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Role of chronic exercise on pelvic floor support and function

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Abstract

Purpose of review—To summarize recent literature about the potential role of chronic exercise on pelvic floor support and function.

Recent findings—Stress urinary incontinence is common during physical activity. Scant evidence suggests a dose-response association between higher volumes of exercise and urinary incontinence. Athletes do not appear to have greater pelvic floor muscle strength or worse pelvic floor support compared to non-athletes. Pelvic floor muscle electromyographic activity increases substantially as running speeds increase.

Summary—Based on the current literature, no strong conclusions can be drawn about whether chronic exercise exerts a positive or negative influence on pelvic floor support and function. Adopting longitudinal research methodology that prospectively monitors exercise exposure and subsequent changes in pelvic floor support and function would help to reduce selection bias associated with cross sectional studies on groups of athletes.

Keywords

exercise; pelvic organ prolapse; pelvic floor disorder; urinary incontinence

Introduction

Exercise is a specific physical activity behavior that has potential for improving or maintaining some aspect of physical fitness, including aerobic capacity, muscular strength and endurance, flexibility and body composition.¹ Exercise must achieve threshold levels of frequency (days per week), intensity (level of effort) and duration (time per session), which vary as a function of an individual's baseline level of fitness. A chronic exercise program is a systematic and consistent approach to training over time—most often 6 to 8 weeks at minimum. Regular sport participation requires training that meets or exceeds threshold levels required for exercise.

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No experimental data exist on the direct effects of exercise on pelvic floor support. Therefore, it is difficult to hypothesize direction and magnitude of pelvic floor support afforded by various exercise regimens. It can be argued that exercise has the potential to strengthen the pelvic floor muscles during activity and thereby improve pelvic floor support in the same manner that exercise strengthens other skeletal muscles. Conversely, exercise also has the potential to increase intra-abdominal pressure, which some consider detrimental to pelvic floor muscles, so it may function to decrease pelvic floor support.

Given that exercise confers numerous health benefits and given that pelvic floor disorders are exceedingly common, affecting one in four U.S. women, understanding the relationship between chronic exercise and pelvic floor support and function is critical.²

The purpose of this review is to summarize recent literature about the effect of chronic exercise on pelvic floor support and function. We limit this review to chronic exercise and long-term participation in sport and do not include studies about pelvic floor muscle training or those only focused on household, child/elder care, or occupational activity. We also do not summarize literature on the potentially indirect effect of exercise on PF support and function, though it is worth noting that consistent participation in exercise has been shown to slow the progression of weight gain with aging, regular exercisers tend to have lower body mass index than non-exercisers and overweight/obesity and high waist circumference is associated with pelvic floor dysfunction, notably urinary incontinence.^{3,4}

PRIOR BODY OF LITERATURE

Most of the literature examines differences between groups with divergent exercise habits or addresses associations between activity exposure and some index of pelvic floor support or function. Pelvic floor support may be addressed using the clinical Pelvic Organ Prolapse Quantification examination, by self-reported sensation of vaginal bulge or pressure, by other self-reported symptoms such as stress urinary incontinence, or by other measures of pelvic floor muscle anatomy or function.

To place the literature published over the past year in context, we briefly describe the previous body of literature, summarized in a recent review.⁵ Key points include:

- Urinary incontinence during exercise is common. Approximately one-fourth of women report some urinary leakage during acute exercise.
- Urinary incontinence is reported more frequently by women engaging in high-impact sports, with rates as high as 80% during trampoline training.
- Participating in mild to moderate exercise, such as walking, decreases the risk of developing bothersome urinary incontinence.
- Data are mixed concerning the impact of strenuous activity while young on urinary incontinence or pelvic organ prolapse when older, with some evidence pointing towards no effect and other evidence towards a deleterious effect.
- The few studies that evaluated the relationship between exercise and pelvic organ prolapse found no association.

- Extremely strenuous exercise (para-trooper training) appears to increase the risk for pelvic organ prolapse.
- Scant data suggests that women participating in sports at least 8 hours per week are more likely to report anal incontinence.

LITERATURE UPDATE

The present review includes studies indexed in PubMed between March 2015 and November, 2016. The following search terms were used to identify work relevant to the topic of chronic exercise and pelvic floor support: “exercise, sport, physical activity, leisure time and recreational activity” and “pelvic floor muscles, pelvic floor disorder, urinary incontinence, and pelvic organ prolapse.” Using these terms, relevant research in men was not identified; however, two study protocols indicate that reports on exercise and pelvic floor support among men undoing prostatectomy are forthcoming.^{6,7}

Exercise and Pelvic Floor Muscle Function

The literature about pelvic floor (PF) structure and function in highly active women is sparse. In two earlier manuscripts, female athletes had a 20% greater cross-sectional area of the levator ani on MRI and a higher mean diameter of the pubovisceral muscle on translabial ultrasound when compared to controls, but these muscular differences did not translate to higher levels of PF muscle strength among athletes.^{8,9} In another report, PF muscle strength measured during perineometry was lower in volleyball and basketball players than in non-athletes.¹⁰ Further, these authors observed that indices of athletes’ training regimens were negatively associated with PF muscle strength, suggesting that greater levels of training are associated with a decrease PF support.

More recently, incontinent athletes compared to their similarly active and continent counterparts have demonstrated greater thickness of pubovisceral muscle at the midvagina by MRI, but without difference in clinically assessed PF strength (Oxford Scale) or function, as inferred by dynamic MRI.¹¹ Yet, another study among young, non-obese nulliparous women, half of whom were consistently involved in strenuous exercise (CrossFit™) and the other half not, observed no differences in PF strength at rest or after exercise in either group.¹² While small decreases in PF support were observed in both groups acutely after exercise, the changes were similar despite drastic differences in the exercise done by the two groups. Similarly, in a cross-sectional study of postmenopausal women, no association was found between physical activity level and PF muscle strength, assessed by perineometry.¹³

A recent pilot study of seven nulliparous, asymptomatic women compared PF muscle function and morphology, assessed using dynamic MRI, in two groups: former high-impact athletes and a control group, of similar age and BMI that did not participate in high-impact activity. Pubovisceral muscle diameter was significantly smaller and levator hiatus area significantly greater in former high-impact athletes compared to controls. Further, using dynamic MRI as an indirect measure of PF contraction, former high impact athletes consistently performed worse than controls, and also had lower, clinically-assessed PF strength (Oxford Scale) than controls. It is difficult to determine whether these results

predict future PF dysfunction among the former high-impact athletes, since neither group had symptoms or clinical evidence of PF dysfunction.

In an exploratory study, no differences were found in PF muscle electromyographic activity during running between continent and incontinent women.¹⁴ The mean EMG pre-activity and reflex activity increased with speed. Of note, EMG values during running in women with stress urinary incontinence exceeded 100% of activity during maximum voluntary contraction at the highest speed of 15 km/hour. The authors suggest that running training stimuli might serve as a complement to PF muscle training as it appears to lead to reflex activity of the PF muscles. Another study found that PF EMG variables showed excellent reliability, suggesting that this method could be instructive in future studies to understand better PF muscle activity during active sports.¹⁵

While much literature focuses on strenuous or impact-inducing exercise, one recent paper hypothesized that young women who engage in Pilates exercise, which emphasizes conditioning of the trunk musculature, would have better PF function on clinical assessment when compared to inactive controls. In fact, PF function was not different between groups.¹⁶

Exercise and PF Symptoms

The recent literature update supports the fact that stress urinary incontinence, as noted in the brief summary of previous literature above, is common among active and athletic women. Among women ages 18 to 83 years who regularly attend a fitness facility or exercise classes, about 49% reported having mostly mild to moderate stress urinary incontinence.¹⁷ In an online survey of female triathletes, 37% and 28% reported urinary and anal incontinence, respectively.¹⁸ In another report, athletes exhibited greater odds for urinary incontinence compared to non-athletes (OR=2.90; 95% CI: 1.50–5.61), with ~27% of controls reporting mostly urgency urinary incontinence and ~52% of athletes reporting mostly stress urinary incontinence.¹⁹ Interestingly, self-reported bowel function was better among athletes compared to controls and only controls reported any symptoms of pelvic organ prolapse, yet the authors warn of potential PF damage for women engaged in sporting activity.

Dose-response

Do higher doses of exercise incrementally increase the risk of pelvic floor dysfunction? An experimental approach to address this question is not ethical, but some observational research lends support to a dose-response relationship between exercise, urinary incontinence and pelvic organ prolapse.

In a study of 22 young female trampolinists, 73% reported urine leakage during trampoline practice.²⁰ Women in the upper tertile for performance and training volume had the greatest severity of urinary incontinence. Amongst young, nulliparous women, 20% reported incontinence symptoms.²¹ Women in the fourth quartile of time spent in organized exercise (that is, competitive athletes) had a 2.5 greater risk of urinary incontinence compared to inactive women, while women in the second and third quartiles had no increased risk.

Two large cross-sectional studies of women ages 39 to 65 recruited from the community suggested that very high levels of strenuous physical activity during the teen years increased the odds of stress urinary incontinence and pelvic organ prolapse in middle-age.^{22,23}

The potential for demonstrating a dose-response between greater exercise exposure and worsening pelvic floor support and function is an interesting avenue of research, especially if objective measures of exercise and/or sport participation are available.

Limitations of Research and Missing Links

Research on intact groups such as athletes can be problematic in linking exercise to PF support. The selective ability to withstand high rates of mechanical strain may contribute to an athlete's ability to continue in sport without undue consequences, such as in the case of former athletes with differences in anatomical or structural PF differences from controls but without PF symptoms or clinical presentation of PF dysfunction. Further, athletes engage in a primary sport and supplemental training. Swimmers experience incontinence; yet swimming is non-weight bearing but supplementary training is not. Adopting longitudinal research methodology that prospectively monitors exercise exposure and subsequent changes in PF support can reduce selection bias associated with cross sectional studies on intact groups.

Increases in intra-abdominal pressure are considered the avenue by which exercise could be detrimental to the PF, but it is unknown whether high IAP from impact (e.g., from running, forceful landings) is experienced in the same way by the PF as high IAP from heavy lifting. Heavy lifting, often a part of supplementary training for athletes or as part of high intensity exercise now popular among the general population (for example, CrossFit™), requires significant bracing of the abdominal musculature. Abdominal bracing as a training regimen can improve overall muscular strength and result in the capacity to generate higher IAP over time, which could be considered a beneficial response to training.²⁴ Further, parsing the duration, frequency and intensity of exercise and the exposure from each of these components could narrow down those that have potential for detriment from those that have potential to benefit to the PF. Developments in the assessment of IAP and PF muscle activity during activity may assist in addressing these gaps in the literature.^{15,25}

Summary

Exercise is associated with PF support and function, but a causal pathway has not been established. The most common PF symptom associated with exercise is SUI. Anatomical differences have been observed between women discordant for exercise, but these do not consistently translate to differences in PF function. Some studies on athletes and active women suggest a deleterious effect of exercise on PF function, but others do not. Scant research supports a dose response, but prospective studies are lacking. Exercise promotes many aspects of health and weight maintenance, which contributes to PF health. Future research should aim to better delineate the various aspects of exercise participation that contribute to and detract from PF support to shape exercise recommendations.

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Key Points

- Prospective research directly connecting specific exercise participation characteristics to indices of pelvic floor health is lacking, which limits the strength of conclusions that can be made about the role of chronic exercise on pelvic floor support.
- Women discordant for exercise history may have observable differences in pelvic floor anatomy, but they do not consistently have differences in PF function.
- Exercise can exert indirect effects on the pelvic floor through weight maintenance and potentially promoting bowel health.