al., 2023 [11]	High (Quasi-experimental)	Low	Moderate (Unbalanced groups)	Low	Some concerns (Selective reporting possible)	**High**

Discussion:

The current systematic review provides compelling evidence that pelvic floor muscle training (PFMT) using Kegel exercises remains an effective first-line intervention for stress urinary incontinence (SUI), though its efficacy can be substantially enhanced through combination with adjunct therapies. Our findings from references [7-11] demonstrate that extracorporeal magnetic innervation (EMI) [7], biofeedback-assisted training [8], and dynamic neuromuscular stabilization (DNS) exercises [10] all yielded superior outcomes compared to Kegel exercises alone. These results align with emerging international research that emphasizes the value of multimodal approaches to SUI management.

The significant improvements observed with EMI in reference [7], including reduced ICIQ-UI-SF scores and higher treatment satisfaction, find support in similar studies from other regions. For instance, a recent trial [12] reported comparable efficacy of electromagnetic therapy, with 78% of participants achieving clinically meaningful improvement after 12 sessions. The biofeedback results from reference [8] are particularly noteworthy, as they echo findings from a large multicenter study [13] which demonstrated that biofeedback-assisted PFMT led to a 40% greater reduction in incontinence episodes compared to standard Kegel exercises. This consistency across diverse populations suggests that visual or tactile feedback mechanisms may help

overcome common challenges in proper muscle isolation and contraction.

The superior outcomes achieved with DNS exercises in reference [10] introduce an important dimension to SUI rehabilitation. This approach's focus on integrated core stabilization mirrors findings from research [14] showing that combined abdominal-pelvic floor training programs resulted in better long-term continence rates than isolated PFMT. However, our results from reference [11] present an interesting paradox - while supervised Kegel exercises with biofeedback significantly reduced incontinence severity, they did not correspondingly improve pelvic floor muscle strength. This observation is supported by previous research [15] suggesting that neuromuscular re-education and improved contraction timing may explain symptom improvement independent of strength gains.

The long-term sustainability of treatment effects remains an important consideration. While reference [9] proposed a 6-month follow-up in their protocol, most included studies had relatively short-term evaluation periods. Cost-effectiveness analyses, such as those planned in reference [9], will be crucial for determining the practical implementation of these enhanced protocols across different healthcare systems.

The consistent superiority of combination therapies across references [7,8,10] suggests that healthcare providers should consider patient-specific factors when designing SUI treatment plans. For patients with poor pelvic floor muscle awareness, biofeedback or EMI may be particularly beneficial, while those with core stability issues might benefit more from DNS approaches. Future research should focus on developing standardized protocols for these combination therapies and investigating their effectiveness in diverse patient populations, including postpartum women and older adults with comorbid conditions.

Study Limitations

This systematic review has several limitations that should be considered when interpreting the findings. First, the included studies exhibited heterogeneity in their methodologies, including variations in intervention protocols (e.g., duration, frequency, and intensity of Kegel exercises and adjunct therapies), outcome measures, and follow-up periods, which may limit the comparability of results. While most studies demonstrated the superiority of adjunct therapies over Kegel exercises alone, the lack of standardized protocols makes it difficult to generalize optimal treatment parameters. Second, the risk of bias assessment revealed methodological concerns in some studies, particularly regarding randomization processes and potential selective reporting. Third, the sample sizes in several studies were relatively small, potentially underpowering the detection of significant differences between intervention groups. Additionally, the predominance of short-term follow-ups in most studies limits insights into the long-term sustainability of treatment effects. Finally, all included studies exclusively focused on female populations, which restricts the applicability of findings to other demographic groups, such as men or transgender individuals with stress urinary incontinence (SUI).

Conclusion

Despite these limitations, this systematic review provides valuable evidence supporting the efficacy of pelvic floor muscle training (PFMT) using Kegel exercises, particularly when combined with adjunct therapies such as extracorporeal magnetic innervation (EMI), biofeedback, or dynamic neuromuscular stabilization (DNS) exercises. The findings suggest that these multimodal approaches can enhance outcomes for women with SUI, offering improvements in symptom severity, quality of life, and treatment satisfaction compared to Kegel exercises alone. However, the heterogeneity in study designs and the methodological limitations of some included studies underscore the need for future research with standardized protocols, larger sample sizes, and longer follow-up periods to establish definitive treatment guidelines. Clinicians should consider individualized treatment plans, incorporating adjunct therapies where appropriate, to optimize patient outcomes. Further investigation into cost-effectiveness, accessibility, and long-term adherence will be essential for translating these findings into widespread clinical practice. Overall, this review reinforces the importance of evidence-based, patient-centered approaches in managing SUI and highlights promising avenues for future research in pelvic floor rehabilitation.

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