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# The potential role of physical activity in the treatment and management of male sexual dysfunction

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## Introduction

Male sexual dysfunction is an umbrella term covering multiple issues such as erectile dysfunction (trouble having and maintaining an erection), premature ejaculation (the inability to delay semen leaving the body (ejaculation) in all or most vaginal penetrations, and low libido (reduced desire for sex).<sup>1,2</sup> The global prevalence of erectile dysfunction could be as high as 76.5%.<sup>3</sup> In terms of premature ejaculation, prevalence has been estimated from 20%<sup>4</sup> to 30%<sup>5</sup> while low sexual desire may be present in approximately 5%.<sup>6</sup> Commonly associated risk factors for male sexual dysfunction include increasing age, presence of cardiometabolic, neurological or psychological health conditions, as well as lifestyle factors such as smoking, excessive alcohol consumption and physical inactivity.<sup>2</sup> In order to treat male sexual dysfunction, pharmacological strategies have been developed over the past number of years with some success, although it is worth considering these pharmacotherapies can have wide-ranging side effects such as headaches, tachycardia and nausea.<sup>7</sup> Therefore, there is a need for non-pharmacological strategies which are likely to have reduced side effects. One such lifestyle change could be increasing physical activity levels. Physical activity is defined as any bodily movement produced by skeletal muscles that results in energy expenditure<sup>8</sup> and can be conceptualised in multiple domains (structured exercise / sports (often leisure time activity), active travel (i.e. walking and cycling), occupational, household chores / gardening) and is performed at different intensities (light <3.0 metabolic equivalent of task (METs), moderate 3.0-5.9 METs, and vigorous ≥6.0 METs).

A systematic review has highlighted that there is compelling evidence for the positive role of physical activity in improving erectile dysfunction.<sup>9</sup> Another recent systematic review by Pizzol et al.<sup>10</sup> focused on non-pharmacological strategies for dealing with premature ejaculation, highlighting that a small number of studies have used physical activity as a form of treatment which have led to significant improvements in clinically important measures such as intravaginal ejaculation latency time (IELT) and scores for the Premature Ejaculation Severity Index (PESI). Therefore, we will discuss some of the associated research and possible mechanisms linking physical activity with improved male sexual function.

## **Male sexual dysfunction and physical activity**

Not only have observational studies reported associations between physical activity and lower prevalence rates of premature ejaculation,<sup>11</sup> interventional studies have also found promising results. For example, Kilinc et al.<sup>12</sup> reported that moderate running for 30 minutes, five days per week, was just as effective in reducing premature ejaculation as Dapoxetine. Furthermore, a recent review found that pelvic floor strength training 'cured' premature ejaculation in between 55-83% of participants (a further 5-11% reported improvements).<sup>13</sup> These pelvic floor strength training exercises were also found to be significantly beneficial for erectile dysfunction, reporting that erectile dysfunction 'cured' rates ranged from 35-47%, whilst 28-40% reported improvements.<sup>13</sup> This concurs with an observational meta-analysis that reported that partaking in 'above average' levels of physical activity was associated with almost half the risk of erectile dysfunction (odds ratio = 0.53), with higher levels of physical activity yielding further levels of protection.<sup>14</sup> Although the potential mechanistic pathways for this apparent protective effect have not been well studied, Allen and colleagues<sup>15</sup> have suggested that physical activity-related improvements in (a) expression and activity of nitric oxide synthase; (b) strengthened endothelial function; (c) acute rises in testosterone; (d) decreased stress and anxiety; and (e) improved body image to be potential reasons.

## **Male sexual dysfunction, cardiometabolic health and physical activity**

Being overweight / obese has been identified as a key risk factor for male sexual dysfunction, specifically erectile dysfunction.<sup>16</sup> This is likely, in part, due to decreased testosterone levels caused by the larger number of adipose cells secreting high levels of leptin.<sup>17</sup> Chin and colleagues<sup>18</sup> critically evaluated the findings of high-quality systematic reviews and meta-analyses conducted since the turn of the century in order to provide some clarity on the likely effectiveness of physical activity in weight management and weight reduction. They found moderate-to-high intensity exercise-only interventions conducted 3-5 times per week resulted in 2-3% weight loss of initial weight within 6 months. Additionally, interventions that utilised low-intensity walking and lifestyle activity also appeared to produce modest weight loss of 1-1.5% at 3-6 months. These interventions used devices such as step counters to track physical activity. However, it is important to note the most important intervention was combined exercise and dietary changes, which typically resulted in 8-11% weight loss after 6 months.

The prevalence of erectile dysfunction in those with Type II diabetes mellitus (T2DM) has been found to be 66.3% in a large meta-analysis of 145 studies.<sup>19</sup> In addition, it was highlighted that men with diabetes mellitus (either Type I or Type II) were over 3.5 times more likely to have erectile dysfunction compared to healthy controls. Interestingly, hypertension was shown to be a significant moderator in this association. Males with T2DM have also been shown to have higher rates of premature ejaculation compared with a healthy cohort.<sup>20</sup> A suggested, plausible mechanism could be due to complications from diabetic neuropathy, and its negative impact on the autonomic nervous system.<sup>21</sup> However, physical activity has been shown to be a potent intervention to reduce the risk of T2DM. A meta-analysis by Aune and colleagues<sup>22</sup> highlighted significant associations between numerous types and intensities of physical activity with T2DM risk, including total physical activity time, walking, light intensity, moderate intensity and vigorous intensity activities. Importantly, significant associations highlighted for leisure-time activity, walking, vigorous activity and resistance exercise were all non-linear, with steeper reductions in T2DM risk at lower levels before attenuating at higher levels. This shows there are numerous strategies which could be utilised to reduce T2DM risk in males with sexual dysfunction.

A systematic review by Gandaglia and colleagues<sup>23</sup> postulate that the links between erectile dysfunction and cardiovascular disease are due to risk factors associated with atherosclerosis, hypertension, endothelial dysfunction, chronic inflammation and low androgen levels. To this end, it has been highlighted how regular moderate-vigorous physical activity can help to attenuate these particular processes.<sup>24</sup> In addition, an umbrella review of systematic reviews has highlighted that meeting the physical activity guidelines (e.g. at least 150 minutes of moderate activity per week, 75 minutes of vigorous activity per week, or a combination of both), reduced cardiovascular disease risk by approximately 75% of the maximal benefit solely obtained with being more physically active.<sup>25</sup> However, even just achieving a third of these physical activity recommendations still positively impacted on cardiovascular disease outcomes.<sup>25</sup> Also worth noting is that in those with established cardiovascular disease, the importance of being able to maintain a healthy sex life should not be under-estimated, with likely positive impacts on mental health and quality of life.<sup>26</sup>

### **Male sexual dysfunction, sleep and physical activity**

The relationship between sleep disorders and erectile dysfunction is well established. For example, Cho and Duffy,<sup>27</sup> in their review examining sleep disorders and erectile dysfunction, concluded that several sleep disorders (including chronic insufficient sleep, insomnia, circadian rhythm sleep disorders, and obstructive sleep apnoea) were associated with elevated prevalence of erectile dysfunction. Although some mechanistic pathways (decreased testosterone levels in people with insomnia, for example) have been hypothesised, there is a lack of studies investigating these causal mechanisms. Although studies have not examined the role that physical activity can play in alleviating these sexual dysfunctions, it can be reasonably hypothesised that physical activity could be a meaningful treatment. Indeed, several studies have reported the beneficial effects of physical activity in alleviating several sleep disorders.<sup>28,29</sup>

### **Male sexual dysfunction, mental health and physical activity**

Physical activity has been shown to have positive impacts on symptoms of anxiety and depression, which are well-established risk factors for male sexual dysfunction.<sup>1</sup> A recently published umbrella review included 97 reviews involving randomised controlled trials, with the main goal of increasing physical activity levels in adult populations.<sup>30</sup> The review highlighted medium-sized effects on anxiety (median effect size = -0.42), depression (median effect size = -0.43) and psychological distress (median effect size = -0.60). Taking part in regular moderate-vigorous physical activity has been shown to significantly reduce the odds of elevated anxiety symptoms, generalised anxiety disorder and having any anxiety disorder by 13%, 56% and 34%, respectively.<sup>31</sup> This also seems to be the case for higher levels of sedentary behaviour (i.e. high amounts of daily sitting over prolonged periods of time), with a meta-analysis adjusting for sociodemographic and health-related factors highlighting a small positive association with anxiety.<sup>15</sup> This is likely to translate to males with sexual dysfunction in terms of reducing the likelihood of aspects such as 'performance anxiety' as well as improving aspects like self-perceived body image. These findings have been echoed in other reviews, with Mammen and Faulkner<sup>32</sup> highlighting that 83% (i.e. n = 25/30) of identified prospective, longitudinal studies, which were generally of high methodological quality, found baseline physical activity levels were negatively associated with later risk of depression.

In terms of trying to understand the potential mechanisms, one causal pathway could be serotonin availability. One study conducted in older men has demonstrated that 16 weeks of

aerobic exercise training may have positive impacts on plasma tryptophan availability, a precursor to serotonin.<sup>33</sup> Indeed, a key risk factor for anxiety and depression is a reduced level of serotonin.<sup>34,35</sup> Other potential mechanisms by which physical activity may improve risk factors for mental ill health include reduced systemic inflammation, increased levels of norepinephrine, improved expression of neurotrophic factors and enhanced regulation of activity at the hypothalamic–pituitary–adrenal (HPA) axis.<sup>30</sup>

### **Low libido and physical activity**

Increased physical activity may be linked with increased sexual libido. One of the proposed mechanisms for this effect is likely to be elevated serum testosterone levels caused by physical activity.<sup>36</sup> However, the research in this area is contrasting, with a cross-sectional study using data from the NHANES cohort highlighting no associations between different physical activity tertiles and serum testosterone levels in the overall sample.<sup>37</sup> Interestingly, the only significant association was amongst the subsample of non-obese men in the highest physical activity tertile who had 50% reduced odds of having low or low-normal testosterone than those in the lowest tertile. Another study has even highlighted that those taking part in the highest training intensities, as well as greatest durations, were found to have lower libido.<sup>38</sup>

### **Summary and recommendations**

Possibly due to the lack of robust randomised controlled trials, the latest Guidelines on Male Sexual Dysfunction from the European Association of Urology provide no recommendations for physical activity as a potential method for treating male sexual dysfunction.<sup>1</sup> Although the evidence around the utility of physical activity to improve male sexual function is growing, there is a need for more robust experimental study designs, using sufficiently powered sample sizes, to provide more confidence in the current evidence. In terms of physical activity prescription, there is a need to establish the types of physical activity (aerobic exercise like walking, running, cycling and swimming versus resistance training using bodyweight and free-weights versus practices such as yoga and tai chi), intensities (light versus moderate-vigorous) and times (understanding if there is a dose-response relationship) which might be most appropriate in this particular population.

In summary, although physical activity is not officially recommended, the almost universal benefits of physical activity, combined with their potential benefits for men's sexual health, we highly recommend physical activity as a therapeutic intervention for the prevention and management of male sexual dysfunction, and specifically erectile dysfunction, premature ejaculation, and low libido.

### **Declaration of interests**

All authors declare no conflict of interest.

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