

767 - The Use of Small Animal Models to Study the Effects of Aging and Ovarian Failure on the Levator Ani & External Anal Sphincter: A Systematic Review

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INTRODUCTION

Small animals are commonly used to model the effects of menopause on the pelvic floor, although the extent to which the impacts of aging and ovarian failure on the pelvic floor muscles have been characterized in small animals is unknown.

In this systematic review, we aimed to determine how aging and ovarian failure...

1. ...have been modeled in small animals to examine the changes in the levator ani (LAM) and external anal sphincter (EAS).
2. ...impact the composition, structure and function of the LAMs and EAS.

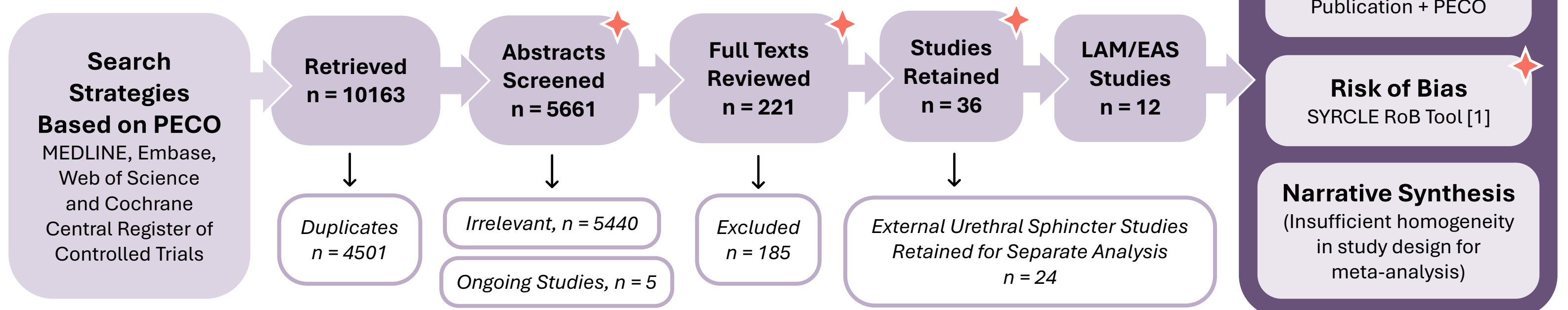
Table 1. PECO Criteria

Population	Female rodents/lagomorphs
Exposure	Aging (16/24 mths) or Ovarian Failure (e.g., ovariectomy)
Comparator	Young or reproductively intact
Outcomes	External Urethral Sphincter, LAM, EAS composition, structure or function

METHODS

PROSPERO ID: CRD42002350979

★ = Performed in duplicate by two independent reviewers



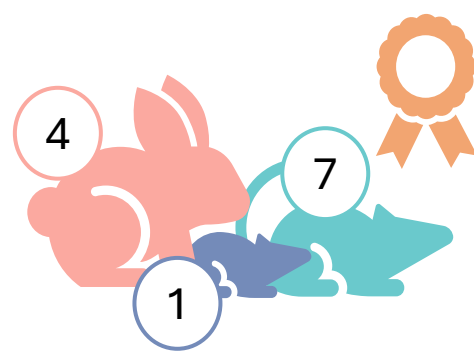
FINDINGS

Rats were the most common species studied

EAS in 3 studies

LAM in 11 studies

- Unspecified, n = 1
- Pubocaudalis, n = 11
- Pubocaudalis and Iliocaudalis, n = 2



Ovariectomy (OVX) in young animals was the most common intervention, with only one aging study and one study that combined aging and ovariectomy.

Outcomes were dependent on species.

Compared with shams, OVX rats showed larger muscle fibers [X,X] while OVX rabbits showed no differences [X,X].

Only one study included both aging and ovariectomy. The impact of OVX on isomyosin I and CDKI [6] differed between younger and older rats

The risk of bias assessment was inconclusive due to a lack of descriptive information provided regarding study protocols.

- Articles best characterize the effects of OVX on the LAMs.
- Estrogen depletion alters LAM composition and structure, which may contribute to altered function.
- Protocol and outcome heterogeneity precluded meta-analysis.
- Knowledge gaps remain, especially regarding the effects of aging.

Table 2. Impact of Aging or Ovariectomy on Reported Outcome Measures

Measures	LAM		EAS	
	OVX	Age	OVX	Age
Composition	α & β Estrogen Receptors	↑		
	G-Protein Estrogen Receptor	ND		
	Aromatase	↑		
	Malondialdehyde	↑		
	GLUT4 Transporter	↑		
	Muscle Glycogen	ND, ?		
	Isomyosin I	↑/ND	↑	↑
	CDKI – p27kip1	↑/ND, ↑	↑	↑, ↑
Structure	Z-Bands	?		
	Vacuole Density	?		
	Mitochondria	?		
	Peripheral Nuclei Count	↑		
	CSA- to –Myonuclei Ratio	↑		
	Fiber CSA	↑/ND, ND, ↑, ND		↑
	Fiber Size Distribution	↑/ND, ND, ↑		ND
	Fractional Area			ND
	Length	ND		
	Width	ND		↑
Function	Muscle CSA			
	Muscle Weight	ND (Wet), ↓ (fixed)		
	Contractile Tension	↓(Normoxic), ND (Hypoxic)		
	Power Spectral Density			
Mean Power				
Median of Frequencies	↑ (Voiding), ND (Storage)			

Age = aging exposure; CDKI = Cyclin-Dependent Kinase Inhibitor; CSA = Cross-Sectional Area; GLUT4 – Glucose Transporter Type 4; ND = No difference between groups; OVX = ovariectomy; ↑ = OVX or older age was > than sham; / = pubocaudalis and iliocaudalis were evaluated separately in the same article; ? = insufficient reporting of results in text

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ABSTRACT



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