**Opinion**

**Could sport be part of paediatric obesity prevention and treatment? Expert conclusions from the 28th European Childhood Obesity Group Congress**

Susanne Ring-Dimitriou a,b, Peter Krustrup c, Manuel J Coelho-E-Silva d, Jorge Mota e, Andera Seabra f, Carla Rego g, Artur Mazur h,b, Elpis Vlachopapadopoulou i,b, Margerita Caroli j,b, Marie-Laure Frelut k,b, Eva Erhardt l,b, Anders Forslund m,b, Ema Boyland n,b, Daniel Weghuber o,b, David Thivel p,b

a Department of Sport Science and Kinesiology, Paris Lodron-University, Salzburg 5020, Austria

b European Childhood Obesity Group (ECOG), Brussels 1000, Belgium,

c Department of Sports Science and Clinical Biomechanics, SDU Sport and Health Sciences Cluster (SHSC), University of Southern Denmark, Odense 5000, Denmark

d Faculty of Sport Sciences and Physical Education, University of Coimbra, Coimbra 3000, Portugal

e Research Centre in Physical Activity, Health and Leisure (CIAFEL), Faculty of Sport, University of Porto, Porto 4000, Portugal

f Research Centre in Physical Activity, Health and Leisure (CIAFEL), Faculty of Sport, University of Porto, Porto 4000, Portugal

g Hospital, Center for Research in Health Technologies and Information Systems (CINTESIS), Faculty of Medicine, University of Porto, Porto 4000, Portugal

h Pediatric Department, Clinical Provincial Hospital No. 2 in Rzeszów, Faculty of Medicine, University of Rzeszów, Rzeszów35-301, Poland

i Department of Endocrinology, Children's Hosp. P. & A. Kyriakou, 10431Athens, Greece

j Paediatric Department, Brindisi Hospital, Brindisi 72100, Italy

k Paediatric Practice, 16 rue de Septfonds 81000 Albi, France

l Department of Paediatrics, University of Pécs, Pécs 7600, Hungary

m Department of Women's and Children’s Health, Uppsala University, Uppsala 74192, Sweden

n Appetite & Obesity Research Group, Department of Psychological Sciences, University of Liverpool, Liverpool, L69 7ZA, UK;

o Department of Pediatrics, Obesity Research Unit, Paracelsus Medical University, Salzburg 5020, Austria

p Laboratory of the Metabolic Adaptations to Exercise under Physiological and Pathological Conditions, Auvergne Regional Center for Human Nutrition, Clermont Auvergne University, Clermont-Ferrand 63000, France

**Corresponding author:** David Thivel

Email: [David.thivel@uca.fr](mailto:David.thivel@uca.fr)

**Running head**: Sport and paediatric obesity

Received 19 December 2018; revised 23 December 2018; accepted 24 December 2019

**Highlights**

* Traditional sports might be considered as part of obesity treatments
* Traditional sports are interesting strategies for the prevention of paediatric overweight and obesity
* A fully adapted medical check-up is mandatory before considering the use of traditional sports for the treatment of paediatric obesity
* Making adaptations in the practice of traditional sports (duration, rules, dimensions of the field) offers possible opportunities for obesity treatment among children and adolescents.

***Introduction***

The prevalence of paediatric obesity continues to grow worldwide, bringing with it various metabolic, functional, social and psychological complications.1 Both prevention and treatment of childhood obesity must be based on multidisciplinary approaches combining nutrition, physical activity (PA) and psychological support.2 As an essential element of these multicomponent strategies, regular physical activity has been acknowledged as having beneficial effects on children’s and adolescents’ body composition, physical fitness and metabolic profile, as well as on their health-related quality of life, social and psychological health, and academic achievement.3,4 Given that only a relatively small proportion of children and adolescents meet the public health recommendations for physical activity,5 and given that weight-loss exercise-based interventions suffer from a high attrition rate, there is a clear need for appropriate PAs.

Traditional sports, including football, handball, gymnastics, athletics, and martial arts, are usually defined as specific and structured activities organized through rules and specific regulations under the control and administration of sports associations and federations. As part of the overall physical activity compendium, could these and other classical sporting activities provide a relevant alternative for the prevention and treatment of paediatric obesity? An entire session was dedicated to this question at the 28th European Childhood Obesity Group Congress (ECOG) held in Porto, Portugal, on 13-16 November 2018; and the session brought together international experts in the field. The present paper summarizes the initial conclusions of this expert panel and details the main considerations when it comes to recommending traditional sports for the prevention and/or treatment of paediatric overweight and obesity.

***Interests of traditional sports for the prevention of paediatric obesity.***

In 2012, a review published in *The* *Lancet* concluded that “sport may contribute to the health of nations”.6 Although the scientific evidence for this claim remains limited, especially in overweight children and adolescents, recent systematic reviews and meta-analyses have shown the beneficial effects of participation in classical sports on overall physical activity level, body composition and metabolic profile in children and youth.7-9 Interestingly, these analyses also point to a potential dose-response effect between the number of sports sessions per week and the quantified beneficial health outcomes.10 Importantly, sports participation favours a broad-spectrum of development for overall physical fitness, including cardiovascular, metabolic and musculoskeletal effects, along with motor skills and motor abilities that have been shown to predict overall physical activity level and health.9,11-13 It seems that intermittent sports that require whole-body activity and variable body motion should be encouraged because they mirror the natural movement patterns of children and youth. Furthermore, regular sports participation does not only seem to favour higher moderate-to-vigorous physical activity (MVPA) and cardio-metabolic fitness, but also appears to be associated with decreased sedentary time and improved eating habits.14,15 Recently, the *Journal of Sport and Health Science* dedicated an entire special issue aimed at discussing the beneficial health effects (as well as the limitations) of participating in traditional sports, particularly team sports.16 Based on the main conclusions arising from that body of work, promoting the engagement of children and adolescents in traditional sports appears to be of value from a prevention perspective.

***What about paediatric obesity treatment?***

Some of the interventional studies that have been conducted, mainly involving football training, have provided clear evidence that regular sports participation might be as effective as common physical activity interventions when it comes to improving body composition, decreasing metabolic complications or enhancing psychological profiles in children with obesity.8,17—19 Based on this evidence, our ECOG expert panel collectively recognized the potential of traditional sports as part of weight-loss interventions, but it also formulated some important recommendations.

First, as with any other kind of physical activity, a medical consultation regarding the child with obesity is recommended when a sport therapy is part of the clinical treatment. A paediatrician with expertise in sports medicine would be the best option for this consultation. This professional could provide the required insight into the cardiologic, pulmonary, psychomotor and orthopaedic profile, as well as the performance level of the child. Based on the child’s physical evaluation, the relevant elements of the sports program and exercise prescription could be adequately implemented and appropriate activities could be recommended. In the context of obesity treatment, it is important that the sport be viewed as a “classical exercise modality” that requires adaptations and modifications in accordance with the patient’s characteristics (degree of obesity, physical capacities, psychological profile, *etc*.) and the clinical objectives. For instance, the modifications and adaptations might concern the rules of the game, the duration of match-play, the dimensions of the playing field, the number of opponents and the overall physical loading of the specific activity.20,21 Here, team sports, such as football, handball, and basketball, are excellent options due to the essential characteristic “play”, and because of their potential for modulating the intensity of exercise interventions by increasing or decreasing the area of the playing field, the number of opponents, the length of play, player exchanges and the timing of playing sessions22,23. The aim is to make participation and engagement easy for the child with adiposity. Importantly, these adaptations and modifications of the characteristics of a sports discipline are the main ingredients for generating enjoyment, fun, self-efficacy and self-esteem, adherence and social integration. When it comes to severe obesity, our ECOG panel collectively recommends that classical sports should only be introduced as part of the exercise intervention after controlled and supervised improvement of the main physical capacities of the severely obese child, with particular attention being paid to the child’s orthopaedic and osteoarticular limitations. This practice would allow the child to engage properly and joyfully in such activities. Not only might this be a good way to improve adherence to exercise interventions, it might also encourage children and adolescents to continue exercising once a formal (possibly supervised) intervention period ends, thereby limiting the weight regain often observed following weight loss. Children and adolescents need to be accompanied, encouraged and supervised in this process to ensure the integration and success of the intervention.

Medical monitoring, individualization, progression, adaptation and integration are the main keywords that must be considered when integrating classical sports into paediatric obesity treatments. Collectively, our ECOG panel calls for more well-controlled and properly designed studies that further explore the specific impact of classical sports on a patient’s profile and that identify the combined benefits of multi-sport interventions in the treatment and prevention of paediatric obesity. Incorporating classical sport as part of anti-obesity strategies in children and adolescents calls for more specific training and education of the professionals supervising these sport activities and exercise sessions.

**Authors' contributions**

SRD, PK and DT wrote the main draft of the paper. All other authors equally reviewed and edited the paper. All authors have read and approved the final version of the manuscript, and agree with the order of presentation of the authors.

**Competing interests**

The authors declare that they have no competing interests.

**References**

1. Rendo-Urteaga T, Ferreira de Moraes AC, Sadalla Collese T, Manios Y, Hagströmer M, Sjöström M, et al. The combined effect of physical activity and sedentary behaviors on a clustered cardio-metabolic risk score: the Helena study. *Int J Cardiol* 2015;**186:**186–95.

2. Watson A, Timperio A, Brown H, Best K, Hesketh KD. Effect of classroom-based physical activity interventions on academic and physical activity outcomes: a systematic review and meta-analysis. *Int J Behav Nutr Phy* 2017;**14**:114.

3. Jones RA, Okely AD, Caputi P, Cliff DP. Perceived and actual competence among overweight and non-overweight children. *J Sci Med Sport* 2010;**13**:589-96.

4. Vasconcellos F, Seabra A, Katzmarzyk PT, Kraemer-Aguiar LG, Bouskela E, Farinatti P. Physical activity in overweight and obese adolescents: systematic review of the effects on physical fitness components and cardiovascular risk factors. *Sports Med* 2014;**44**:1139-52.

5. Ellis YG, Cliff DP, Janssen X, Jones RA, Reilly JJ, Okely AD. Sedentary time, physical activity and compliance with IOM recommendations in young children at childcare. *Prev Med Rep* 2017;**7**:221-26.

6. Khan KM, Thompson AM, Blair SN, Sallis JF, Powell KE, Bull FC, et al. Sport and exercise as contributors to the health of nations. *The* *Lancet* 2012;**380**:59–64.

7. Milanović Z, Pantelić S, Čović N, Sporiš G, Krustrup P. Is recreational soccer effective for improving VO2max: A systematic review and meta-analysis. *Sports Med* 2015;**45**:1339-53.

8. Bangsbo J, Krustrup P, Duda J, Hillman C, Andersen LB, Weiss M, et al. The Copenhagen Consensus Conference 2016: children, youth, and physical activity in schools and during leisure time. *Br J Sports Med*  2016; **50**:1177–8.

9. Milanović Z, Pantelić S, Čović N, Sporiš G, Mohr M, Krustrup P. Broad-spectrum physical fitness benefits of recreational football: a systematic review and meta-analysis. Br J Sports Med 2018; pii: bjsports-2017-097885. doi: 10.1136/bjsports-2017-097885.

10. Larsen MN, Nielsen CM, Helge EW, Madsen M, Manniche V, Hansen L, et al. [Positive effects on bone mineralisation and muscular fitness after 10 months of intense school-based physical training for children aged 8-10 years: the FIT FIRST randomised controlled trial.](https://www.ncbi.nlm.nih.gov/pubmed/27297443) *Br J Sports Med* 2018;**52**:254-60.

11. Barnett LM, van Beurden E, Morgan PJ, Brooks LO, Beard JR. Childhood motor skill proficiency as a predictor of adolescent physical activity. *J Adolesc Health* 2009;**44**:252-9.

12. Minck MR, Ruiter LM, Van Mechelen W, Kemper HC, Twisk JW. Physical fitness, body fatness, and physical activity: The Amsterdam Growth and Health Study. *Am J Hum Biol* 2000;**12**:593-9.

13. Williams HG, Pfeiffer KA, Dowda M, Jeter C, Jones S, Pate RR. A field-based testing protocol for assessing gross motor skills in preschool children: the CHAMPS motor skills protocol (CMSP). *Meas Phys Educ Exerc Sci* 2009;**13**:151-65.

14. Grgic J, Dumuid D, Bengoechea EG, Shrestha N, Bauman A, Olds T, et al. Health outcomes associated with reallocations of time between sleep, sedentary behaviour, and physical activity: a systematic scoping review of isotemporal substitution studies. *Int J Behav Nutr Phys Act* 2018;**15**:69. doi: 10.1186/s12966-018-0691-3.

15. Vella SA, Cliff DP, Okely AD, Scully ML, Morley BC. Associations between sports participation, adiposity and obesity-related health behaviors in Australian adolescents. *Int J Behav Nutr Phys Act* 2013;**10**:113.

16. Castagna C, de Sousa M, Krustrup P, Kirkendall DT. Recreational team sports: the motivational medicine. *J Sport Health Sci* 2018;**7**:129-31

17. Hansen PR, Andersen LJ, Rebelo AN, Brito J, Hornstrup T, Schmidt JF, et al. Cardiovascular effects of 3 months of football training in overweight children examined by comprehensive echocardiography: a pilot study. *J Sports Sci* 2013; **31**:1432-40.

18. Krustrup P, Hansen PR, Nielsen CM, Larsen MN, Randers MB, Manniche V, et al. Cardiovascular adaptations to a 10-wk small-sided school football intervention for 9-10-year-old children. *Scand J Med Sci Sports* 2014;**24**(Suppl.1):S4-9.

19. Seabra A, Katzmarzyk P, Carvalho MJ, Seabra A, Coelho-E-Silva M, Abreu S, et al. Effects of 6-month soccer and traditional physical activity programmes on body composition, cardiometabolic risk factors, inflammatory, oxidative stress markers and cardiorespiratory fitness in obese boys. *J Sports Sci* 2016;**34:**,1822-9.

20. Randers MB, Nybo L, Petersen J, Nielsen JJ, Christiansen L, Bendiksen M, et al. Activity profile and physiological response to football training for untrained males and females, elderly and youngsters: influence of the number of players. *Scand J Med Sci Sports* 2010;**20**(Suppl.1):S14-23.

21. Krustrup P, Helge EW, Hansen PR, Aagaard P, Hagman M, Randers MB, et al. Effects of recreational football on women's fitness and health: adaptations and mechanisms. *Eur J Appl Physiol* 2018;**118**:11-32.

22. Seabra A, Brito J, Oliveira J, Hansen PR, Krustrup P, Rebelo A, Seabra A. Effects of a 6-month soccer intervention program on psychological well-being and body composition of overweight boys. *Scand J Med Sci Sports* 2014;**24**(Suppl. 1):S10-16.

23. Krustrup P, Dvorak J, Bangsbo J. [Small-sided football in schools and leisure-time sport clubs improves physical fitness, health profile, well-being and learning in children.](https://www.ncbi.nlm.nih.gov/pubmed/27324872) *Br J Sports Med* 2016;**50**:1166-7.