Pelvic Physical Therapy Distance Journal Club
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[1]*Is there a difference in pelvic floor muscle tone between women with and without pelvic pain? A systematic review and meta-analysis. Kadah S, Soh SE, Morin M, et al. J Sex Med 2023;20:65-96. Doi.org/10.1093/jsxmed/qdac002.*

INTRODUCTION
AIMS
1. Synthesize evidence relating to differences in PFM tone between women with and without pelvic pain
2. Describe the methods used to measure PFM tone in women with and without pelvic pain

Study Design/Study Format:

METHODS
Eligibility

- women
- ≥18 years
- reported data on PFM tone at rest
- women with and without persistent non-cancer pelvic pain (PNCPP), confirmed by a clinician
- All study designs and gray literature, such as conference abstracts and theses, were included except case reports and systematic and narrative literature reviews.
- Manual hand-searching of reference lists of included studies was also conducted.

Exclusion

- neurologic disorders
- medications that could affect muscle tone
- cancer treatment (surgery or radiotherapy)
- conditions with active infection or inflammation
- studies were also excluded if ≥25% of the women had pelvic floor disorders, such as incontinence or pelvic organ prolapse, or had a history of a noncancer perineal or pelvic surgery

Quality Assessment / Risk of Bias

National Heart, Lung, and Blood Institute (NHLBI) Quality Assessment Tool for observational and cross-sectional studies

1. Clear research objective
2. Clear study population
3. Participation rate <50%
4. Prespecified eligibility criteria

5. Sample size justification
6. Exposure (pain) measured prior to the outcome
7. Exposure measures (pain)
8. Outcome measures (tone)
9. Blinding of outcome assessors
10. Controlling confounding factors

Synthesis methods
- Data analyzed according to parameters (resistance, flexibility, stiffness, relaxation, myoelectrical activity, intravaginal pressure or morphometry)
- Sensitivity analysis: removed studies according to study design from meta-analysis for each parameter (determine meaningful change, ensure robust findings)
- Synthesis: All studies included because only baseline data were extracted
- Risk of publication bias: funnel plots-symmetrical=lower risk

RESULTS
Study selection
21 studies included
(**Reviewer note:** Appendix 2: 27 tools in 19 papers (calculated by reviewer Rachel Worman, but paper reports 21 papers were included, other papers found elsewhere were Lahaie and DosBispo, 19 studies had healthy comparisons)

Study characteristics
16 cross-sectional
1 case-control
3 cohort
1 controlled trial

Participant characteristics
1068 women with pelvic pan
812 women without pain
18-84 years
9 included only nulliparous women

Patient-reported outcome measures

- Self-reported presence of pain: yes/no
- Numeric rating or visual analog scale of pain intensity

Validated patient questionnaires

- McGill Pain Questionnaire
- Present Pain Index
- ICIQ sexual matters module [ICIQ-FLUTSsex]
- O'Leary-Sant questionnaire

Clinician reported outcome measures

- Algometry
- Cotton swab test (CST)
- Digital palpation

19 studies had health comparisons

- 10-vulvodynia
- 1-vaginismus
- 2-pelvic pain (not specified)
- 2-endometriosis
- 2-IC/PBS
- 1 myofascial pelvic pain
- 1-pregnant women with dyspareunia (postpartum data also collected-excluded due to potential hormone influence)
- 2-mixed (vaginismus, PVD, control)

Risk of Bias

- Majority were cross-sectional (n=21, 80%) (**Reviewer note:** n=21 would be 100% ???, unclear if they meant the majority of parameters (29) or n=16/17)
- Mean: 7.3/10 (range: 2-10)
- Proportion of eligible women no reported in majority of studies (n=???)
- 17 used reliable methods to measure tone
- 9-no blinding to participant allocation
- 13-well controlled confounding factors (age, parity, body weight) btwn groups
- 4-significant differences btwn groups (participant characteristics, commonly age)
- 3-no report of differences at baseline btwen groups

Synthesis of results

Tone measures

- 7 parameters/outcome measures in 8 tools (all taken at rest)
- 9 (43%)/21 used EMG, 5 (24%)-US, 1 (4%)-MRI, 1-dynamometry, 1-myotonometry, 3(14%)-manometry, 1-strain elastography

Myoelectric activity

Pooled results: pain>control (n = 9, SMD= 1.32 [95% CI, 0.36-2.29], P = .007, I2 = 96%)

- 8-sEMG, 1-intramuscular EMG
- 2-superficial & deep

Resistance -combined/summative measure

Pain>control (n = 6, SMD= 2.05 [95% CI, 1.03-3.06], P <.0001, I2 = 95%; high heterogeneity)

- 5-digital palpation
- 1-dynomometric intravaginal speculum

Morphometry- combined/summative measure

- 5-US
- 1-MRI

Anterior-posterior diameter of levator hiatus (LH-AP)

- Pain<control (n = 5, SMD=−0.34 [95% CI, −0.51 to −0.16], P = .002, I2 =0%)

Levator hiatus area-ultrasound

- 3/4 studies Pain<control (P<.05)

L-R transverse diameter of levator hiatus-ultrasound

- 3/4 Pain vs control: no difference (meta-analysis did show difference, but Thibault-Gagnon used 1-way ANOVA to examine group effects (pain vs control) and task effects (rest, MVC, valsalva), and current study uses standardized mean difference [SMD])

Length-US, MRI
- Pain vs control: no difference (authors used a two-tailed t test, but SR uses SMD stats)

ARA-US

- 2 studies had conflicting findings, 1-pain>control (p=.013), 1-ND

LPA-US

- 2 studies had conflicting findings, 1-pain>control, 1-pain<control

PR angle-MRI

- Pain>control (p<.01)

*Stiffness-combined/summative measure-dynamometry, strain elastography (**Reviewer comment**: does not measure stiffness, it is shear modulus, and estimate/proxy of stiffness)*

- No meta-analysis due to limited studies
- Pain>controls

Flexibility-combined/summative measures-digital palpation, dynamometry

- No meta-analysis due to limited studies
- Pain<controls

Relaxation-combined/summative measures

- No meta-analysis due to limited studies
- 2-Pain<controls, 1-no difference per meta-analysis, but significant difference in study due to ANOVA

Intravaginal pressure-combined/summative

- No meta-analysis due to limited studies

- 2-ND, 1-pain>control

Passive component of tone-dynamometry with quiescent EMG

- Pain>control for resistance (p=.02) and stiffness (p<.001) and flexibility (p<.001)

Sensitivity analysis

- No change with removing RCT from pool of cross-sectional studies
- No change when removing risk of bias
- Funnel plots were asymmetrical (indicating risk of publication bias)

DISCUSSION
EMG: Conflicting findings; 3 studies showed no significant difference in EMG
- sEMG is not recommended as a research measure due to poor between-day reliability or interindividual comparisons
  - (**REVIEWER COMMENT:** between day and between individual comparisons are okay if the amplitude data is normalized.[2])
- EMG is prone to cross-talk
  - Normalization is recommended
- Most measures are a composite of multiple pelvic floor muscles
(**REVIEWER COMMENT:** EMG is a valid measure)

Resistance-digital palpation:
- Most frequently cited method
- Article states "although a previous study showed that digital palpation has satisfactory face validity and intraobserver reliability"[3] (**Reviewer comment:** Slieker ten Hove 2009 article does not study resistance to passive stretch. The closed proxy measure to tone is relaxation, so this comment is unjustified here and digital palpation for resistance does not have face-validity.)
- Reissing 7-point scale is the most reliable of the palpation scales

Resistance-dynamometry:
- Direct, objective, valid and reliable method
- Other factors: variability of pain-intensity during examination

Morphometry:
- ARA and LPA can be influenced by rectal content
- Level of examiner experience
- Inconsistent finding may be related to poor correlation compared to other measures

Relaxation:
- Lack of reliability

Manometry:
- Inclusion of parous and postpartum women compared to nulliparous
- Slightly lower intravaginal pressures observed asymptomatic parous women than nulliparous

Other comments:
- Location of measure may provoke, however, noninvasive measures have also found greater tone suggesting tone is present

LIMITATIONS
- Even with blinding, those with pain may be identified by reactions, which may bias results
- Authors may not have identified: previous treatment, coexisting pelvic floor disorders, infection or inflammation
- Limited studies-no meta-analysis for some parameters (stiffness, flexibility, relaxation, intravaginal pressure, PFM morphometry)
- 20/21 articles were observational studies

PRACTICAL IMPLICATIONS
- Alterations in some tone parameters in women with pain, suggesting increased tone may be related to pain
- Comprehensive assessments of tone should be considered
- Assessing these parameters could be important for guiding interventions (but RCTs of interventions are needed)

CONCLUSION
- Activity and resistance: pain>control
- LH-AP: pain < than controls
- LHA, stiffness: pain>control
- Flexibility: pain<control
- Research needed to establish normative and threshold values to define problematic tone

REVIEWER COMMENTS
5/27 (19%) provided convincing evidence when compared to grading in Worman 2022.

5/29 (21 papers) (17%) provided convincing evidence

REVIEWER COMMENTS
The authors have chosen an over-arching term, "persistent non-cancerous pelvic pain" for the article, however, not all topics in the article are persistent. They do separate the persistent (unprovoked) from the non-persistent (provoked) throughout the article. The phrasing "persistent" is problematic, especially in pelvic health where conditions such as dyspareunia and provoked vestibulodynia that are recurrent/episodic in nature and conditions such as endometriosis and dysmenorrhea that are very cyclical in nature. The non-synonymous swap from chronic to persistent seems to have stemmed from the NOI group and Diarmuid Denney /Physio Pain Association work in the UK with the idea that "chronic" has terminal implications that may be driving the psychophysiologic factors preventing a patient from thinking they can overcome a condition, despite the fact that the word chronic comes from the Greek "time," and indicates the time since onset of the symptoms. However, there is very little evidence or consensus to support this change nor is there qualitative evidence inviting patients to decide what they prefer. In other words, there is no indication that it actually has terminal meaning to patients. And yet, we have made a non-synonymous swap of these terms. An article by Kennedy in 2014 highlights that the semantic distinction between chronic and persistent

drastically changes the prevalence when conducting a survey.[4] In other words, you won't pick up all the cases on a survey depending on the word you use because people classify themselves. Most adults with conditions such as arthritis, carpal tunnel, back or joint pain do not describe their pain as persistent. Of the people who do report persistent pain, 67.2% state that it is constantly present, further highlighting why persistent is not the better overarching term in many pelvic health conditions. The "standard for terminology in chronic pelvic pain syndromes: A report from the chronic pelvic pain working group of the international continence society" also suggest that chronic pain may be further characterized by it's modality as either persistent and/or continuous, recurrent and/or episodic and/or cyclic. Therefore, persistent is a characterization of chronic pain, it is not equivalent to chronic pain.[5] These distinctions are important in pelvic health. Further, the International Association for the Study of Pain (IASP) has suggested that pain be classified more broadly as nociceptive, nociplastic or neuropathic[6,7], moving away from timeline terminology in pain and this would be especially important in pelvic pain.

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"E. Chronic Pelvic Pain—Chronic pelvic pain is characterized by persistent pain lasting longer than 6 months or recurrent episodes of abdominal/pelvic pain, hypersensitivity or discomfort often associated with elimination changes, and sexual dysfunction often in the absence of organic etiology.20"[5]

"H. Characteristics
a. Duration of pain: Six months or more of persistent pain.FN4
b. Location of pain: Pelvis, lower abdomen, low back, medial aspect of thigh, inguinal area, perineum.
c. Perception of pain: Patients may describe the pain as sharp, burning, aching, shooting, stabbing, pressure or discomfort, sexual pain (dyspareunia).22 FN5
d. Modality of pain (7): Persistent and/or continuous, recurrent and/or episodic and/or cyclic (related to menstrual cycle)."[5]

Kadah 2023-1 Parameter, Author, Year	Tool	Worman 2022 Included	Worman 2022 Convincing-Yes, No, NC (no comparison)
Parameter: myoelectric activity			
Dong 2021	sEMG	✓	No
Morin 2017	sEMG	✓	No
Naess 2015	sEMG	✓	No
Loving 2014	sEMG	✓	No
Polpeta 2012	sEMG	✓	No
Gentilcore-Saulnier 2010	sEMG	✓	**Yes**
Engman 2004	sEMG	✓	No
Shafik 2002	sEMG	✓	No
Glazer 1998	sEMG	✓	No

Parameter: stiffness

Abe-Tahahashi 2021	Elastography	—	NC
Davidson 2017	Myotonography	—	NC
Morin 2017	Dynamometry	✓	**Yes**

Parameter: flexibility

Thibault-Gagnon 2018	Digital palpation	✓	No
Morin 2017	Dynamometry	✓	Yes
Gentilcore-Saulnier 2010	Digital palpation	✓	No

Parameter: relaxation

Thibault-Gagnon 2018	Digital palpation	✓	No
Loving 2014	Digital palpation	✓	No
Gentilecore-Saulnier 2010	Digital palpation	✓	No

Parameter: intravaginal pressure

Naess 2015	Manometry	✓	**Yes**
Tennfjord 2014	Manometry	—	NC
Polpeta 2012	Manometry	✓	Yes

Parameter: morphometry

Nesbitt-Hawes 2018	US	—	NC
Raimondo 2017	US	✓	No
Thibault-Gagnon 2016	US	✓	No
McLean 2016	US	—	NC
Ackeman 2016	MRI	✓	No
Morin 2014	US	✓	No

REFERENCES

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