

**EDITORIAL****Executive summary: Recreational football training as medicine**

We are very pleased to present the third supplement to the *Scandinavian Journal of Medicine and Science in Sports* fully dedicated to Football for Health. The two previous supplements were landmarks in establishing the scientific evidence for recreational football training as an effective strategy for the prevention and treatment of non-communicable diseases across the lifespan.<sup>1,2</sup> The current supplement focuses on recreational football training as a therapy. The six original investigations aim to tackle three main topics, including diabetes, cancer, and obesity/inactivity in children. Overall, the results are overwhelming and launch the platform for disseminating and implementing recreational football training as medicine.

The World Health Organization (WHO) projects that diabetes will be the 7th leading cause of death by 2030.<sup>3</sup> Prediabetes is an intermediate condition in the transition between normality and diabetes, characterized by impaired glucose tolerance and impaired fasting glycaemia. However, the progression to type 2 diabetes is not inevitable and recreational football training is a feasible, cost-saving strategy for the prevention and treatment of this condition.<sup>4,5</sup> Recreational football training combined with nutritional counseling promotes metabolic and cardiovascular health in patients with prediabetes (Skoradal et al<sup>6</sup>). Blood glucose, mean arterial pressure, and body fat were effectively reduced after 16 weeks of recreational football training twice per week in combination with a diet, whereas lean body mass and maximal oxygen consumption were enhanced. Similarly, the positive osteogenic effects of training should also be highlighted (Skoradal et al<sup>7</sup>). Sixteen weeks of twice weekly 30- to 60-min sessions improved lower-limb bone mineral density and leg bone mineral content, although whole-body bone mineral density and bone mineral content were unchanged over the 16-week intervention. Additionally, recreational football training markedly improved plasma osteocalcin, PINP, and CTX-1.

The positive effects of long-term recreational football in bone health were also examined in a group of patients with prostate cancer (Uth et al 2018<sup>8</sup>). The study resulted from a 5-year follow-up assessment of the original FC Prostate Randomized Controlled Trial, where patients with prostate cancer undergoing androgen deprivation therapy practised football for 12 weeks.<sup>9</sup> The first original results have been published in the 2nd supplement of the *Scandinavian Journal of Medicine and Science in Sports* dedicated to Football for

Health.<sup>10</sup> This current follow-up report showed that patients with prostate cancer can sustain recreational football training for the long-term.<sup>8</sup> Interestingly, the participants continued football training in a self-organized setting, with one-to-two sessions per week over 4.5 years. Body composition and physical fitness deteriorated over the 5-year period regardless of football training. However, the elderly men with prostate cancer, managed with androgen deprivation therapy, that continued football training over the 5 years preserved femoral neck bone mineral density.

The promotion of physical activity within schoolchildren is key for reducing the burden of non-communicable diseases, as articulated in the WHO's Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020.<sup>11</sup> The WHO highlights that children and adolescents should include daily physical activities that strengthen muscle and bone, at least three times per week, but 81% of school-going youths are still not active enough. We are therefore happy that the current supplement of the *Scandinavian Journal of Medicine and Science in Sports* includes three original investigations on the health effects of school-based football practice in school children.

It is now well established that football training is effective in improving health-related fitness parameters and self-esteem in overweight and obese children.<sup>12,13</sup> In fact, recreational football training, organized as small-sided games, elucidates high heart rates and a high number of intense actions.<sup>14</sup> Here, Cvetkovic et al (2018) compared the effects of 12 weeks of recreational football and standard high-intensity interval training, showing that both programs enhanced physical fitness in obese 11- to 13-year-old boys.<sup>15</sup> Both activities enhanced lean body mass and muscle mass by 3-4%, with a concomitant reduction of 6-7% in body fat. Also, diastolic blood pressure was reduced by 9-10% in both training programs. By contrast, the non-training control group, which were involved in mandatory school-based physical education classes, increased body mass, body mass index and fat mass over the 12-week period.<sup>15</sup>

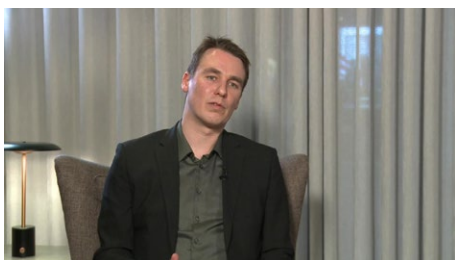
Larsen et al (2018) examined the cardiovascular adaptations of school-based physical training throughout the full school year (i.e. 10 months).<sup>16</sup> The study involved 291 8- to 10-year-old children from eight schools. The children were cluster-randomized by school in team-based ball games (including not only football, but also basketball and floorball), circuit strength training and a control group, which was

instructed to retain their normal curricular routines. Again, both standard training programs were effective in reducing diastolic blood pressure, interventricular septum thickness, left atrial volume index, and tricuspid annular plane systolic excursion, while no changes were detected in reactive hyperemia index regardless of training program over the 10-month period. Therefore, the authors concluded that intense physical exercise should be incorporated in standard school-based activities to elicit positive adaptations in cardiac structure and function in children.<sup>16</sup>

Over recent years, the Federation Internationale de Football Association (FIFA) has promoted a comprehensive standardized program using football-based exercises to educate children about health, hygiene, and contamination and to introduce regular physical activity in order for the children to gain from the benefits of football practice.<sup>17</sup> The FIFA 11 for Health initiative has gained cultural adaptations. Children from Africa and Latin America involved with the FIFA 11 for Health program improved their knowledge about health behaviors,<sup>17-20</sup> while the European version was adapted and first implemented in Denmark in a close collaboration with the research group of Professor Peter Krstrup and the Danish Football Association, with improved cardiovascular and metabolic health profile in children.<sup>21,22</sup> Here, Skoradal et al<sup>23</sup> present the results of a school-based intervention using the FIFA 11 for Health for Europe in a small-scale society in the Faroe Islands. The intervention comprised twice-weekly sessions of the FIFA 11 for Health during 11 weeks. The activities were included in the school curriculum of 10- to 12-year-old children, while the control group continued their standard school activities. Overall, the program was effective in improving systolic blood pressure, body composition, and postural balance and clearly reinforces how football can be used in educational contexts as a primary strategy for prevention of non-communicable diseases.

Thus, recreational football training in the broad sense of football as medicine can be promoted as a therapy. Football training is applicable across several health morbidities, impacting on both young and old and can be shown to affect multiple organs and systems, thereby demonstrating positive treatment outcomes.

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