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Comparison and migrations of physical activity during covid-19 confinement in Latin American
Comparación y migración de la actividad física durante el confinamiento por covid-19 en Latinoamérica

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Abstract. Purpose: The study aims to characterize the practice and migration of physical activity in active people during the COVID-19 pandemic. Design: Cross-sectional observational study of a Latin American survey. Setting: An online survey in Google Forms format was applied between June and July 2020 through social networks. The survey consisted of general characteristics, characteristics of confinement, and characteristics related to physical activity. Subjects: 2134 people participated (33.6% male, the mean age was 30.7 ± 9.2 years), 95.2% with higher education, 74% were normal weight, 60.8% in voluntary lockdown, and 39.2% mandatory lockdown. Results: Pre-pandemic men did 217.92 min/week, and women 199.78 min/week; post-pandemic men declined to 168.34 min/week, and women to 176.70 min/week. Men pre-pandemic, had a higher proportion of compliance the WHO recommendation (77.3% vs 64.9% p =0.001). Regarding, physical activity migrations, men decreased in outside activities, team sports and increase in home physical activity, in women decreased in outside activities, team sports and an increased in fitness classes, yoga and home physical activity. Finally, when associating compliance with physical activity during confinement, it is associated with being a woman and with long weeks of confinement. Conclusion: The physically active people, despite the confinements, remain like this in the four countries evaluated; only changes are observed in the type of physical activity and the frequency of weekly sessions, not affecting their physical condition levels according to self-report.
Keywords: Covid-19, Physical activity, exercise, confinement.

Resumen. Objetivo: Caracterizar la práctica y migración de actividad física (AF) en personas activas durante la pandemia de COVID-19. Diseño: Estudio observacional transversal de una encuesta latinoamericana. Escenario: Se aplicó una encuesta online en formato Google Forms entre junio a agosto de 2020 a través de las redes sociales. La encuesta consistió en características generales, del encierro y relacionadas con la AF. Sujetos: Participaron 2134 personas (33,6% hombres), edad media 30,7 ±9,2 años), 95,2% con educación superior, 74% normopeso, 60,8% confinamiento voluntario y 39,2% obligatorio. Resultados: Pre-pandemia hombres realizaban 217,92, y las mujeres 199,78 min/semana, post-pandemia los hombres bajaron a 168.34 y las mujeres a 176.70 min/semana. Los hombres pre pandemia tuvieron una mayor proporción de cumplimiento de la recomendación OMS (77,3% vs 69,4%, p = 0,001). Con respecto a las migraciones del tipo de AF en hombres se observó una reducción de actividades al aire libre, deportes de equipos y aumento de AF el hogar, en mujeres se observa una disminución de actividades al aire libre y deportes en equipos y un aumento en la práctica de clases de fitness, yoga y AF en el hogar. Finalmente, al asociar el cumplimiento de la AF durante el confinamiento esta se asocia a ser mujer y a mayores semanas de confinamiento. Conclusión: Las personas físicamente activas, durante el confinamiento, disminuyeron los minutos de AF, migran a actividades dentro del hogar, mientras que el cumplimiento de la AF se asocia con ser mujer y mayor número de semanas de cuarentena.
Palabras clave: Covid-19, actividad física, ejercicio, confinamiento.

Introduction

Towards the end of 2019, there was an outbreak of a virus unknown until that moment in Wuhan's city, and that would bring severe consequences for global health. In January 2020, the Centers for Disease Control and Prevention (CDC) isolated the virus and named it severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Lake, 2020). The World Health Organization (WHO), following best practices for naming new human infectious diseases, called the disease COVID-19, short for "coronavirus disease 2019" (Lake, 2020; World Health Organization, 2020a). On January 30, 2020, the WHO declared the COVID-19 outbreak a global health emergency (Singh et al., 2015). The countries implemented measures to contain the disease's spread including, confinements for long periods. This measure was applied in a diversified manner in Latin American countries, being voluntary or mandatory according to the epidemiological situation. Lockdown is associated with disruption of free movement and work routine and could lead to mood swings, such as anxiety or boredom. These emotional changes are associated with a greater energy intake

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(IASC, 2020; Moynihan et al., 2015); also, they can cause unwanted effects such as a decrease in physical activity, although these effects appear to be different according to sex and socioeconomic status (Crochemore-Silva et al., 2020).

The physiological benefits of moderate to vigorous physical activity (PA) are widely documented. More recently It has been suggested that the metabolic adaptations that PA promotes can positively modulate the immune system, constituting an important tool in reducing the risk of becoming severely ill with this virus (Leandro et al., 2020). However, there is a lack of empirical data to show that mandatory stay-at-home restrictions affect regular physical activity among physically active people. Although a decrease in physical activity has been seen in the general population, we do not know the empirical impact on physical activity levels of physically active citizens (Celis-Morales et al., 2020). Another study carried out on the Brazilian population showed that 24.4% of people reported having performed physical activity in their free time during the pandemic and 7.7% according to health recommendations. Approximately a quarter of the participants reported having performed physical activity without professional guidance, mainly at home. The highest levels of physical inactivity were seen in women and participants with lower schooling levels (Crochemore-Silva et al., 2020). On the other hand, 33% of sedentary people increased their physical activity levels, while 40.3% of physically active people increased their levels of physical activity (Lesser & Nienhuis, 2020). On the other hand, people who performed physical activity had lower anxiety (Morales-Beltrán et al., 2022).

Physical activity is essential, especially during the pandemic, for its role in preventing and treating chronic diseases and decreasing mortality (Warburton & Bredin, 2017). Its practice is also associated with improvements in mood and reduced symptoms of anxiety, anger, and depression (Lahart et al., 2019; Thompson Coon et al., 2011). Physical activity is of particular relevance in the context of a viral outbreak due to its ability to protect the body against the stresses of many diseases and optimize its immune function (Yan & Spaulding, 2020). Obesity, diabetes, and hypertension increase the risk of mortality from COVID-19 (Yu et al., 2020; Khorrami et al., 2020; Pietri et al., 2021). Therefore, it is necessary to promote physical activity in the general population to maintain body weight and reasonable control of chronic diseases, especially noticing that some benefits can be obtained with a minimal amount of physical activity increased (Jakicic et al., 2019).

In this sense, a proper evaluation of the practice of physical activity levels and its migrations is essential to evaluate the strategies that promote physical activity among physically active people between different conditions, during the COVID-19 crisis.

The study's objective is to characterize the practice and migration of physical activity in active people during the COVID-19 pandemic in Latin America.

Material and methods

Participants

A cross-sectional observational study online from a Latin American survey. 3254 participants answered the survey, 216 were excluded for not exercising, and 904 for not accomplishment of Physical activity recommendation, therefore 2,134 participants were included in the present study were as follows: over 18 years old, physically active, internet access, and living in Argentina, Chile, Colombia, Mexico, Bolivia, Brazil, Costa Rica, Ecuador, El Salvador, Guatemala, Panama, Paraguay, Peru, Puerto Rico, Dominican Republic, and Venezuela, among others, The countries have high internet penetration. (CEPAL 2021). In addition, these participants were under confinement (mandatory or voluntary). Physically active is defined as any person who performs at least 150 minutes of moderate to vigorous physical activity or its equivalent following the WHO recommendations was considered. Through informed consent, pregnant women and physically active people who, for health reasons (fracture or other), were not able to exercise during quarantines were excluded from the surveys.

Data collection

An online survey in Google Forms format was applied between June and July 2020 through social networks (Instagram and Facebook) and email voluntarily. Before its application, the survey was subjected to a content validation process through the Content Validity Index (CVI), through the calculation of Lawshe's Content Validity Ratio (RVC) (Lawshe, 1975), using its original model that fluctuates between 9 and 40 experts. The survey was formulated with a total of 24 items/questions. Lawshe's original acceptance criterion for 17 experts was equal to or greater than 0.45 in the RVC. All questions presented a minimum value of 0.55, leaving all questions within the questionnaire; only changes were made to the wording or order of the questions according to comments from the same reviewers. Each question was individually displayed on a single page. The approximate time to answer the survey (24 questions) was estimated at 7 minutes, and the questionnaire could only be answered once to avoid data duplication.

Data privacy and participation consent

During the informed consent process, survey participants were assured that all data would be used for research purposes only. The participants' responses were anonymous and confidential, following Google's privacy policy

(https://policies.google.com/privacy?hl=en). Participants were not allowed to provide their names or contact information. Also, participants could stop participating in the study and leave the questionnaire at any stage before the submission process; if they did, their answers would not be saved. Responses were kept only by clicking the "submit" button provided. Upon completing the survey, participants voluntarily and anonymously gave their consent. Participants at the beginning of the survey read the informed consent; they continued with the survey if they accepted. This study was developed following the Declaration of Helsinki and was approved by the Ethics Committee of the Pontificia Universidad Católica de Chile.

The survey consisted of:

Sociodemographic characteristics (age, sex, educational level, and country of residence).

Aspects of the Lockdown (mandatory or voluntary, and the number of weeks under Lockdown).

Characteristics related to the physical activity (frequency, intensity, duration, and migrations of physical activity practice).

For the calculation of physical activity minutes/week, the highest frequency range and the average number of minutes in self-reported physical activity duration were used. The WHO (World Health Organization, 2020) physical activity recommendations were used (whether people complied with 150 minutes or more of moderate physical activity or 75 minutes or more vigorous physical activity). Only the individuals who declared that they performed physical activity before and during the pandemic period were included (n = 1,032 [72.9%]).

Data analysis

Descriptive statistics were applied for data analysis. The quantitative data were expressed in mean and standard deviation (SD), the qualitative data in frequency and percentage (%); for the qualitative data analysis, the Chi-square or Fisher test was used. To investigate the association between minutes of exercise a week by sex, linear regression was used, meanwhile, for investigating the achievement of recommendation logistic regression was used, we coded 0 as failed and 1 as complies, All the analyses were adjusted by age, education, week lockdown, and country. For the statistical analysis, the statistical package STATA 16.0 was used, and a value of $p < 0.05$ was considered significant.

Results

Table 1 shows the general characteristics of the sample of 2,134 participants, who had their survey completed by June 30th, 2020, they were in lockdown when the survey was applied; 23.8% were male, mean age was 30.7 ± 9.2 years. Schooling was mostly higher education (complete or incomplete, exceeding 95%), with respect to self-reported nutritional status, most are concentrated on normal nutritional status. With respect to lockdown, most of them were in mandatory lockdown.

Table 1.
General characteristics of the sample by sex

	Male	Female	Total
n	507 (23.8%)	1627 (76.2%)	2134
Age	31.0 (9.13)	30.7 (9.22)	30.7 (9.20)
Sex			
Men	651 (39.5%)	124 (29.2%)	1021 (33.6%)
Women	997 (60.5%)	300 (70.8%)	2017 (66.4%)
Country			
Chile	312 (61.5%)	800 (49.2%)	1112 (52.1%)
Colombia	63 (12.4%)	309 (19.0%)	372 (17.4%)
Argentina	53 (10.5%)	120 (7.4%)	173 (8.1%)
Mexico	16 (3.2%)	166 (10.2%)	182 (8.5%)
Others	63 (12.4%)	232 (14.3%)	295 (13.8%)
Schooling			
High school/Secondary	28 (5.5%)	75 (4.6%)	103 (4.8%)
Higher education	479 (94.5%)	1552 (95.4%)	2031 (95.2%)
Nutritional Status			
Under weight	4 (0.8%)	37 (2.3%)	41 (1.9%)
Normal weight	366 (72.2%)	1217 (74.8%)	1583 (74.2%)
Overweight	129 (25.4%)	341 (21.0%)	470 (22.0%)
Obesity	8 (1.6%)	32 (2.0%)	40 (1.9%)
Lockdown			
Mandatory	220 (43.4%)	617 (37.9%)	837 (39.2%)
Voluntary	287 (56.6%)	1010 (62.1%)	1297 (60.8%)
Weeks in lockdown			
Less than a week	34 (6.7%)	83 (5.1%)	117 (5.5%)
1 a week	8 (1.6%)	9 (0.6%)	17 (0.8%)
2 a week	16 (3.2%)	20 (1.2%)	36 (1.7%)
3 a week	22 (4.3%)	26 (1.6%)	48 (2.2%)
4 a week	74 (14.6%)	142 (8.7%)	216 (10.1%)
5 or more times per week	353 (69.6%)	1347 (82.8%)	1700 (79.7%)

Data is presented as frequency and percentage.

Table 2 shows compliance with the WHO recommendations, when reviewing the duration of the pre-pandemic exercise, a significant difference ($p = 0.001$) is observed between sex, Pre pandemic men achieved a mean 217.92 minutes/week, meanwhile women 199.78. However, during pandemic, men had a lower mean of exercise per week compared women, however, there was no difference among sex.

When reviewing compliance with the WHO recommendations, pre-pandemic men had a higher proportion of complied with the recommendation (77.3% vs 69.4, $p = 0.001$). However, during pandemic women had a higher proportion to achieve the recommendation (50.3% vs. 57.8%, $p=0.009$) (Table 2).

Pre pandemic, in all countries, the people who comply with the recommendation predominate (71.3%), led by Colombia and lastly other countries, while during the pandemic, only 56.0% of the studied population complied with the recommendations, being Colombia, the one with the largest population that complied with the recommendation and Chile the country with the lowest compliance with the guidance (Table S1).

Table 2.
Compliance with the WHO physical activity recommendations pre-pandemic and during pandemic.

	Total	Male	Female	P value
Duration of exercise in pre-pandemic, minutes / week (mean (SD))	204.09 (84.13)	217.92 (81.46)	199.78 (84.51)	0.001*
Duration of exercise in pandemic, minutes / week (mean (SD))	174.71 (79.87)	168.34 (81.66)	176.70 (79.23)	0.094 *
Compliance with WHO pre-pandemic recommendation (%)				
Fails	613 (28.7)	115 (22.7)	498 (30.6)	0.001♣
Complies	1521 (71.3)	392 (77.3)	1129 (69.4)	
Compliance with WHO recommendation in pandemic (%)				
Fails	939 (44.0)	252 (49.7)	687 (42.2)	0.009♣
Complies	1195 (56.0)	255 (50.3)	940 (57.8)	

*Linear regression adjusted by age, education, week lockdown, and country ♣ logistic regression (1 complies recommendation), adjusted by age, education, week lockdown, and country

Table S1.
Compliance with the WHO physical activity recommendations pre-pandemic and during pandemic.

	Chile	**Colombia**	**Argentina**	**México**	**Other**	**Total**	**P value**
Duration of exercise in pre-pandemic, minutes / week (mean (SD))	195.02 (85.98)	243.37 (64.59)	200.85 (78.25)	206.21 (85.51)	189.36 (87.06)	204.09 (84.13)	<0.001
Duration of exercise in pandemic, minutes / week (mean (SD))	162.39 (79.67)	216.37 (69.96)	164.46 (75.63)	179.67 (78.34)	171.32 (78.27)	174.71 (79.87)	<0.001
Compliance with WHO pre-pandemic recommendation (%)							
Fails	364 (32.7)	35 (9.4)	49 (28.3)	55 (30.2)	110 (37.3)	613 (28.7)	<0.001
Complies	748 (67.3)	337 (90.6)	124 (71.7)	127 (69.8)	185 (62.7)	1521 (71.3)	
Compliance with WHO recommendation in pandemic (%)							
Fails	561 (50.4)	79 (21.2)	79 (45.7)	77 (42.3)	143 (48.5)	939 (44.0)	<0.001
Complies	551 (49.6)	293 (78.8)	94 (54.3)	105 (57.7)	152 (51.5)	1195 (56.0)	

chi-square

Figure 1 and 2 (men and women, respectively) shows migrations in the type of physical activity according to sex; men are A reduction in outdoor activities, and team sports, an increase in physical activity at home is observed, and an increase in people who stopped doing physical activity. In women, there is also a decrease in outdoor activities and team sports and an increase in the practice of fitness classes, yoga and physical activity at home.

Figure 1. Migrations in physical activity during the pandemic in men

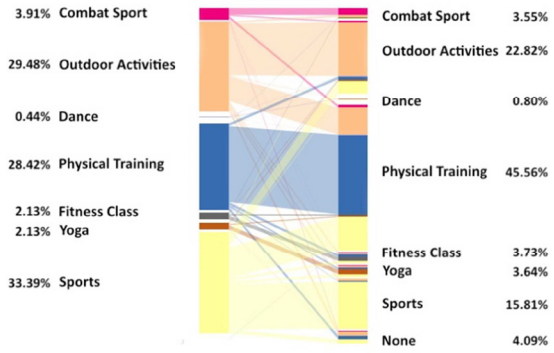
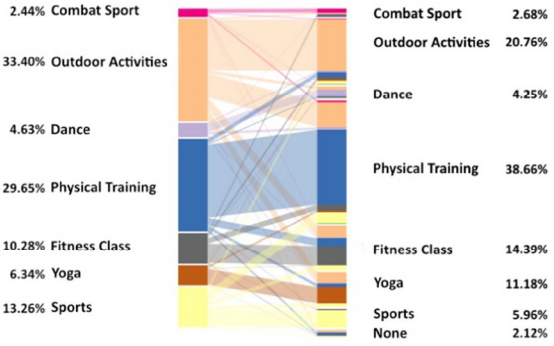


Figure 2. Migrations in physical activity during the pandemic in women



Finally in Table 3. When associating compliance with physical activity during confinement was done, being a woman (p = 0.009) and with long weeks (p = 0.003) of confinement was associated with compliance with physical activity recommendation.

Table 3.
Association compliance physical activity recommendation and factors studied.

Factor	OR 95% IC	P value
Country	1.01 (0.96; 1.08)	0.591
Sex (women vs men)	0.76 (0.62; 0.93)	0.009
Age	1.01 (0.85; 1.20)	0.887
Education	0.92 (0.61; 1.37)	0.690
Weeks in lookdown	1.10 (1.03; 1.18)	0.003

Data is present as Odds Ratio with their 95% confidence interval (CI) (1 complies recommendation), adjusted by age, sex, education, week lockdown, and country.

Discussion

The study's main result is that physically active people (before the pandemic). They reduced the time of physical activity and migrated to other activities, especially within the home; among the factors associated with maintaining physical activity is being a woman and being in confinement for a longer time.

In our study, physically active people reduced weekly physical activity levels (approx. -30 min, in men, this value reached -49.6 minutes and in women, -23 minutes). In addition, before the pandemic, 71.3% achieved the WHO recommendation of physical activity; however, during confinement, it only reached 56%, reduced by almost 20 percentage points. This drop-in PA level was more significant in men. A survey carried out on the five continents showed that in the general population, the home confinement of COVID-19 had had a negative effect, increasing physical inactivity levels, consequently causing an increase in daily

sitting time by more than 28% (Ammar et al., 2020). Some countries carried out initiatives such as Belgium that encouraged citizens to exercise at home (for example, yoga, dance, and bodyweight training was promoted) (Ammar et al., 2020; Hammami et al., 2020). In a study conducted in the same country among highly active people, 36% reported higher levels of physical activity than before quarantine, 41% reported having exercised the same as before the pandemic, and 23% reported having decreased their levels of physical activity. Approximately half of the physically active people (54%) considered that they had more time than before to exercise (6% less time, 36% as much time), and among the main obstacles to the practice of physical activity described by this group, were related to the closure of parks or public sports areas (50%), the closure of sports clubs and private venues (38%), cancellation of sporting events (32%) and the prohibition of social gatherings for sports practice (30%) (Constandt et al., 2020)

Among the significant results of our study, we found that the surveyed subjects made physical activity migrations due to confinement, managed to adapt to the new reality, and maintained a physically active lifestyle. Most of the subjects who practiced collective sports outdoors or in public or private venues (soccer, basketball, etc.) migrated from these activities to others that could be carried out at home, especially with the incorporation of resistance exercises. This is mainly due to mobility restrictions to the imposition of confinements. During this pandemic period, another variable that affects physical activity practice was the availability of implements. In our study, it is observed that migration was different depending on sex; in the case of men, a reduction in outdoor activities, team sports, and an increase in physical activity at home is observed, as well as an increase in people who stopped doing physical activity, while in women there was a decrease in outdoor activities and team sports and an increase in the practice of fitness classes, yoga and physical activity at home. However, it has been observed by others that physically active subjects have modified their training by using the available materials and exercising with body weight and with minimal equipment (Wewege et al., 2017). On the other hand, it is interesting to mention that the factors associated with the maintenance of physical activity in physically active people were women, probably because before the pandemic, they were the ones who least participated in outdoor group sports such as soccer, basketball, rugby, etc. and there were various alternatives.

As the weeks of confinement increased (>5 weeks), people who did not have the possibility of exercising outside looked for alternatives inside their homes to continue exercising; people in the first weeks of confinement likely evaluated the possibility of exercising indoors. Still, as the weeks went by, they decided to do physical activity and buy devices that would help them exercise in a better way. A study, carried out in young Mexican boxers, showed a tendency to maladaptive coping as a result of the changes derived from the pandemic (Zazueta-Beltrán et al., 2022).

A study on the general population showed that among those who exercised indoors, 53.9% performed physical activity in an indoor and outdoor patio; followed by 21.5% who said they used a room and corridor in their home; 8.4% used their living room and 16.2% other rooms in the home based on their activity. (AMUCH, 2022),

Strengths and Limitations

Among the study's strengths is that a validated questionnaire was used. We obtained a large sample of participants; in addition to our understanding, it is the first to be done in self-reported people who declare themselves physically active and describe migration in physical activity. A weakness of the study is that as the survey was sent through social networks, it could also be argued that the sample is not representative of the active population, considering that many individuals, especially people with less education lower-income, in these countries may not have access to the internet, in addition, an overrepresentation of women in the survey compared to men. However, we believe that this does not affect the interpretation of the results.

Conclusions

Physically active people, despite lockdown, remain active, but min/weeks decrease, affecting both sexes. Furthermore, despite the confinements, people managed to adapt to the new reality, migrating from physical activity practiced collectively in public or private settings to places of residence. Finally, compliance with physical activity is associated with being a woman and a greater number of weeks of quarantine.

Author contributions

Were responsible for study design, methodology, data analysis, and drafting, editing and review of manuscript. All authors have read and agreed to the published version of the manuscript.

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Conflicts of interest

The authors declare no conflict of interest.

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