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ORIGINAL ARTICLE
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The impact of the COVID-19 pandemic on functional capacity in a population of young athletes: should we expect long-time consequences?

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ABSTRACT

BACKGROUND: From 2020, most countries all over the world have implemented strategies aimed at limiting contagion of COVID-19. The pandemic caused a reduction in physical activity (PA) and sports at all levels. The aim of the present study was to analyze and quantify the related impact of imposed PA restrictions on functional capacity in young athletes.

METHODS: This observational cohort study evaluated annually the exercise capacity of a sample of young athletes (N.=344) referred for the pre-participation screening at our Sports and Exercise Medicine Division (2017-2021). Standardized maximal exercise testing was performed on treadmill and linear mixed models analyzed metabolic equivalent of tasks (METs) and exercise time as dependent variables.

RESULTS: METs and exercise time showed a reduction in the year 2020 and a subsequent increase in 2021, with males revealing a faster recovery in exercise capacity. Athletes who maintained >250 annual training hours were less affected by the pandemic.

CONCLUSIONS: These data suggest a significant impact of forced physical inactivity on a cohort of apparently healthy young athletes. The COVID-19-related experience should lead to strategies to avoid negative effects and long-term consequences of containment measures.

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KEY WORDS: Exercise tolerance; SARS-CoV-2; Sedentary behavior.

March 2022 was the second anniversary of the COVID-19 pandemic declared by the WHO: it caused catastrophic effects from a both clinical and economical point of view, overwhelming many healthcare systems. From March 2020 most countries all over the world have implemented strategies aimed at limiting contagion, such as suspending sports events, stopping group training and restricting the practice of physical activity (PA) in certain settings.[1, 2] Despite the necessary containment measures, these decisions may have imposed potential clinical repercussions. The cancellation of in-person school and sports activities was associated with a decrease in PA with subsequent physical and mental health consequences among young subjects.[3]

Many research activities investigated the possible cardiac complications of a SARS-CoV-2 infection and how to ensure a safe return to play in young competitive athletes.[4, 5] However, less attention was given to the indirect impact that the pandemic caused even to those who were not affected by COVID-19 but had to cope with a radical change in their PA and exercise habits.[6]

Regular PA promotes general health, prevents obesity and several other non-communicable diseases.[7] It is recommended that children and adolescents reach a daily minimum of 60 minutes of moderate to vigorous PA and limit sedentary recreational screen time to 2 hours maximum;[8-10] however, these guidelines are often not followed.[8, 9] The introduction of strict quarantine restrictions in many countries initiated a direction in scientific literature to study the behavioral characteristics of children and adolescents during the social isolation at the population level,[10] but only few studies highlighted the impact of COVID-19 pandemic on functional capacity in young athletes.[11, 12] Some of these studies described a reduction in estimated cardiorespiratory fitness through functional tests such as the 20-m shuttle run (Leger's Test), 6-minute endurance run test or by measuring sit-ups performance.[12-15] Only one study showed a reduction in directly measured maximal aerobic capacity of a small cohort of ten healthy children undergoing standardized cardiopulmonary exercise testing before and after COVID-19 restrinctions.[11] Overall, most studies have reported a significant decline in physical fitness of healthy children as a result of the COVID-19 pandemic and its associated restrictions. However, since objectively measured data are still lacking for a representative sample of young subjects and since none of these studies described a trend with consecutive and standardized annual monitoring, our study aims to analyze and quantify a possible pandemic-related impact of the forced PA restriction on functional capacity in a cohort of young athletes.

Materials and methods

Study setting

This is an observational cohort study, conducted according to RECORD/STROBE guidelines.[16, 17] A sample of young athletes referred for the annual sports medical pre-participation screening (PPS) at the Sports and Exercise Medicine Division of the University Hospital of Padova was used as representative study population. The selected cohort consisted of all subjects examined during 2020 presenting the following inclusion criteria: age <18 years, never being tested positive to COVID-19 and maximal exercise stress testing (EST) performed for at least 3 consecutive years. Therefore, EST data from 2017 to 2022 were analyzed. We decided to exclude COVID-19 positive athletes since this could have impaired their physical fitness.

Evaluation

The sport medicine PPS was organized into two parts: personal history and EST.

All the measurements were performed in a room with a standardized temperature (21° C), by the same trained examiner.

Firstly, age, gender, sports category and annual training hours of each athlete was recorded. Body weight was measured in underwear to the nearest 0.1 kg. Height was measured with a stadiometer to the nearest 0.5 cm. Both measurements were used to calculate Body Mass Index (BMI, kg/m^2).

Afterwards, each participant performed the maximal EST on a treadmill. The protocol consisted of a standardized incremental ramp protocol (Supplementary Digital Material 1: Supplementary Table I). Sitting torso-lead electrocardiogram was recorded at rest, during the exercise and during recovery using Cardioline Cube PC software (Cardioline US, San Diego, CA, USA). Heart rate (HR) was recorded both at rest and at peak exercise, providing both HR reserve and recovery data as well as percentages of maximum HR (calculated as 220 – age). Similarly, systolic (PAS) and diastolic (PAD) blood pressures were recorded at rest and at peak. All tests were conducted under the supervision of a sports and exercise medicine physician. Exercise capacity was evaluated by metabolic equivalents of task (METs) and exercise time. Criteria of exhaustion were a Borg rating of perceived exertion ≥18/20 associated with a maximal heart rate (HR) ≥85% of predicted.

Ethics

Before the visit, each parent of participants or their caregivers signed a written informed consent accepting medical procedures and data collection. All information was recorded anonymously. Moreover, the data collection form specifies that data should be used for scientific purposes, in aggregate form and maintaining the privacy of each specific subject. All procedures performed in studies were in accordance with the Helsinki declaration and its later amendments or comparable ethical standards.

Statistical analysis

Data are presented as median and interquartile range (IQR). Friedman test was performed for comparison between the continuous variables at different time points. Chi-squared (χ^2) test was used to analyze categorical data. Linear Mixed Models (LMMs) were provided considering the selected outcomes as dependent variables (METs and exercise time) and years as categorical variable. The effect of gender on repeated measurements over time was investigated by multiple LMMs, adjusting for BMI and age. The value of $P<0.05$ was considered statistically significant. All analyses were performed by an author not involved in data collection and were conducted using Stata Software v. 12 (StataCorp, College Station, TX, USA).

Results

Overall, 1519 subjects underwent PPS in 2020: after the application of inclusion and exclusion criteria, 344 athletes (184 males and 160 females) were enrolled for the present study. Baseline characteristic of study subjects are reported in Table I.

Height, weight, BMI, PAS and PAD physiologically increased over the years. Annual exercise training hours showed a modest but continuous growth from 2017 to 2019 (+19 h), a significant decline in 2020 (-78 h) and a following rebound in 2021 (+80 h). HR remained relatively stable in resting conditions and at peak exercise, reaching around 91% of maximal predicted HR in the 5 years analyzed.

LMMs revealed a significant decrease in METs and exercise time in the year 2020 and a subsequent increase in 2021, when adjusted for age and BMI (Figure 1) (Supplementary Digital Material 2: Supplementary Table II). This recovery appears to be more evident in the male gender.

TABLE I.—*Baseline characteristics.*

Parameter	2017 (N.=175)	2018 (N.=344)	2019 (N.=344)	2020 (N.=344)	2021 (N.=221)	P value over time
Age (years)						<0.001[a]
All	12.0 [11.0, 13.0]	13.0 [11.0, 14.0]	14.0 [12.6, 15.1]	15.2 [13.8, 16.6]	15.8 [14.0, 16.6]	
Male	12.0 [11.5; 13.0]	13.0 [12.0; 14.0]	14.1 [13.0; 15.6]	15.5 [14.3; 16.8]	16.0 [15.0; 17.0]	
Female	12.0 [10.8; 13.0]	12.0 [11.0; 14.0]	13.0 [12.0; 15.0]	14.9 [13.1; 16.2]	15.5 [13.6; 16.3]	
Gender						0.948[b]
Male	99 (56.6%)	184 (53.5%)	184 (53.5%)	184 (53.5%)	116 (52.5%)	
Female	76 (43.4%)	160 (46.5%)	160 (46.5%)	160 (46.5%)	105 (47.5%)	
Sports category (%)						0.72[b]
Skill	11 (3.2%)	20 (5.8%)	19 (5.5%)	20 (5.8%)	18 (5.2%)	
Power	26 (7.6%)	71 (20.6%)	73 (21.2%)	64 (18.6%)	40 (11.6%)	
Mixed	117 (34.0%)	202 (58.7%)	201 (58.4%)	206 (59.9%)	128 (37.2%)	
Endurance	17 (4.9%)	48 (14.0%)	47 (13.7%)	49 (14.2%)	32 (9.3%)	
Annual training hours (h)						<0.001[a]
All	270 [203, 270]	270 [203, 270]	270 [225, 338]	210 [158, 245]	240 [200, 360]	
Male	270 [203; 270]	270 [203; 270]	270 [203; 270]	193 [158; 210]	240 [180; 280]	
Female	270 [225; 360]	270 [270; 360]	270 [225; 360]	210 [158; 280]	315 [225; 405]	
BMI (kg/m²)						<0.001[a]
All	19.6 [17.6, 21.8]	19.5 [17.6, 22.0]	20.3 [18.2, 22.7]	21.0 [19.1, 23.1]	21.2 [19.5, 23.8]	
Male	19.3 [17.2; 21.8]	19.5 [17.8; 22.2]	20.2 [18.2; 23.0]	20.9 [18.9; 23.3]	21.5 [19.2; 24.1]	
Female	20.1 [18.1; 21.8]	19.5 [17.3; 21.7]	20.3 [18.1; 22.2]	21.1 [19.3; 23.0]	21.1 [19.7; 23.2]	
HR at rest (bpm)						<0.001[a]
All	71.0 [63.0, 81.5]	69.0 [62.0, 78.0]	69.0 [61.0, 76.0]	72.0 [64.0, 81.0]	71.0 [62.0, 82.0]	
Male	67.0 [61.5; 77.0]	67.5 [59.8; 76.0]	67.0 [59.8; 73.0]	70.0 [62.0; 77.3]	69.0 [60.8; 77.3]	
Female	75.0 [65.0; 84.0]	71.0 [64.0; 79.3]	71.0 [62.0; 78.3]	75.0 [66.8; 83.0]	75.0 [67.0; 84.0]	
HR at peak (bpm)						<0.001[a]
All	190 [184, 196]	190 [184, 196]	190 [184, 196]	190 [184, 193]	187 [184, 193]	
Male	190 [184; 193]	190 [184; 194]	190 [184; 196]	190 [181; 193]	187 [181; 193]	
Female	193 [187; 196]	190 [187; 196]	190 [185; 196]	190 [184; 196]	187 [184; 193]	
HR max (% of predicted)						0.313[a]
All	91.0 [88.0, 93.0]	91.0 [88.8, 93.0]	91.0 [89.0, 94.0]	91.0 [88.0, 94.0]	91.0 [89.0, 94.0]	
Male	90.0 [88.0; 93.0]	91.0 [88.0; 93.0]	91.0 [88.0; 94.0]	91.0 [88.0; 94.0]	91.0 [89.0; 95.0]	
Female	92.0 [89.0; 93.3]	91.0 [89.0; 93.0]	91.0 [89.0; 94.0]	91.0 [89.0; 94.0]	91.0 [89.0; 93.0]	
HR reserve (bpm)						<0.001[a]
All	119 [110, 126]	120 [114, 127]	122 [113, 128]	117 [110, 124]	116 [106, 126]	
Male	121 [113; 127]	122 [115; 128]	124 [116; 130]	118 [111; 125]	119 [109; 129]	
Female	118 [108; 124]	119 [112; 126]	118 [111; 126]	115 [108; 122]	112 [102; 123]	
HR recovery at 1st minute (bpm)						<0.001[a]
All	-52.0 [-66.5, -41.5]	-47.0 [-61.0, -39.0]	-45.0 [-56.0, -37.0]	-41.0 [-51.8, -33.0]	-37.0 [-47.8, -29.0]	
Male	-57.0 [-73.0; -46.0]	-50.0 [-66.0; -39.8]	-46.0 [-61.0; -39.0]	-42.0 [-53.0; -33.0]	-38.5 [-48.0; -30.0]	
Female	-47.5 [-59.0; -36.8]	-45.0 [-57.0; -39.0]	-44.5 [-53.0; -34.0]	-40.0 [-50.0; -31.0]	-34.5 [-46.0; -27.8]	

(To be continued)

TABLE I.—*Baseline characteristics (continues).*

Parameter	2017 (N.=175)	2018 (N.=344)	2019 (N.=344)	2020 (N.=344)	2021 (N.=221)	P value over time
PAS at rest (mmHg)						<0.001[a]
All	110 [100, 119]	105 [95.0, 112]	105 [95.0, 115]	110 [100, 120]	110 [100, 120]	
Male	112 [103; 122]	105 [95.0; 115]	110 [98.5; 120]	113 [105; 125]	110 [101; 125]	
Female	107 [98.8; 115]	100 [95.0; 110]	105 [95.0; 110]	105 [95.0; 115]	105 [100; 115]	
PAD at rest (mmHg)						<0.001[a]
All	62.0 [58.0, 67.0]	55.0 [50.0, 60.0]	50.0 [45.0, 60.0]	60.0 [50.0, 65.0]	55.0 [50.0, 65.0]	
Male	61.0 [57.0; 67.0]	55.0 [50.0; 60.0]	55.0 [45.0; 60.0]	60.0 [51.3; 65.0]	60.0 [55.0; 65.0]	
Female	62.5 [59.0; 67.3]	55.0 [50.0; 60.0]	50.0 [45.0; 55.0]	55.0 [50.0; 60.0]	55.0 [50.0; 60.0]	
PAS at peak exercise (mmHg)						<0.001[a]
All	150 [140, 160]	150 [140, 170]	150 [140, 170]	160 [150, 180]	165 [150, 180]	
Male	150 [140; 168]	160 [140; 170]	160 [150; 180]	170 [160; 180]	173 [160; 186]	
Female	140 [130; 160]	150 [140; 160]	150 [140; 160]	150 [145; 160]	160 [150; 170]	
PAD at peak exercise (mmHg)						<0.001[a]
All	40.0 [40.0, 50.0]	40.0 [40.0, 50.0]	50.0 [40.0, 50.0]	50.0 [40.0, 50.0]	50.0 [40.0, 60.0]	
Male	40.0 [40.0; 48.8]	40.0 [40.0; 50.0]	40.0 [40.0; 50.0]	40.0 [40.0; 50.0]	40.0 [40.0; 50.0]	
Female	40.0 [40.0; 50.0]	40.0 [40.0; 50.0]	50.0 [40.0; 50.0]	50.0 [40.0; 60.0]	50.0 [40.0; 60.0]	
Metabolic equivalent of tasks (METs)						<0.001[a]
All	16.3 [14.9, 17.2]	16.7 [15.1, 17.9]	17.0 [15.2, 18.9]	16.8 [14.9, 18.6]	16.9 [15.5, 19.5]	
Male	16.7 [15.1; 18.0]	17.1 [15.9; 19.1]	18.5 [16.8; 20.1]	18.1 [16.7; 19.8]	18.9 [16.9; 20.6]	
Female	15.6 [14.7; 16.8]	15.6 [14.4; 17.0]	15.8 [14.6; 17.0]	15.2 [14.2; 16.8]	15.9 [14.4; 16.9]	
Exercise time (s)						<0.001[a]
All	410 [391, 434]	419 [393, 447]	427 [395, 466]	422 [391, 459]	426 [400, 473]	
Male	414 [394; 441]	429 [406; 466];	458 [421; 482]	450 [418; 477]	466 [424; 499]	
Female	403 [390; 421]	400 [381; 426]	405 [384; 427]	397 [376; 421]	407 [381; 425]	

Data are presented as median and interquartile range.
BMI: Body Mass Index; HR: heart rate; PAS: systolic blood pressure; PAD: diastolic blood pressure.
[a] Friedman test was performed for comparison between the continuous variables at different time points; [b] chi-squared (χ^2) test was used to analyze categorical data.

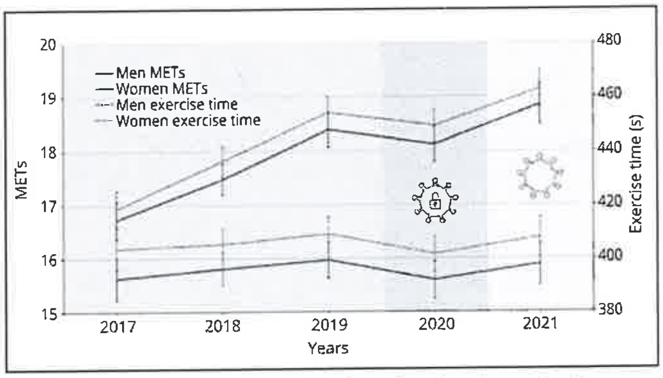

Figure 1.—The impact of COVID-19 on functional capacity in young athletes. Linear mixed models showed a significant decrease in metabolic equivalents of task (METs) and exercise time in the year 2020 and a subsequent improvement in 2021, consistently with the recovery of previous physical activity levels. METs and exercise time models with 95% confidence limits were adjusted for age and BMI of the young athletes. Male athletes showed a faster recovery of exercise capacity after resuming physical activity and exercise training when compared to female athletes.

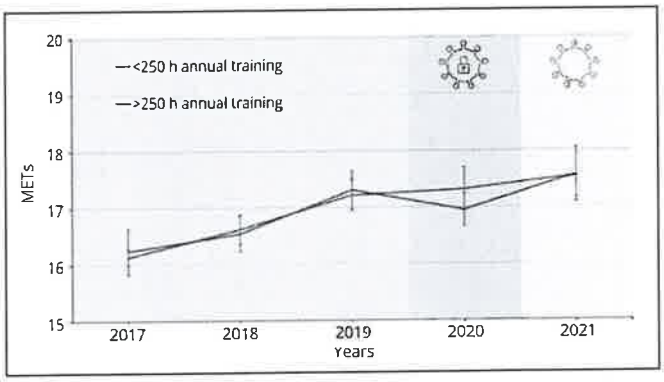

Figure 2.Influence of annual training hours on functional capacity during the COVID-19 pandemic. Linear mixed models showed a significant interaction between time (years) and annual training hours (cut-off 250 hours) in metabolic equivalents of task (METs) for the year 2020 (P=0.040).

Finally, a sub-analysis by training volumes was made using as a cut-off 250 hours/year, *i.e.* the average annual training hours of the 5 years monitored. Those who performed more than 250 training hours per year showed a more linear trend regarding their exercise capacity in 2020, which received a significant decline in the group of young athletes not reaching this training volume (interaction effect between 2020 and annual training hours: -0.362; 95% CI: [-0.708; -0.016], P=0.040). This difference was no longer significant in the year 2021 (Figure 2).

Discussion

Italy was the first country in the Western World suffering a huge impact by the COVID-19 pandemic and the first to implement large-scale anti-contagion policies after China.[18]

PPS for sports competitions is mandatory according to Italian law, which is based on yearly evaluations through EST.[19, 20] Therefore, Italy represents a unique opportunity to monitor and analyze the impact of imposed physical inactivity on a representative sample of young athletes. Moreover, serial yearly evaluations were performed with the same test setting, thus allowing to objectively measure the effects on maximal exercise capacity, a powerful predictor of mortality.[21]

During the monitored period of time, a regular physiological growth of anthropometric parameters was observed. Interestingly, functional capacity and exercise tolerance showed a significant decline in the first pandemic year with a noticeable but not complete recovery in 2021, even when adjusting for the physiological increase in age and BMI. Male athletes showed a faster recovery of functional capacity than their female counterparts, probably related to the later development process and the greater prevalence of mixed sports in the male gender, generally associated with higher exercise capacity. Indeed, a greater reduction in girls' functional capacity has already been described, particularly in girls under 14 years of age.[12] Athletes who continued to practice a substantial quantity of training hours experienced only a small impact on their functional capacity, while a reduction is evident in those who practiced a smaller annual training volume during 2020. Since this difference is only significant for 2020, the subpopulation who has completely stopped the training activity due to the pandemic might have had a significant impact. Furthermore, data suggest that it seems feasible to maintain functional capacity also during restrictive containment measures.

The role and the effect of the facial mask during exercise is still debated.[22, 23] However, most of the studies reported that the use of facial mask during exercise could affect exercise tolerance and cardiorespiratory fitness.[24-26] Our study has the advantage of removing most of these confounding factors because each subject can be compared with himself before and two years after the use of the same mask, in the same environmental conditions and with the same test protocol. Moreover, since both ESTs during the pandemic period had to be performed with the surgical mask, the reduction of functional capacity in the year 2020 can be mainly attributed to the lower level of PA practiced.[22, 27] These data strongly suggest a significant impact of forced physical inactivity on a cohort of apparently healthy young athletes.

Functional capacity has a high prognostic value in a wide variety of clinical conditions and PA represents a predictor of severity of COVID-19,[28] also showing enhanced vaccine-induced immunogenicity.[29] Evidence clearly shows that the pandemic induced a reduction in PA of the whole population[1, 2] and social isolation can further increase physical inactivity.[30] It is also known that even short-term inactivity has been associated with negative cardiovascular effects and increased cardiovascular risk factors, also in the young population.[30, 31] For all these reasons, it is necessary to learn from the COVID-19 pandemic and to think about strategies to avoid possible adverse effects and long-term consequences of forced physical inactivity.

The experience from this unpredictable pandemic could help policy makers to develop programs for the maintenance of functional capacity that can be implemented on a large scale but adapted to the individual needs and different settings, such as gyms.[32, 33] This is particularly important for the young people in which PA is demonstrated to improve strength, cardiorespiratory fitness, body composition, psychological well-being and cardiovascular risk factors until adulthood.[34]

Strength and limitations of the study

The study was conducted on a representative sample of young subjects and the setting represents a unique example of monitoring the exercise capacity in a cohort of young athletes for five consecutive years (two of which were during the pandemic) with maximal EST. Regarding the missing values for subjects enrolled in 2017 and 2021 no consideration was done because linear fixed model specifically allowed to deal with this issue. Moreover, we did not perform a cardiopulmonary exercise testing (CPET) that could have provided gold standard evaluations of maximal aerobic capacity: however, differently from published studies that used CPET,[11] we evaluated a larger cohort for a longer period in time with objective data on maximal exercise capacity.

Conclusions

Forced physical inactivity induced by the COVID-19 pandemic appears to have affected functional capacity of many young athletes. The long-term consequences of this event are difficult to predict and appear to depend on gender and physical activity level. This study evidences the insufficient level of preventive measures adopted during the pandemic and the need of intensification of health education strategies, in schools, *via* parental instruction and massive dissemination of healthy behaviors.

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SUPPLEMENTARY DIGITAL MATERIAL 1

Supplementary Table I.—Stages of maximal treadmill exercise testing used in the study.

Stage	Time (min)	Speed (km/h)	Incline
Stage 1	1	3,5	4.7%
Stage 2	1	3,5	9.5%
Stage 3	1	3,5	14.5%
Stage 4	1	5	15%
Stage 5	1	7,2	15%
Stage 6	1	9	15%
Stage 7	1	11	15%
Stage 8	Until exhaustion	11	15%

SUPPLEMENTARY DIGITAL MATERIAL 2

Supplementary Table II.—Linear mixed model. Linear mixed model with METs and exercise time (s) as the dependent variables. Data are presented as regression coefficients (estimates) with confidence interval (95%) and P value. Time period (years) was the categorical variable of the model. Tukey's method was used in *post-hoc* analyses.

	METs			**Exercise Time (s)**		
Predictors	*Estimates*	*CI 95%*	*P value*	*Estimates*	*CI 95%*	*P value*
(Intercept)	15.5688	(14.3953; 16.7423)	**<0.001**	400.22	(77.84; 422.59)	**<0.001**
Year (2017)	Reference			Reference		
Year (2018)	-0.00724	(-0.3629; 0.3484)	0.9681	-1.5418	(-8.4213; 5.3378)	0.6596
Year (2019)	-0.1682	(-0.5910; 0.2546)	0.4345	-4.0961	(-12.1777; 3.9855)	0.3195
Year (2020)	-0.8534	(-1.3203; -0.3565)	**0.0008**	-17.8123	(-27.3008; -8.3238)	**0.0003**
Year (2021)	-0.6957	(-1.2804; -0.110)	**0.0198**	-14.3885	(-25.4869; -3.2900)	**0.0112**
Gender (Male)	0.8711	(0.3771; 1.3652)	**0.0006**	11.0217	(15049; 20.5385)	**0.0233**
BMI	-0.2129	(-0.2609; -0.1650)	**<0.001**	-4.0361	(-4.9510; -3.1212)	**<0.001**
Age	0.3713	(0.2803; 0.4623)	**<0.001**	7.2027	(5.4728; 8.9326)	**<0.001**
2018 *Gender [Male]	0.5504	(0.08370; 1.0171)	**0.0209**	15.3279	(6.2908; 24.3651)	**0.0009**
2019 *Gender [Male]	1.2677	(0.7438; 1.7916)	**<0.001**	28.6142	(18.5929; 38.6356)	**<0.001**
2020 *Gender [Male]	1.3915	(0.8298; 1.9531)	**<0.001**	31.7412	(21.0024; 42.4801)	**<0.001**
2021 *Gender [Male]	1.8076	(1.1560; 2.4591)	**<0.001**	38.8596	(26.4810; 51.2383)	**<0.001**
Post-hoc analysis	**METs**			**Exercise Time (s)**		
	Estimates	*CI 95%*	*P value adjusted*	*Estimates*	*CI 95%*	*P value adjusted*
2019-2020	0.6233	(0.3305; 0.9162)	**<0001**	12.1527	(26.6331; 17.6722)	**<0.001**
2020-2021	-0.3657	(-0.6633; -0.0681)	0.0074	-6.9831	(-12;5812; -1.3849)	**0.0063**
2019-2020 in male	0.5615	(0.01272; 0.9957)	**0.0019**	10.5892	(2.24100; 18.7683)	**<0.0019**
2020-2021 in male	-0.5738	(-1.0377, -0.1099)	**0.0039**	-10.5423	(-19.2773; -1.8072)	**0.0056**
2019-2020 in female	0.6852	(0.2222, 1.1482)	**0.0002**	13.7162	(5.0065; 22.4259)	**0.0001**
2020-2021 in female	-0.1577	(-0.6497, 0.3344)	0.9909	-3.4239	(-12.6723; 5.8246)	0.9751

METs: metabolic equivalent of tasks; BMI: Body Mass Index.