

# ARTISTIC GYMNASTICS IMPROVES HEALTH-RELATED BIOMARKERS AT PRIMARY SCHOOL AGE



25<sup>th</sup> ANNIVERSARY CONGRESS

OCTOBER 28-30, 2020

STEFAN KOLIMECHKOV<sup>1</sup>  
LUBOMIR PETROV<sup>2</sup>  
ALBENA ALEXANDROVA<sup>2</sup>  
MONÈM JEMNI<sup>3</sup>

<sup>1</sup>STK Sport, United Kingdom

<sup>2</sup>National Sports Academy, Bulgaria

<sup>3</sup>University of Cambridge, United Kingdom

# AIM OF THE STUDY



The purpose of this study was to assess health-related biomarkers to physical fitness in young artistic gymnasts whilst estimating the benefits of regular gymnastics practice at primary school ages.



# METHODS

Participants:

**90 primary school children** from the UK

- **49 artistic gymnasts** (mean age = 9.5 years) from 5 gymnastics clubs within 3 different areas (London, Bexhill-On-Sea, and Basingstoke), and with > 2 years of sports experience in gymnastics;
- **Control group of 41 children** (mean age = 8.9 yrs.) from London. Those children were not seriously engaged in any sports, apart from their PE lessons.

## ALPHA-FIT TEST BATTERY



The Alpha-Fit test battery is one of the most widely applied and recommended tools for assessing the health-related physical fitness in children and adolescents

(ALPHA, 2009; Cvejic, Pejovic, & Ostojic, 2013; Kolimechkov, 2017; Ruiz et al., 2010; Santos & Mota, 2011).



# ALPHA-FIT TEST BATTERY

## Body Composition

Height, weight, waist circumference, triceps and subscapular skinfolds

## Motor fitness

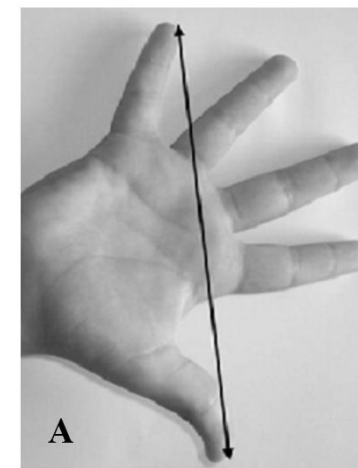
4x10 m shuttle run test

## Musculoskeletal fitness

Handgrip strength & standing long jump

## Cardiorespiratory fitness

20 m shuttle run test



# CARDIORESPIRATORY FITNESS

## BeepShuttle Junior software



The Software uses the original 1-minute protocol,



- duration (min)
- stage (number)
- shuttle (number)
- distance (m)
- speed (km/h)
- $\text{VO}_2\text{max}$  (ml/kg/min)
- percentile score (PRs)
- PRs assessment

# ANTHROPOMETRY

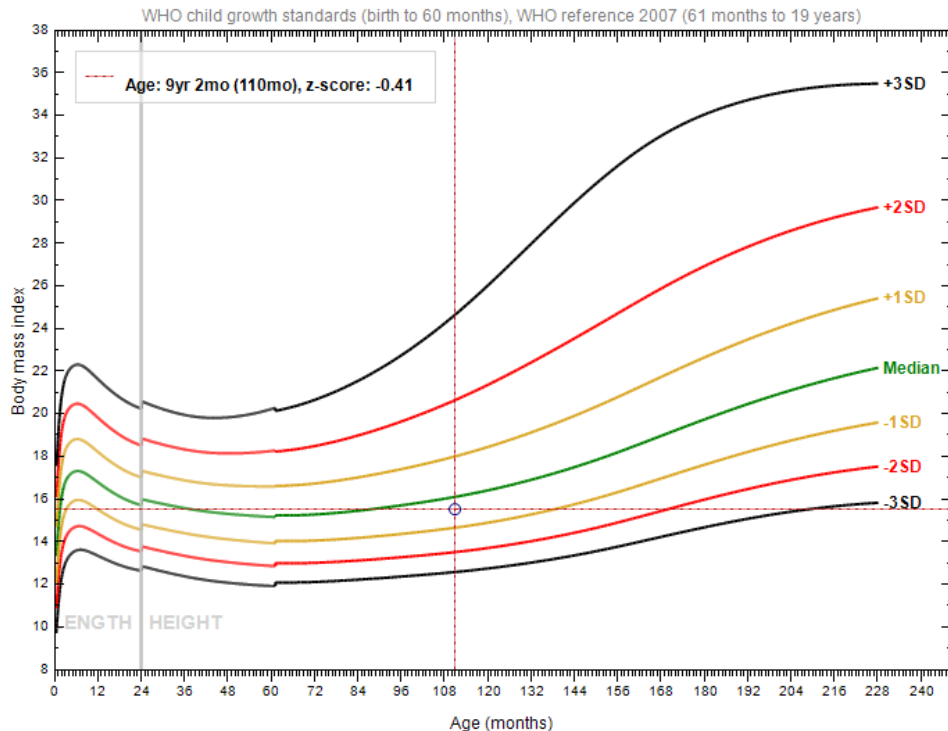
Upper Arm Muscle Area UAMA (cm<sup>2</sup>)

Relative UAMA (cm<sup>2</sup>/kg)

Waist-to-height ratio

BMI (kg/m<sup>2</sup>) and % Fat

Percentile scores



## STATISTICAL ANALYSES

The statistical analyses were conducted with SPSS Statistics 19 software, using test of normality, descriptive statistics, independent t-test and Mann-Whitney U test.

The data is presented as mean  $\pm$  SD.





# RESULTS & DISCUSSION

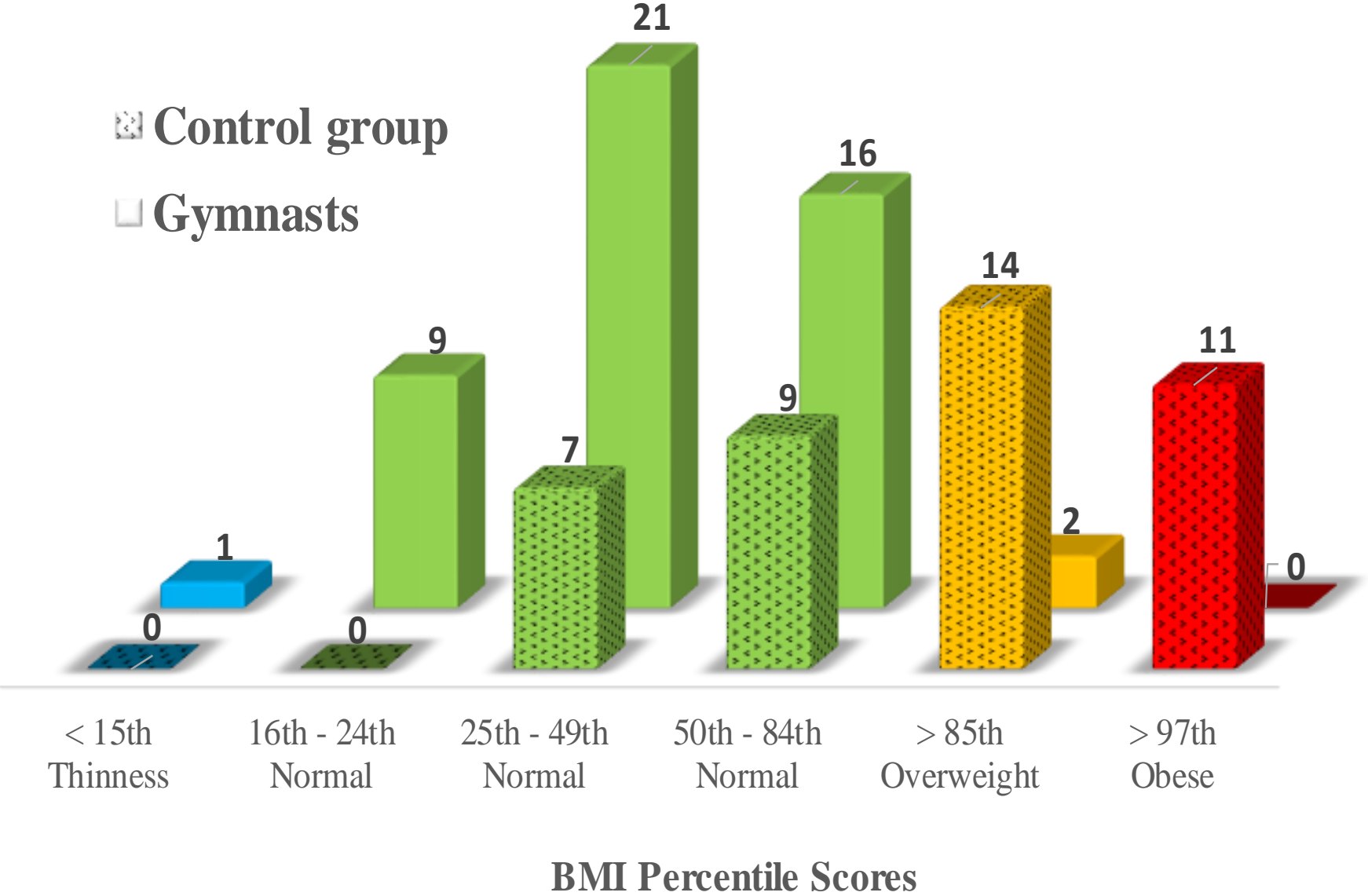
	Control group Females (n=23)	Female gymnasts (n=30)
Age (years)	9.03 ± 0.54	9.37 ± 1.35
Height (cm)	139.92 ± 9.07	130.60 ± 7.36 ***
percentile score	75.1 ± 30.76	28.9 ± 23.45 ***
Weight (kg)	37.81 ± 10.01	27.18 ± 4.61 ***
percentile score	80.9 ± 25.94	37.7 ± 22.81 ***
BMI (kg/cm <sup>2</sup> )	19.08 ± 3.51	15.83 ± 1.45 ***
percentile score	74.4 ± 26.37	39.2 ± 23.55 ***
Waist-to-height ratio	0.47 ± 0.06	0.41 ± 0.03 ***
Fat (%)	22.13 ± 5.99	13.21 ± 2.47 ***
percentile score	63.3 ± 33.98	12.0 ± 14.00 ***
UAMA (cm <sup>2</sup> )	27.18 ± 6.38	24.42 ± 4.42
Relative UAMA (cm <sup>2</sup> /kg)	0.73 ± 0.09	0.91 ± 0.12 ***

\*\*\*p<0.001 vs Control group Females

	Control group Males (n=18)	Male gymnasts (n=19)
Age (years)	8.79 ± 0.52	9.69 ± 1.49 †
Height (cm)	136.56 ± 6.96	133.26 ± 7.62
percentile score	73.1 ± 19.38	33.9 ± 18.60 †††
Weight (kg)	37.09 ± 6.86	28.88 ± 4.39 †††
percentile score	88.6 ± 14.45	41.0 ± 19.97 †††
BMI (kg/cm <sup>2</sup> )	19.83 ± 2.97	16.17 ± 1.02 †††
percentile score	86.9 ± 17.63	43.4 ± 21.26 †††
Waist-to-height ratio	0.49 ± 0.05	0.42 ± 0.04 †††
Fat (%)	23.72 ± 8.63	10.69 ± 2.85 †††
percentile score	82.8 ± 23.29	23.0 ± 20.20 †††
UAMA (cm <sup>2</sup> )	27.12 ± 5.41	25.95 ± 3.85
Relative UAMA (cm <sup>2</sup> /kg)	0.77 ± 0.17	0.91 ± 0.08 ††

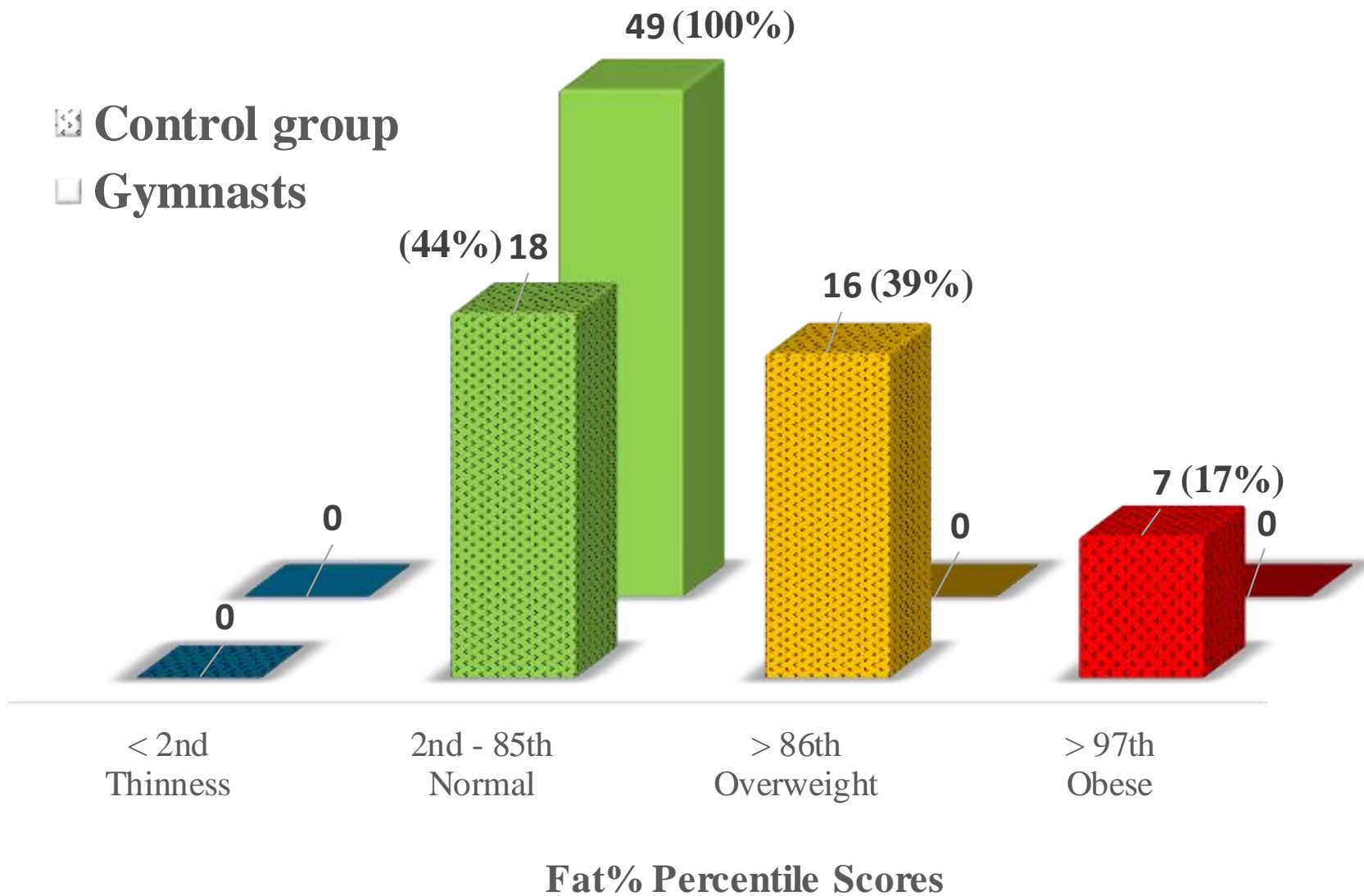
†p<0.05 vs Control group Males; ††p<0.01 vs Control group Males;  
†††<0.001 vs Control group Males

# BODY MASS INDEX ASSESSMENT



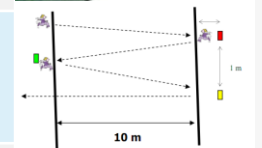
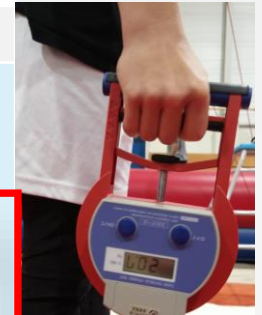


# FAT% ASSESSMENT



# HEALTH-RELATED PHYSICAL FITNESS

	Control group Females (n=23)	Female gymnasts (n=30)	Control group Males (n=18)	Male gymnasts (n=19)
<b>Musculoskeletal Fitness: Upper body strength</b>				
Handgrip strength (kg)	<b>16.45</b> ± 4.13	<b>14.18</b> ± 2.97	<b>15.42</b> ± 2.90	<b>16.91</b> ± 3.44
percentile score	75.8 ± 26.44	54.1 ± 29.24 **	66.4 ± 24.34	58.6 ± 18.62
Relative handgrip strength (kg/kg body weight)	<b>0.45</b> ± 0.11	<b>0.52</b> ± 0.07 **	<b>0.42</b> ± 0.08	<b>0.58</b> ± 0.08 †††
<b>Musculoskeletal Fitness: Lower body strength</b>				
Standing long jump (cm)	<b>123.48</b> ± 21.70	<b>154.61</b> ± 16.81 ***	<b>124.56</b> ± 23.04	<b>176.78</b> ± 22.44 †††
percentile score	55.6 ± 31.00	92.3 ± 11.65 ***	45.7 ± 30.28	96.2 ± 4.36 †††
<b>Motor Fitness</b>				
4x10 m shuttle test (sec)	<b>13.88</b> ± 1.25	<b>11.97</b> ± 0.71 ***	<b>13.36</b> ± 1.08	<b>11.18</b> ± 0.89 †††
percentile score	52.4 ± 28.04	91.0 ± 10.31 ***	49.4 ± 25.25	92.4 ± 6.09 †††
<b>Cardiorespiratory Fitness</b>				
VO <sub>2</sub> max (ml/kg/min)	<b>45.88</b> ± 2.08	<b>52.06</b> ± 4.17 ***	<b>46.36</b> ± 2.67	<b>53.98</b> ± 3.93 †††
percentile score	54.1 ± 22.34	89.3 ± 17.08 ***	43.13 ± 21.56	88.63 ± 15.89 †††



\*\*p<0.01 vs Control group Females; \*\*\*p<0.001 vs Control group Females

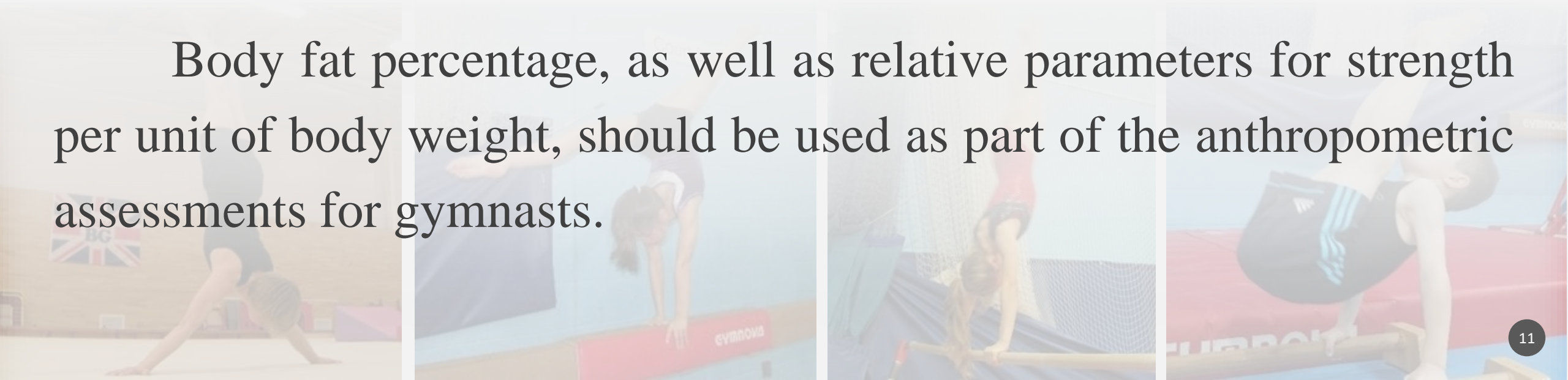
†††<0.001 vs Control group Males

# CONCLUSIONS



**Gymnastics** training in childhood, contributes to maintaining a normal mass, and thereby sustaining a normal health status. Practising artistic gymnastics **has a positive impact on the health-related biomarkers** of children's physical fitness.

Body fat percentage, as well as relative parameters for strength per unit of body weight, should be used as part of the anthropometric assessments for gymnasts.







# THANK YOU



**Stefan Kolimechkov PhD**



**@kolimechkov**



**www.stk-sport.co.uk**



**dr.stefan.kolimechkov@gmail.com**

