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Physical activity and sedentary lifestyle: changes during confinement due to the COVID-19 pandemic according to age and non-communicable disease

Actividad física y sedentarismo: cambios durante el confinamiento por la pandemia COVID-19 según edad y enfermedades no transmisibles

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Abstract. Objective: To analyze the changes in physical activity (PA) and sedentary behavior during the COVID-19 pandemic, in the adult population according to age and non-communicable disease. Method. A cross-sectional study including n=1,334 subjects 18-55-year-old was carried out. The International Physical Activity Questionnaire (IPAQ-SF) was applied through an online survey to estimate the time (minutes/week) at each PA intensity and the total amount of METs/week before and during the COVID-19 confinement period. Results. The total METs/week [median (interquartile range, IQR)] decreased from 3657 (1977, 5466) to 1059 (396, 2225); sedentary behavior increased from 840 (0, 2100) to 2520 (1680, 4200) [p <0.001]. PA decrease was mainly observed in those with a previously active lifestyle (≥3000 METs/week). Age was negatively related to this change. Conclusion. During the confinement, PA decreased, and sedentary behavior increased, mainly in subjects physically active before the confinement who were younger and regardless of suffering from non-communicable diseases.
Keywords: guidelines physical activity, sedentary behavior, SARS-CoV-2, IPAQ.

Resumen. Objetivo: Analizar los cambios en la actividad física (AF) y comportamiento sedentario durante la pandemia de COVID-19, en población adulta de acuerdo con la edad y enfermedades no transmisibles. Método. Estudio transversal que incluyó n=1334 sujetos de 18-55 años de edad. El Cuestionario Internacional de Actividad Física (IPAQ-SF) se aplicó mediante una encuesta en línea para estimar el tiempo (minutos/semana) a cada intensidad de AF y el total de METs/semana antes y durante el periodo de confinamiento por COVID-19. Resultados. El total de METs/semana [mediana (rango intercuartílico, RIC)] disminuyó de 3657 (1977, 5466) a 1059 (396, 2225); el sedentarismo aumentó de 840 (0, 2100) a 2520 (1680, 4200) [p <0.001]. La disminución de la AF se observó principalmente en aquellos con un estilo de vida previamente activo (≥3000METs/semana). La edad se relacionó negativamente con dicho cambio. Conclusión. Durante el confinamiento, la AF disminuyó y el comportamiento sedentario aumentó, principalmente en sujetos físicamente activos antes del confinamiento más jóvenes e independientemente de padecer enfermedades no transmisibles.
Palabras clave: pautas de actividad física, sedentarismo, SARS-CoV-2, IPAQ.

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Introduction

During the Covid-19 pandemic, surveillance tracked the spread and evolution of the virus, enabling the rapid development of public health strategies, vaccines, and treatments. However, this progress would not have been possible without studies related to lifestyle changes. derived from the pandemic. Therefore, even though the COVID-19 pandemic has ended, there must be evidence of changes related to lifestyle especially in different ages and people with non-communicable diseases who were the most affected.

The severe acute respiratory syndrome, by the Coronavirus 2 (SARS-CoV-2), or COVID-19, is a respiratory viral disease that was first described in December 2020, in Wuhan, China (Gabutti et al., 2020). The World Health Organization (WHO) declared a pandemic in March, 2020. This virus has infected more than 15 million people in more than 200 countries which generated deaths of more than 7 million by July 2024 (WHO, 2024). The main prevention measures to face this virus were confinement, social distancing, and mobility restriction. While these strategies effectively decreased virus transmission (Bertuzzo et al., 2020; Chen et al., 2021), they led to lifestyle changes. Increasing home office work and screen time spent in front of the computer, television, cell phone, or other electronic devices increases sedentary behavior and decreases the time spent in physical activity (PA) and PA energy expenditure (Gasmi et al., 2020; Koohsari et al., 2021).

Literature related to respiratory viruses and exercise before the pandemic is scarce, that's why pre-COVID-19 studies related to respiratory diseases and viruses will be described. Concerning infants, scientific evidence shows that children diagnosed with asthma spend less time in PA compared to controls (Lang et al., 2004). However, studies such as Dimitrakak (Dimitrakaki et al., 2013) conclude that children with asthma do not differ in the intensity of PA compared to those who do not have the disease, as both groups engage in low to moderate PA without differences between them. Conversely, Kim, So and Kim (2012) assessed adolescents with asthma and found that those with this pathology engage in more than three hours of sedentary behavior compared to those without asthma.

The study by Martin et al., (2009) reports that the frequency of low and moderate-intensity physical exercise reduced the risk of mortality associated with H3N2 influenza

pandemic in 1968, a situation assessed in residents of Hong Kong. Additionally, more time dedicated to outdoor sports correlates negatively with the total number of weeks with upper respiratory tract infection. Matthews et al., (2002) found a 29% decrease in the incidence rate in people who engage in moderate and vigorous PA compared to those with lower levels of PA, as well as shorter periods of infectious episodes compared to sedentary controls.

Regarding chronic obstructive pulmonary disease, Parada et al., (2011) show that patients with this disease have lower lung function due to progressive dyspnea and secondary peripheral muscle compromise (like conditions in patients infected by Sars-Cov2) and are less physically active compared to control without the disease. Hernández-Martinez and Ochoa-Vigo suggest that the application of diaphragmatic breathing techniques, such as pursed lips, assisted coughing, vibrotherapy, and forced expiration, is necessary for these patients (Hernández-Martínez & Ochoa-Vigo, 2015). It has been observed that after participating in rehabilitation programs, significant improvements in aerobic capacity, as assessed by VO_2 were observed (Hernández-Martínez & Ochoa-Vigo, 2015).

Based on the previous studies, we can understand that PA is relevant to the health process related to respiratory diseases and that its practice helps in recovery, due to this, suggestions were made on how to do physical exercise at home due to confinement (Enriquez, 2020); nonetheless, physical inactivity is considered the fourth risk factor for mortality in the world. Six percent of deaths, 27% of the prevalence of diabetes, 30% of ischemic heart disease, and more than 20% of breast and colon cancers are attributed to physical inactivity (Jastreboff et al., 2019; Lin et al., 2018; Mctiernan et al., 2019; Mok et al., 2019. These comorbidities, as well as obesity, are associated with increased mortality from COVID-19. In the USA, 94% of patients who died from COVID-19 had a comorbidity (Centers for Disease Control and Prevention [CDC], 2020) and in Mexico, 66% of the patients who died from COVID-19 had obesity, diabetes, and/or hypertension (Pamplona, 2020). In addition, physical inactivity is associated with COVID-19 severity. A large study involving 48,440 patients in the U.S.A. showed that low PA increases the risk of hospitalization, admission to intensive care, and death (Sallis et al., 2021). Similarly results of a study involving 387,109 adults in the U.K. showed that those who were physically inactive had an increased risk of COVID-19 hospitalization (Hamer et al., 2020).

Given the multiple PA benefits, institutions such as the WHO, the American Heart Association, and the American Diabetes Association emphasize the importance of an active lifestyle (American Diabetes Association [ADA], 2021; American Heart Association, 2021; WHO, 2020). However, the confinement and the temporal closure of sport/exercise centers contributed to changes in PA patterns. The consequences of the confinement on PA have been reported in athletes and teachers (Hall-López et al., 2020). This information is useful for assessing the magnitude of the changes on lifestyle and for developing strategies aimed to promote an active lifestyle. Therefore, the objective of this study was to analyze the changes in PA and sedentary behavior during the COVID-19 pandemic, in the adult population according to age and non-communicable disease.

Methods

This cross-sectional study was registered and approved by the Institutional Scientific Committee from Faculty of Physical Culture Sciences (number 23022021-015). Procedures were in line with the ethical principles of research in humans according to the Declaration of Helsinki (Asociación Médica Mundial, 2014; Ley General de Salud, 2014).

The study included n=1334 subjects aged 18 to 55 years, residents of the state of Chihuahua, Mexico, who were recruited through social networks through the snowball method having a greater response through WhatsApp (67%) preventing two responses from being generated from the same account or the same device.

All subjects provided their consent who were informed based on the legal terms of age and mental capacity, informing about the right for information to be clear, sufficient, timely, and objective in relation to the questionnaire as well as the freedom of choice to participate before to participate in the present research. Before answering the survey questions, the informed consent of voluntary participation was presented in the online format. Then, the questionnaire was displayed only for those who accepted to participate. The data were collected from October 21 until November 6, 2020, which was the period with the greatest mobility restriction at the data collection site. We excluded those with incomplete or inconsistent data.

Information about sex, age, and the presence of a non-communicable disease (NCD) diagnosis was requested. There was no request for information that would reveal the subjects' identity. Age was reported as 18 to 24, 25 to 34, 35 to 44, and 45 to 55 years according others investigations (Castañeda-Babarro et al., 2020).

PA was assessed by the International Physical Activity Questionnaire, in short form (IPAQ-SF) translated to Spanish, which has been validated in many countries (Craig et al., 2003), including Mexican population, and reached moderated reliability (Bacelis-Rivero et al., 2020; Medina et al., 2013). Its use in national and regional context for monitoring the PA at population level has been recommended (Bauman et al., 2009; Medina et al., 2013).

The IPAQ-SF was configured in digital format through a Google online survey form, as in similar studies (Ács et al., 2020; Maugeri et al., 2020). It was distributed through social

networks such as Facebook ™ and WhatsApp ™ (Peloso et al., 2020). The IPAQ-SF was split into two parts, with the first section focused on PA practice before confinement and the second section based on PA practice during the last week of confinement.

PA was reported as a numerical variable based on the amount of time spent (minutes per week) on vigorous PA (VPA), moderate PA (MPA), walking, and sedentary behavior. Vigorous PA, MPA, and walking were multiplied by 8.0, 4.0, and 3.3 MET, respectively, to calculate the total MET/week. We generated two lifestyle categories: inactive <2999 MET/week and active ≥3000 MET/week according to ACSM's Guidelines (Gallè et al., 2020).

We formed categories of VPA as follows: < 75 min/week, 75 to 150 min/week, and ≥ 150 min/week; and for MPA, they were: < 150 min/week, 150 to 300 min/week, and ≥ 300 min/week, based on WHO PA recommendations (WHO, 2020).

Statistical analysis

An exploratory analysis was conducted to verify the distribution of the data. Numerical variables (VPA, MPA, walking, sedentary time, and total MET) are reported as median and interquartile range [IQR] (p-value of the Kolmogorov-Smirnov test <0.05).

The Wilcoxon's signed rank test was used to compare these measures before and after the confinement. The effect size was estimated according to $r = \frac{z}{\sqrt{n}}$, where a value of 0 to 0.3 was considered low, 0.3 to 0.5 medium, and greater than 0.5 was considered high (America Cancer Society, 2014). The percentage of change between before and during confinement was estimated as follows: (PA during confinement (min/week)-PA before confinement (min/week)) / (PA before confinement (min/week)) * 100. Changes in total MET (during - before confinement), between categories of dichotomic variables were compared by Wilcoxon's rank sum test, and those among the different age groups were compared with the Kruskal-Wallis test, followed by the Dunn's post hoc test, with Bonferroni's adjustment.

Furthermore, a general linear model was carried out to determine the main effects and interactions of fixed factors such as sex, NCD diagnosis, age group and physical activity classification before confinement on changes in total METs. In addition, age groups were treated like dummy variables in a linear regression model, with 18 to 24 years was the reference category.

Finally, McNemar's chi-square test was used to determine the differences in the frequency between the different groups of vigorous PA (<75 min/week, 75 to 150 min/week, and >150 min/week) and moderate PA (<150 min/week, 150 to 300 min/week and >300 min/week) before and during confinement. All tests were performed at a 95% confidence level.

Results

A total of n=1334 adults were included in the study and it can be seen that the time spent on moderate, vigorous, and walking activities decreased; and the time spent on moderate, vigorous, and walking activities decreased; and the sedentary time increased, during the confinement period, in the studied population (p<0.001) (Figure 1).

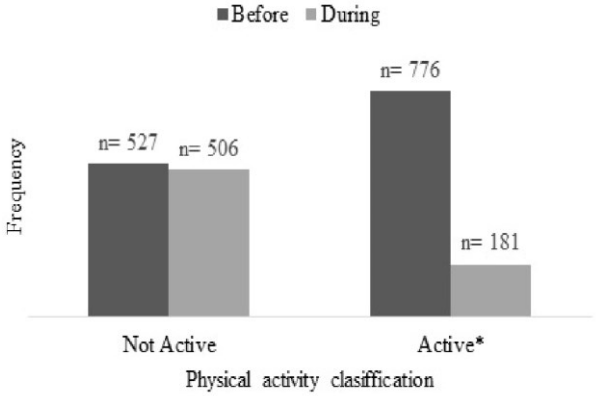

Figure 1. Participants who were classified as not active or active before the contingency and who remained in the same category during the confinement. *Statistically significant difference (Chi-square= 369.9, p<0.001).

The medians and IQR of the time spent on VPA, MPA, walking, and sedentary time, before and during the confinement period, among the different categories of grouping variables are shown in table 1. A decrease in total METs/week was observed mainly in active people (effect size = 0.84) and in the population aged 18 to 24 years (effect size = 0.80). Furthermore, sedentary time increased, mainly in people with NCDs (effect size = 0.80).

Table 2 shows the difference of medians and IQR of total MET per week before and during confinement. The group of 18 to 25 years of age had a greater decrease in MET/week than the group 35 to 44 years (p = 0.003). Participants who were active prior to the confinement decreased their METs per week more (3172.5 METs [IQR= -1897, -4492]) than people who were inactive (-802.0 METs [IQR=-145, -1520]) (p <0.001).

It also displays the number of participants classified as inactive before the confinement remained similar during the confinement (p = 0.514). Whereas a great proportion of participants with an active lifestyle was classified as inactive during the confinement (p < 0.001), according to the amount of MET per week. We evaluated the role of other variables (sex, age, NCD) in the total MET change of the active lifestyle group. Only age (years) was significant (beta = -27.8, 95%IC -41.8, -13.8) (table 2).

Table 1.
Physical activity before and during the COVID-19 confinement by sex, age group, NCD diagnosis, and PA classification.

Group	Before	During	Median	Effect
	Median (IQR)	Median (IQR)	change (%)	size *
Vigorous PA (min/week)				
Total	200 (60, 360)	0 (0, 120)	-100	-0.71
Sex				
Women	180 (30, 360)	0 (0, 90)	-100	-0.71
Men	250 (120, 450)	40 (0, 150)	-84	-0.71
Age group (years)				
18 to 24	240 (80, 450)	20 (0, 120)	-92	-0.73
25 to 34	200 (60, 360)	0 (0, 90)	-100	-0.70
35 to 44	180 (0, 300)	0 (0, 77.5)	-100	-0.66
45 to 55	150 (10, 300)	0 (0, 40)	-100	-0.69
NCD diagnosis				
No	240 (60, 360)	10 (0, 120)	-96	-0.72
Yes	180 (37, 360)	0 (0, 60)	-100	-0.70
Physical activity Classification before confinement				
Not active	60 (0, 120)	0 (0, 20)	-100	-0.55
Active	360 (240, 450)	60 (0, 150)	-83	-0.79
Moderated PA (min/week)				
Total	240 (120, 360)	70 (20, 160)	-71	-0.63
Sex				
Women	240 (120, 420)	80 (20, 200)	-67	-0.61
Men	225 (120, 357)	60 (20, 160)	-73	-0.65
Age group (years)				
18 – 24	200 (100, 350)	60 (20, 160)	-70	-0.66
25 – 34	270 (120, 420)	80 (20, 210)	-70	-0.60
35 – 44	240 (150, 420)	80 (20, 207)	-67	-0.51
45 – 55	250 (120, 450)	95 (20, 210)	-62	-0.61
NCD diagnosis				
No	240 (120, 360)	80 (20, 160)	-67	-0.62
Yes	240 (120, 375)	60 (20, 163)	-75	-0.66
Physical activity Classification before confinement				
Not active	120 (60, 200)	40 (0, 120)	-67	-0.56
Active	300 (200, 450)	100 (40, 210)	-67	-0.66
Walking (min/week)				
Total	150 (80, 280)	60 (5, 150)	-60	-0.54
Sex				
Women	150 (60, 250)	50 (0, 120)	-67	-0.56
Men	200 (100, 350)	85 (16, 195)	-58	-0.51
Age group (years)				
18 – 24	150 (80, 280)	60 (10, 150)	-60	-0.55
25 – 34	160 (60, 280)	40 (0, 140)	-75	-0.50
35 – 44	150 (80, 300)	70 (0, 160)	-53	-0.51
45 – 55	150 (65, 295)	75 (75, 140)	-50	-0.57
NCD diagnosis				
No	150 (75, 290)	60 (9, 150)	-60	-0.54
Yes	170 (90, 280)	60 (0, 160)	-65	-0.55
Physical activity classification before confinement				
Not active	90 (40, 150)	40 (0, 100)	-56	-0.45
Active	210 (120, 360)	80 (15, 180)	-62	-0.59
Sedentary time (min/week)				
Total	840 (0, 2100)	2520 (1680, 4200)	200	-0.78
Sex				
Women	840 (0, 2100)	2520 (1680, 4200)	200	-0.78
Men	840 (0, 2100)	2520 (1680, 4200)	200	-0.77
Age group (years)				
18 – 24	840 (0, 2100)	2520 (1680, 4200)	200	-0.79
25 – 34	420 (0, 1680)	2520 (1680, 3780)	500	-0.79
35 – 44	420 (0, 1680)	2520 (1260, 3780)	500	-0.73
45 - 55	840 (0, 1680)	2100 (1260, 3780)	150	-0.70
NCD diagnosis				
No	840 (0, 2100)	2520 (1680, 4200)	200	-0.77
Yes	840 (0, 2100)	2520 (1995, 4200)	200	-0.80
Physical activity Classification before confinement				
Not active	420 (0, 2100)	2520 (1680, 4200)	500	-0.78
Active	840 (0, 2100)	2520 (1680, 4200)	200	-0.78

Significance level in all comparisons between before and during the contingency <0.001, by Wilcoxon Signed-Rank Test. * Negative values represent a decrease, while positive values represent an increase.
IQR= Interquartile range; NCD = Non-communicable disease

Table 2.
Median and interquartile range of the total METs per week and difference between during and before the confinement

Group	Before	During	Change (%)	Effect size*	Difference Median (IQR)	p-value†
	Median (IQR)	Median (IQR)				
Total	3657 (1977, 5466)	1059 (396, 2225)	-71	-0.78	-1920 (-754, -3596)	--
Sex						
Women	3380 (1653, 5226)	975 (339, 1960)	-71	-0.77	-1873 (-580, -3550)	0.065
Men	3989 (2335, 5997)	1241 (480, 2587)	-69	-0.8	-2039 (-957, -3602)	
Age group (years)						
18 – 24[a]	3765 (1981, 5664)	1064 (400, 2029)	-72	-0.81	-2065 (-854, -3757)	0.005
25 – 34	3642 (2107, 5304)	1013 (343, 2401)	-72	-0.74	-1945 (-560, -3405)	
35 – 44[a]	3489 (1911, 5069)	1102 (419, 2799)	-68	-0.7	-1575 (-524, -3129)	
45 – 55	3046 (1770, 5226)	975 (373, 2060)	-68	-0.79	-1582 (-804, -3033)	
NCD diagnosis						
No	3705 (2053, 5469)	1080 (414, 2250)	-71	-0.79	-1924 (-772, -3598)	0.686
Yes	3254 (1614, 5466)	956 (320, 2055)	-71	-0.77	-1836 (-631, -3575)	
Physical activity classification before confinement						
Not active	1530 (798, 2350)	516 (193, 1013)	-66	-0.64	-802 (-145, -1520)	<0.001
Active	5085 (4019, 6453)	1722 (800, 2898)	-66	-0.84	-3172.5 (-1897, -4492)	

p<0.001 in all before vs. during the contingency by Wilcoxon Signed-Rank Test.
*Negative values represent a decrease, while positive values represent an increase.
†between categories. IQR= Interquartile range; NCD= Non-communicable disease.
Wilcoxon Rank Sum Test used, except for age group in which. Kruskal-Wallis test, followed by Dunn's test with Bonferroni adjustment was used. [a]p=0.003 vs group of 35-45 years or age.

In addition, general linear model was performed to determine the main effects of sex, NCD diagnosis, age group, and PA classification before confinement on changes in total METs per week during confinement, similar results were found. Where age group (18 to 24 years) and PA classification before confinement (active people) were associated (p<0.05) (Table 3).

Table 3.
Summary of general linear model considering differences in Met by week before and after confinement as response variable and sex, NCD diagnosis, age group and physical activity classification as predictor variables.

Variable	Square sum type III	df	Square mean	F	p value
Model	1866287393.8	6	311047899.0	117.8	<0.001
Intercep	1964300668.5	1	1964300668.5	744.0	<0.001
Sex	1304318.2	1	1304318.2	0.5	0.482
NCD diagnosis	4201833.4	1	4201833.4	1.6	0.207
Age group	62623904.5	3	20874634.8	7.9	<0.001
Physical activity Classification before confinement	1794391032.1	1	1794391032.1	679.7	<0.001
Error	3421642442.2	1296	2640156.2		
Total	11632514300.0	1303			
Total corrected	5287929836.0	1302			

R^2=0.353. Response variable= Differences in METs by week before and after confinement

Subsequently, a linear regression analysis was conducted with the age groups as dummy variables (18-24 years, as a reference group) and the changes in total METs per week during confinement as the response variable, finding a decrease of 330 METs/week respect to the group aged 25 to 34 years (beta coefficient of -0.061, p=0.008); and a decrease of 596 METs per week in comparison with the group aged 35 to 44 years (beta coefficient of -0.098, p <0.001). A similar analysis was performed for the variable of "physically active classification before the confinement", considering active people as reference group, finding a reduction of 2396 METs/week in comparison with no-active group (beta coefficient of 0.584, p<0.001). In addition, in those subjects aged 18 to 25 years and who were considered active, physical activity decreased 924 METs/week during confinement (p<0.001). Table 4 presents the linear regression summary with the dummy variables. These results indicated how the 18 to 24-year-old group and the physically active people before the confinement, were the ones who reduced their activity the most during confinement.

Table 4.
Decrease in Physical Activity During the COVID-19 Pandemic by Age Group and Physical Activity Classification.

	Unstandardised coefficients		Typified coefficients	t	p value
	B	Error	Beta		
Intercept	924.419	79.079		11.690	<0.001
Active before confinement	2396.361	91.845	0.584	26.091	<0.001
26-35 years	-330.004	123.896	-0.061	-2.664	0.008
36-45 years	-596.234	139.039	-0.098	-4.288	<0.001
>45 years	-183.972	169.326	-0.025	-1.086	0.277

Dependent variable: Differences in METs by week before and after confinement

Table 5.
Comparison of the proportion of physical activity categories before and during confinement.

Physical activity	Before		During		McNemar's chi-square value	p value
	n	%	n	%		
Vigorous						
<75 min/week	348	27	890	68	663.8	<0.001
75 - 150 min/week	179	14	209	16		
>150 min/week	776	60	204	16		
Moderate						
<150 min/week	410	31	903	69	471.9	<0.001
150 - 300 min/week	508	39	258	20		
>300 min/week	385	30	142	11		

p<0.001 Before and during confinement

When the participants who reported a diagnosis of NCD (n=242) were analyzed, it was observed that the 134 people classified as active before the confinement decreased their total METs per week more than the 108 people with NCDs classified as inactive ((-3425.5 METs, IQR -1894.5, -4519.5 vs -650.0 METs, IQR -85.0, -1490.0), during the confinement (p <0.001).

Finally, table 5 and 6 shows the frequency and prevalence of the different subgroups of moderate and vigorous PA before and during confinement. The number of subjects who performed more than 150 min/week of VPA before, decreased from 60% to 16% (p<0.001); and the proportion of participants who previously performed <75 min/week of VPA (i.e. below the recommendation) was 27%. This proportion increased to 68% (p<0.001) during the confinement, similar results were observed for MPA; the number of subjects who previously performed <150 min/week increased nsiderably during the confinement (31% vs. 69%, p<0.001).

Table 6.
Summary of general linear model considering differences in Met by week before and after confinement as response variable and sex, NCD diagnosis, age group and physical activity classification as predictor variables.

Variable	Square sum type III	df	Square mean	F	p value
Model	1866287393.8	6	311047899.0	117.8	<0.001
Intercep	1964300668.5	1	1964300668.5	744.0	<0.001
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Error	3421642442.2	1296	2640156.2		
Total	11632514300.0	1303			
Total corrected	5287929836.0	1302			

R^2=0.353
Response variable= Differences in METs by week before and after confinement

Discussion

The results show a decrease in self-reported PA during the confinement due to the COVID-19 pandemic. The time spent in vigorous and moderate-intensity activities decreased and sedentary activities increased. These changes were observed

in both sexes, across all assessed age groups, and in participants with or without NCD. However, those with a previous active lifestyle reported the greatest decrease in the total MET per week amount.

Several studies have described changes in PA during the COVID-19-related confinement or mobility restriction in many countries. Gallé et al., (2020) and Ács et al., (2020) observed an increase in sedentary time and a decrease in PA during the confinement, in young Italians, and in students of the University of Chile (Cartes et al., 2023). Similarly, Srivastav et al., (2021) reported a decrease in total PA and energy expenditure per week in Indian population, as well as in the Mexican and Colombian populations where they also found this behavior (Montoya et al., 2024) in Mexican children and adolescents like in adults (Enriquez del Castillo et al., 2022; Flores et al., 2021). In contrast, Romero-Blanco (2020) reported an increase in the frequency and time spent on moderate and vigorous PA during confinement in young Spaniards. The authors attributed this result to the training of students in PA sciences.

Usual PA influences PA during confinement; some studies have reported a reduction in the total MET per week from vigorous and moderate activities and walking time, mainly in those who were considered active before the confinement (Chuatrakoon et al., 2023; Maugeri et al., 2020; Mulasso et al., 2023). In Mexico, Alarcon-Meza et al., (2021) observed a decrease in energy expenditure in athletes. This is in line with our finding that those with an active lifestyle showed a greater decrease in PA energy expenditure (total MET/week) than those classified inactive, however, relative to their previous expenditure, the decrease was similar.

On the other hand, the increase of more than 200% in sedentary time during the confinement in all the groups studied stands out. Castañeda-Babarro et al., (2020), reported an increase in sedentary time of 23% in the Spanish population with medium effect size, while Ammar et al., (2020), found a 58% increase in sedentary lifestyle in a multicenter study. The increase in sedentary time may be related to home office, online learning, and the use of social media. However, the questionnaires that we applied did not include details on these activities.

The main prevention measures to face the new viral outbreak have been different among the countries. At the time of this survey, the duration of mobility restriction measures was seven months, with several restrictions such as closed sports spaces, gyms, and some parks or other areas where people practice some activities, such as training, walking, and running. This could has been a factor for the increase in the levels of sedentary lifestyle, as we applied the survey among October 21 and November 6, 2020, which was the period when the number of cases of COVID-19 was the highest in Chihuahua and preventive measures were reinforced (Gobierno del Estado de Chihuahua, 2020).

Another finding of this study was the increase in the proportion of people who did not reach PA recommendations of vigorous (<75 min/week) and moderate (<150 min/week) PA. We found a higher percentage of subjects considered inactive than that reported by Castañeda-Babarro et al. (2020) in a Spanish population and a meta-analysis that found this decrease in vigorous physical activity and sleep quality (Cui et al., 2023). While the duration of these patterns is currently unknown, it is important to establish campaigns to promote PA, as a protective factor for the development of non-transmissible chronic diseases, since as found by Rejeki et al., (2023), COVID-19 patients who previously engaged in moderate to vigorous physical activity demonstrated a lower risk of morbidity, hospitalization, and mortality compared to those who were less active, highlighting the importance of an active lifestyle despite the pandemic situation in which such activities are limited. Furthermore, in subjects with a predominantly sedentary lifestyle, the WHO recommends increasing physical activity above 150 -300 minutes per week of moderate-intensity or 75 to 150 minutes per week of vigorous-intensity PA (WHO, 2020).

In addition, people with NCD significantly decreased PA and increased sedentary time. This may further compromise their health and increase other potential risk factors (WHO, 2024). Thus, physical activity strategies in this population must be prioritized in public health campaigns and interventionist research.

One of the limitations of the present study was the retrospective design, relying on participants PA self-report. However, given the unexpected nature of the current pandemic, this strategy has been widely used to estimate the impact of confinement by COVID-19 on PA levels (Ruiz-Roso et al., 2020). The use of objective measurement devices such as accelerometers may provide more accurate PA and sedentary time estimation.

In conclusion, the present study observed an increase in sedentary lifestyle and decrease in the time spent on moderate and vigorous PA during confinement; Active participants before the confinement and those with diagnosis of NCDs were the ones who reduced their levels of PA the most. This may be transitory; however, further research is necessary.

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