Pelvic Physical Therapy Distance Journal Club
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Mechanisms of pelvic floor muscle training for managing urinary incontinence in women: a scoping review. Sheng Y, Carpenter JS, Ashton-Miller JA, et al. BMC Women's Health 2022;22:161. Doi: 10.1186/s12905-022-01742-w.

Introduction: UI is defined as involuntary loss of urine. PFMT is considered a first line treatment for stress, urge, and mixed UI. If data was available for the specific mechanisms of why and how PFMT improves UI, it may help to better understand the best candidates for treatment, and could help explain why some women do not respond as well.

Aim/Primary Aim: To systematically map evidence for and against theorized mechanisms through which PFMT interventions work to reduce UI in women. Research questions: 1) What is known from statistical analysis in the literature about association between changes in PFM strength and UI. 2) What is known about PFM tear as a moderator of these associations?

Study Design/Study Format: Scoping review of the literature to summarize evidence on theorized mechanisms underlying PFMT for UI in women. Proposed theorized mechanisms:

1) "Enhanced Pelvic Floor Muscle Strength.": Pertaining to increasing cross sectional area of key support under urethra.
2) "Maximized Awareness of Timing.": Pertaining to enhanced personal control over improving urethral closure pressure momentarily in a moment of need.
3) "Strengthened Core Muscles.': Mechanism derived from supposition that contraction of core abdominal muscles elicits co-contraction of the PFM.

Methods: Review of literature following Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for scoping Reviews guidelines. Separate reviews for each theory using specific search terms using PubMed for all.. Hand searches also included to screen articles cited by systematic reviews of interventions, searched ClinicalTrials.gov, searched MEDLINE/Pubmed. Pubmed searches completed in August 2020 and ClinicalTrials.gov in December 2020. First and second authors independently reviewed full text articles and first author extracted relevant data and second author verified.

Eligibility criteria:
Inclusion: Peer-reviewed, original research, full-length articles, English-language, published 1990 or later, PFMT an intervention for adult women, reported data on purported mechanisms.
Exclusion: Book chapters, review articles, commentaries, dissertations, published abstracts, newspapers, magazines, animal studies, studies on men or children.

Results:
- 13 of the 278 full articles reviewed met inclusion criteria for providing statistical analysis testing linkage between purported mechanism and intervention outcomes, 2 provided direct evidence of correlation as part of the primary aims and 11 indirect of the association between improved PFM strength and UI Table 3).

-11 articles included for the mechanism of enhanced PFM strength, 2 for maximized awareness of timing mechanism and none for the strengthened core muscles. (Fig 2)
-Majority used Spearman's rho, Pitman's permutation test, or Pearson's r.Few
-Table 4 summarizes instruments used for measurement of PFM strength and their limitations, and their heterogeneity makes comparisons across articles impossible.
-Table 5 summarizes the exercise regimens, and again the heterogeneity makes comparison impossible.

Mechanism 1: enhanced PFM strength

-7/11 reported statistically significant association of PFM strength change and incontinence change.
-1/11 found moderate to large statistical association between self-reported improvement of PFM strength and training success of reduced UI (but confidence interval large: OR=35.54, 95% CI 4.96-254.61 All others reported no or only weak or moderate associations.
- Two reported primary aim to look for correlation between purported mechanism and outcome.
-Remaining with no stated aim to link mechanism and outcome.

Mechanism 2: Maximized awareness of timing:

-Only Cammu 2000 and Junginger 2014 , included maximized awareness of timing into programs (using Knack in daily life + PFMT) but both had small sample sizes (n=45 and 55) and used different exercise regimens.

-Neither reported on strength of PFM, both used vaginal palpation for assessment and training, and Junginger used perineal ultrasound to observe bladder neck movement.
-Frequency of application of maximized awareness described as being related to success in terms of improved continence and treatment satisfaction. : the more they used the strategy the better they did.

-Relationship not significant in Cammu and weakly moderate in Junginger (71% women who routinely used Knack had less UI, p=0.021),

-Both articles noted frequency of application of maximized awareness described as being related to success of UI and treatment satisfaction.
-Both provided indirect evidence of theorized mechanism of timing
-Reported subjects gained PFM skill in voluntarily contracting the PFM or improved function and found self-reported reduction in UI/success in some women

Mechanism 3: Strengthened core muscles: all articles excluded secondary to lack of analytical data linking mechanism and PFMT outcome.

PFM tear as a moderating variable: No studies found

Discussion:

-Poor evidence to support or refute the 3 purported mechanisms through which PFMT interventions are believed to work. Most reported no or weak associations.

-Findings from this scoping review similar to literature review of 22 articles published between 1952 and 1988 by Wells, 1990.

-Most studies underpowered for association analysis.
-Most studies looked at association between PFM strength and UI, but none looked at association between strength/skill and UI according to age, clinical condition,etc.

-Age of sample could affect association between strength or skill and changes UI in light of the decline in muscle with age, including loss of large diameter motorneurons and large diameter muscle fibers.
-The measures used for testing highly variable, subject to examiner influences, and varying validity.
-The heterogeneity prevents ability to determine which regimen produces strongest response.

-Although there was weak or no correlation between strength changes and UI, continence status improved.
-None of the articles evaluated levator ani tears.
-Findings from study should not be misinterpreted as discounting PFMT for UI, but rather highlights the gap in the literature that helps identify the mechanism as to why it is beneficial.
-Authors call on researchers to state their theoretical basis guiding their work and which components of the theory are being tested.

Weaknesses:
Search not fully exhaustive, as it limited to only English.
By the time published it is already outdated
Did not separate out SUI vs UUI
Strengths:
A unique look at literature regarding theoretical mechanisms of treatments to better understand the effects of PFMT on UI.
The Tables summarizing types of measurements, statistical analyses from the studies, and details of pelvic floor training are good resources

Conclusion/Summary:
This review illuminates the limited data published supporting proposed theorized mechanisms for pelvic floor training to treat UI in women. Further research is needed to better guide clinicians.

Clinical Application
This research lays groundwork for future research that could help the clinician better understand which types of PFMT programs are appropriate for their patient, ie, and identify who is best candidate for PFMT.

List discussion questions

1) Are there any other theories for mechanisms that PFMT could reduce UI?

blood flow

2) Do you think age impacts outcomes, ie is the mechanism different pre- versus post-menopausal?
3) Have you observed clinically that PFM strength does not change but symptoms reduce?

Other References:

- Mercier J, Morin M, Tang A, Reichetzer B, Lemieux MC, Samir K, Zaki D, Gougeon F, Dumoulin C. Pelvic floor muscle training: mechanisms of action for the improvement of genitourinary syndrome of menopause. Climacteric. 2020 Oct;23(5):468-473. doi: 10.1080/13697137.2020.1724942. Epub 2020 Feb 27. PMID: 32105155.