

## Physical Activity to Improve Erectile Function: A Systematic Review of Intervention Studies

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### ABSTRACT

**Introduction:** The leading cause of erectile dysfunction (ED) is arterial dysfunction, with cardiovascular disease as the most common comorbidity. Therefore, ED is typically linked to a web of closely interrelated cardiovascular risk factors such as physical inactivity, obesity, hypertension, and metabolic syndrome. Physical activity (PA) has proved to be a protective factor against erectile problems, and it has been shown to improve erectile function for men affected by vascular ED. This systematic review estimated the levels of PA needed to decrease ED for men with physical inactivity, obesity, hypertension, metabolic syndrome, and/or manifest cardiovascular diseases.

**Aim:** To provide recommendations of levels of PA needed to decrease ED for men with physical inactivity, obesity, hypertension, metabolic syndrome, and/or cardiovascular diseases.

**Methods:** In accord with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, a systematic review was performed of research articles specifically investigating PA as a possible treatment of ED. The review included research on ED from physical inactivity, obesity, hypertension, metabolic syndrome, and/or cardiovascular diseases. All available studies from 2006 through 2016 were checked for the predetermined inclusion and exclusion criteria to analyze the levels of PA needed to decrease ED.

**Results:** 10 articles met the inclusion criteria, all suggesting various levels of PA needed to decrease ED for men with relevant risk factors for ED. The results of the review provided sufficient research evidence for conclusions regarding the levels of PA necessary to decrease ED.

**Conclusion:** Recommendations of PA to decrease ED should include supervised training consisting of 40 minutes of aerobic exercise of moderate to vigorous intensity 4 times per week. Overall, weekly exercise of 160 minutes for 6 months contributes to decreasing erectile problems in men with ED caused by physical inactivity, obesity, hypertension, metabolic syndrome, and/or cardiovascular diseases. **Gerbild H, Larsen CM, Graugaard C, Areskoug Josefsson K. Physical Activity to Improve Erectile Function: A Systematic Review of Intervention Studies. Sex Med 2018;X:XXX–XXX.**

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**Key Words:** Erectile Dysfunction; Sexual Health; Rehabilitation; Lifestyle Intervention; Physiotherapy; Systematic Review

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### INTRODUCTION

Sexuality is an important part of physical and mental health.<sup>1</sup> Erectile dysfunction (ED) is the most common sexual dysfunction in men,<sup>2–7</sup> and it is defined as the inability to attain or maintain a penile erection of sufficient quality to permit satisfactory sexual activity.<sup>3,5,7–12</sup> Whether aging, heterosexual couples continue to be sexually active seems, to a large extent, determined by the sexual function of the male partner.<sup>13</sup> ED has a negative impact on quality of life and well-being, and it is further associated with anxiety and depression.<sup>7,14</sup> In consequence, ED is increasingly recognized as a public health challenge,<sup>15</sup> although it is frequently neglected in clinical practice.<sup>12</sup>

ED affects 1/3 of all men, and the prevalence of ED increases with age.<sup>2,5,6,16,17</sup> Epidemiologic studies have demonstrated that physical inactivity, obesity, hypertension (HTN), metabolic syndrome (MetS), atherosclerosis, and manifest cardiovascular diseases (CVDs) are risk factors for ED,<sup>2,4,6,7,14,15,17–22</sup> because the prevalence of ED is increased in these general population groups.<sup>4,17,23–26</sup> Furthermore, the prevalence of ED increases with the number of risk factors present.<sup>5</sup>

Penile erection is a hemodynamic process involving increased arterial inflow and restricted venous outflow<sup>3,6</sup>; therefore, ED can be an early warning sign of poor vascular function. Thus, ED has been coined “penile angina”<sup>24</sup> because it can be predictive of future CVD<sup>12</sup> and because CV risk factors and CVD frequently lead to ED.<sup>3,4,6,18,27–29</sup> Endothelial inflammation, which disrupts nitric oxide (NO) production, is a central determinant of vascular diseases including ED.<sup>4–6,29</sup> Neuronal and endothelial NO mediates the vascular component of sexual arousal by causing engorgement of the corpora cavernosa tissue and subsequent erection of the penis. It is well recognized that erectile blood flow is regulated by constriction or relaxation of the smooth muscle cells of penile arterial vessels.<sup>3,19,21,28</sup>

To diagnose and quantify the severity of ED, the International Index of Erectile Function (IIEF)<sup>9</sup> and the abridged 5-item version (IIEF-5)<sup>10</sup> are the most commonly used patient-reported outcome measures.<sup>12</sup> The main therapeutic strategy in clinical health care is to compensate for ED by using phosphodiesterase type 5 inhibitor medications. However, phosphodiesterase type 5 inhibitors only temporarily restore erectile function, and they have been found to be ineffective in a significant proportion of men with ED.<sup>21</sup> Moreover, phosphodiesterase type 5 inhibitors do not appear to have any long-term impact on the underlying vascular dysfunction,<sup>21</sup> and they do not have any curative effect on endothelial or arterial dysfunctions or erectile problems.<sup>3,11,21,29–31</sup> Additional medical treatment possibilities are scarce, although the role of non-pharmacologic lifestyle interventions in lessening the burden of ED has increasingly been recognized.<sup>3,12,14,32,33</sup>

Physical activity (PA) can potentially decrease ED,<sup>7,21</sup> and PA has been identified as the lifestyle factor most strongly correlated with erectile function and the most important promoter of vascular health.<sup>19,28</sup> Thus, moderate- and vigorous-intensity PA is associated with normal erectile function and lower risk of ED.<sup>6,18–20,25,27,29,34,35</sup> The protective effect of PA also applies to men with obesity, HTN, and MetS.<sup>19,36–38</sup> PA causes improved endothelial function and NO production,<sup>6,24,28,29,39</sup> and PA has consistently been shown to advance erectile function.<sup>5,19,21,29,39</sup>

Hence, there is strong evidence that frequent PA significantly improves erectile function.<sup>3,11,12,31</sup> Previous reviews have assessed the association between PA and ED,<sup>3,5,12,14,33</sup> but the quality and quantity of PA needed (ie, modalities, duration, intensity, and frequency<sup>39</sup>) are insufficiently described,<sup>12,14</sup>

although knowledge of these is essential for clinical guidance of patients with ED.<sup>4,12,19,28,40</sup>

To provide recommendations for PA-induced improvement of erectile function in men characterized by physical inactivity, obesity, HTN, MetS, and/or manifest CVD, we need in-depth knowledge of the specific modality, duration, intensity, and frequency of PA required to treat ED successfully. A systematic review of clinical intervention studies could provide this knowledge or indicate the need for future research in this field.

## AIM

The aim of the study was to provide recommendations of levels of PA needed to decrease ED for men with physical inactivity, obesity, HTN, MetS, and/or manifest CVDs.

## METHODS

### Search Strategy

A systematic review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines based on PICO (patient, intervention, comparison, and outcome<sup>41</sup>) and the “Building Block Search Strategy.”<sup>42</sup> The PubMed, Embase, and Cochrane databases were systematically searched to identify studies eligible for the review. The following search terms were used: *physical activity, physical endurance, physical conditioning, exercise, exercises, training, aerobic, fitness, and resistance training* in combination with *erectile dysfunction, erection dysfunction, and impotence*.

An initial screening of titles and abstracts was performed with Covidence<sup>43</sup> to identify potentially relevant studies, after which the full texts of the identified studies were examined. Reference lists of eligible articles were manually checked for additional relevant studies. The search strategy is provided in Appendix B. Only full-text studies written in English were included. The search was performed on January 25, 2017. The PRISMA checklist is provided in Appendix A.

### Inclusion Criteria

The studies included in the review meet the following inclusion criteria:

1. Study design: randomized controlled trials (RCTs) or controlled trials (CTs)
2. Study population: men at least 18 years old with arterial ED and men characterized by physical inactivity, obesity, HTN, MetS, and/or manifest CVD
3. Study intervention: any exercise protocol involving PA to decrease ED
4. Baseline and follow-up measurements: ED measured using the IIEF score (maximum = 30 points) or IIEF-5 score (maximum = 25 points)<sup>9,10,44</sup> and exercises measured by modality, duration, intensity, and frequency

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