

Factors associated with Internet searches for exercise during the COVID-19 pandemic in Brazil

Factores asociados a las búsquedas acerca del ejercicio físico en Internet durante la pandemia de COVID-19 en Brasil

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ABSTRACT

The aim of this study was investigated changes in online search patterns for exercise and the influence of social isolation and socioeconomic variables during the Covid-19 pandemic in Brazil. Google Trends was used to retrieve the search volume on the theme "Physical Exercise", in the category "fitness and beauty", during two periods: the previous five years and from January 1, 2020 to May 16, 2020. The deadline was March 12. After this cutoff, the actual search volume and values predicted by exponential smoothing were compared using the Student's t-test. Two linear regression models were created. In the first, the search volume for the second period was the outcome variable and the Government Response

Stringency Index (GSRI) was the predictive variable. In the second model, the dependent variable was the difference between the values before and after the cutoff point, by the Brazilian State. The predictive variables tested were: Percentage of Social Isolation; Internet access; mHDI; Per capita Household Income and the Ranking of Cities Friends of Physical Activity. A difference of 29.8% was identified between the variables in the first analysis. In addition, the GSRI explained 51.2% of the variation in the research volume and the second model explains up to 42% of the changes in the outcome variable. In conclusion, the social isolation promoted by the government during the COVID-19 pandemic, in the period evaluated, had an impact on the search for subjects related to physical exercise on the internet among Brazilians.

Keywords: exercise; COVID-19; Internet Behavior.

RESUMEN

El objetivo de este estudio fue investigar los cambios en los patrones de búsqueda en línea de ejercicio y la influencia del aislamiento social y las variables socioeconómicas durante la pandemia de COVID-19 en Brasil. Se utilizó *Google Trends* para recuperar el volumen de búsqueda sobre el tema “ejercicio físico”, en la categoría “fitness y belleza”, durante dos períodos: los cinco años anteriores y del 1 de enero al 16 de mayo de 2020. La fecha límite fue el 12 de marzo. Después de este límite, el volumen de búsqueda real y los valores pronosticados por el análisis exponencial se compararon mediante la prueba t de *Student*. Se crearon dos modelos de regresión lineal. En el primero, el volumen de búsqueda para el segundo período fue la variable de resultado y el índice de rigurosidad de la respuesta del gobierno (GSRI, por sus siglas en inglés) fue la variable predictiva. En el segundo modelo la variable dependiente fue la diferencia entre los valores antes y después del punto de corte, por el Estado brasileño. Las variables predictivas probadas fueron: porcentaje de aislamiento social; acceso a Internet; IDHm; renta per cápita de los hogares y *ranking* de las ciudades amigas de la actividad física. Se identificó una diferencia de 29,8 % entre las variables en el primer análisis. Además, el GSRI explicó el 51,2 % de la variación en el volumen de investigación y el segundo modelo explica hasta el 42 % de los cambios en la variable resultado. En conclusión, el aislamiento social promovido por el gobierno durante la pandemia de COVID-19, en el período evaluado, tuvo impacto en la búsqueda de temas relacionados con el ejercicio físico en Internet entre los brasileños.

Palabras clave: ejercicio físico; COVID-19; comportamiento en Internet.

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Introducción

An emerging research field that combines traditional epidemiology with data science was coined as infodemiology by *Eysenbach*.⁽¹⁾ Studies in this field consist of identifying distributions, determinants, and inferences from information available on the Internet, using scientific search and data analysis parameters. Meanwhile, several studies have emerged with diverse proposals and different methodologies and objects of investigation.^(2,3,4,5)

Google Trends stands out as one of the most used tools for information retrieval. It was a tool that was already used in other fields like econometrics and social sciences to monitor and predict the political, economic, and general behavior trends of a population.^(6,7,8) During the H1N1 pandemic, Google Trends also started being used in the health sciences as a surveillance and behavior prediction tool.^(4,5,9) In the current COVID-19 pandemic, some studies have already used Google Trends as a data recovery tool on various topics, such as the increase in the search for chloroquine and derivatives after pronouncements by political authorities.⁽¹⁰⁾

Currently, a relevant issue to be discussed is the increase in physical inactivity resulting from measures of social distancing and an increase in comorbidities associated with sedentary lifestyle.⁽¹¹⁾

Thus, the aim of this study was to investigate whether the isolation measures resulting from the COVID-19 pandemic influenced the interest of Brazilians in the topic of physical exercise. As a specific objective, we questioned whether national and regional socioeconomic variables are associated with the process of searching for the topic of physical exercise in Brazil.

Methodology

This is an analytic study of infodemiology.^(1,2) As such, Google Trends was used as the main data collection tool, which retrieves data from Google Search. Some specifics about its operation, filtering mechanism and data presentation should be noted, however.

The main objective of Google Trends is to find search trends in Google Search, the company's standard search engine. As such, it retrieves search data based on the choice of terms, topics, categories, locations, and time intervals.⁽²⁾ The platform makes the data available in relative values (0,25,50,75,100) after a normalization process, where 0 is equivalent to the smallest search volume found and 100 to the largest.

In addition, it is important to consider the differences between search "terms" and "topics". In Google Trends, the term is related to the search for a specific word that was explicitly described. When a topic is used, the tool will include all the terms in the search volume that it considers consistent with the topic, regardless of spelling or language errors. It is therefore also essential to delimit search categories and subcategories to minimize the collection of information outside the scope of the study.^(2,3)

We chose to use the topic "Exercício Físico" within the category "Beauty and Fitness" and subcategory "Fitness". The purpose of this was to reduce the interference of researchers in the choice of specific terms, avoiding confirmation bias. In addition, the topic "Physical Exercise" was used instead of "Physical Activity" because it was more sensitive in a pilot search. The main terms included in the search volume for the topic were: "exercício físico" and spelling variations, "workout", "exercicios com elásticos", "pilates" and "exercicio em casa".

Two distinct time intervals were used for the search period. The first interval was 5 years: May 17, 2015, to May 16, 2020. And the normalized search volume was identified weekly.

This first data set was used for the trend analysis and to compare the expected volume and the observed volume after March 12, 2020. The second filtered period recovered the daily search volume between January 1, 2020, and May 16, 2020. This data set was used in the linear models to observe associations that could explain the search behavior for the topic "Exercício Físico" based on other independent variables.

Difference in the Expected and Observed Search Volume

To project the search volume, the first period gathered (last 5 years) was used to employ a simple exponential smoothing. The adopted cutoff point was the week beginning on March 8, the same week in which the Ministry of Health published the social isolation guideline until May 16, following the standard behavior of the last five years. A second time series was then created with the projected values, which was compared to the actual observed search volume.

Dependent Variables in linear models

In the first simple linear model, the dependent variable was the actual volume observed after the cutoff date. In the second model, after treatment, the dependent variable was the difference between the values before and after the cutoff point, referring to each Brazilian state.

Independent Variable in first model: Government Response Stringency Index

We use the Government Response Constraint Index (GRSI) ⁽¹²⁾ available on the Our World in Data website⁽¹³⁾ as an indicator of government response to the pandemic. These responses are classified based on the following indicators: school and/or workplace closures, cancellation of public events, restriction on meetings and gatherings, closure of public transportation, information campaigns, social isolation measures, restrictions on internal movement in public places, international travel controls, testing policy, contact tracing.⁽¹⁴⁾ Each indicator has a specific score, and the sum of these points can vary from 0 to 100. This score evolves in a time series format as official government actions become more restrictive.

Independents Variables in second linear model

The predictive power of other variables was tested to identify the association with the Internet search behavior for physical exercise. These variables were: average social isolation rate,⁽¹⁵⁾ percentage of households with Internet access in 2018,⁽¹⁶⁾ mHDI 2017; per capita

household income 2017⁽¹⁷⁾ and the z score classifying the capitals according to a ranking of Physical-Activity-Friendly Cities (RCAAF, Portuguese initialism)⁽¹⁸⁾ and the proportion of physically active people in leisure time in the 26 Brazilian capitals and the Federal District⁽¹⁹⁾ since Brazil is a continental country with recognized regional inequalities.

Statistical Analysis

Absolute and relative frequency of the descriptive statistics were established for the search terms. The mean and standard deviation were calculated for the other study variables. And the graphical analysis by histogram, the Kolmogorov-Smirnov test with the residual values and the F test were performed to check if the variables met the theoretical assumptions for the construction of the statistical model. The independent Student's t -test was used to compare the mean of the actual search volume and the predicted volume. The linear regression model was chosen to evaluate the possible associations of the difference in search volume with the GRSI and the other socioeconomic, social isolation and structural variables. After the bivariate analyses, we opted to order the associations in an increasing way and to enter the independent variables in the model manually. We adopted confidence level was 95%. The analyses were made using Microsoft Excel and Jamovi 1.1.9.0.

Results

The main terms searched within the topic "Exercício Físico" in Brazil during the period under study, ranging from May 17, 2015, to May 16, 2020, were spelling variations of the term physical exercise, but specific terms such as "Pilates", "Workout", "Exercício com elásticos", "Exercícios em casa" were also observed. It should be noted that all terms are in Portuguese because this is the official language in Brazil.

Figure 1 shows the main terms searched during the entire period. There is also a comparison with the specific terms when the search was limited to the period from January 1 to May 16, 2020. In this comparison, the difference in the weight of the term "Exercícios em casa" stands out, with the search volume for this term being higher in 2020. The option to adopt a

topic filtered by category and period proved sensitive to identify terms related to physical exercise, including home exercise.

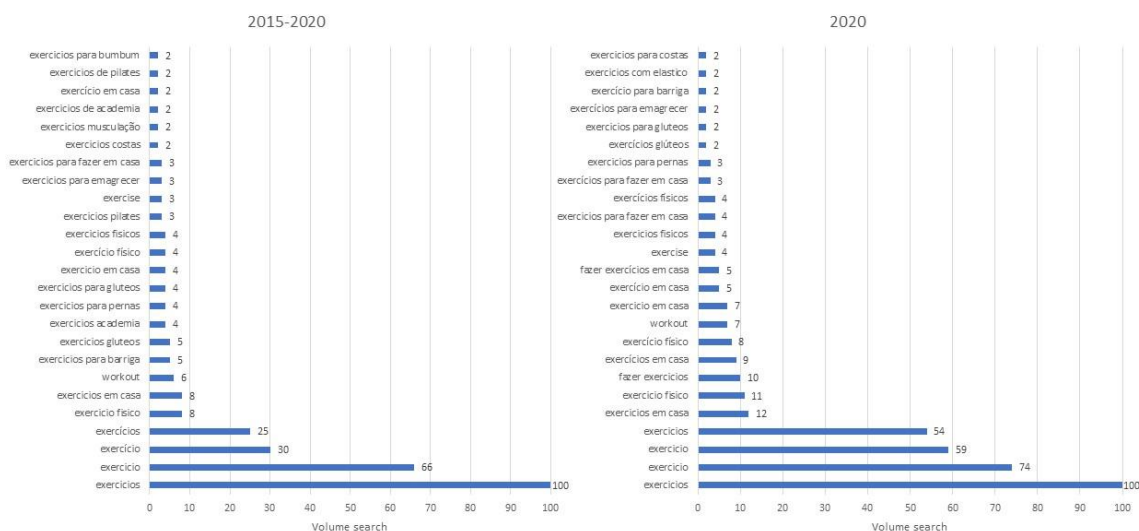


Fig. 1 – Main terms searched during the entire period in the topic “Exercício Físico”.

The figure 2 shows the search volume behavior along the time series starting in 2015 and ending on May 16, 2020. A search peak can be identified in the second week of May, starting on the 10th.

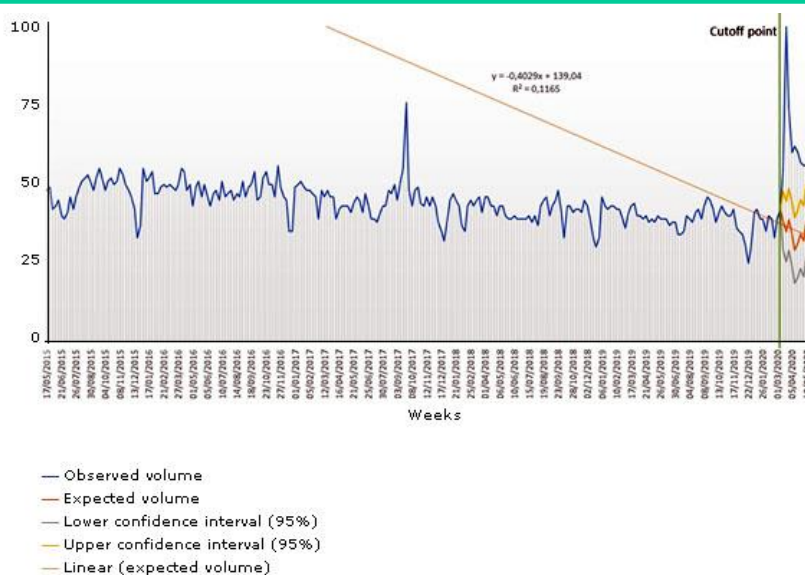


Fig. 2 - Comparison between the search volume projected for March, April and May 2020 and the actual observed volume.

This same figure shows the graphic representation of the projection using a simple exponential smoothing and its confidence limits. In addition, the difference in means resulting from the Student's t-test between the actual observed volume and the predicted volume can be seen. Using the week of March 8 as cutoff point, the difference between the observed volume and the predicted volume was 29.8 points ($p < 0.001$).

Our first linear regression model (table 1) returns a significant association between Search Volume and the GSRI. The findings suggest that the set of covariates present in the model explain 51.2% ($R^2=0.512$, $F=142$ and $p = 0.001$) of the variability of the dependent variable. Considering the value of the estimate, the model reports that there is an increase of 0.336 points in the Search Volume for each GSRI point.

Table 1 - Association between the search volume in 2020 and GSRI

			95% Confidence Interval			
Predictor	Estimate	SE	Lower	Upper	t	p
Intercept	31.561	1.3561	28.879	34.243	23.3	< 0.001
GRSI	0.336	0.0282	0.280	0.391	11.9	< 0.001

Legend: *GSRI*: Government Response Stringency Index.

This second model (table 2) explains 42% ($R^2 = 0.421$, $F = 3.99$ and $p = 0.014$) of the variability in the difference between the search volume before and after social isolation. The variable related to the regular practice of physical activity during leisure time showed an inverse association ($p=0.033$). For each point decrease in the percentage of physically active individuals in leisure time recorded in 2019, the difference in the volume of searches increased by 0.7928 points. The variable mHDI 2017 also had an inverse association ($p = 0.015$). For each decimal increase in the mHDI score, a decrease of 235.60 in the difference between pre-and post-isolation search volumes is predicted in the model.

Table 2 - Association between the difference in search volume before and after social isolation, the percentage of physically-active individuals in capital cities and socioeconomic data

			95% Confidence Interval			
Predictor	Estimate	SE	Lower	Upper	<i>t</i>	<i>p</i>
Intercept	205.1896	62.9973	74.54113	335.8381	3.26	0.004
Household income per capita (R\$)	0.0353	0.0128	0.00869	0.0619	2.75	0.012
mHDI	-235.5947	89.7357	-421.69524	-49.4942	-2.63	0.015
CAAF Ranking	6.2841	2.8687	0.33487	12.2334	2.19	0.039
PAILT	-0.7928	0.3475	-1.51334	-0.0722	-2.28	0.033

Legend: Per capita income: value in R\$ of the average per capita household income per state in 2018; mHDI: human development index score in 2018 by Brazilian state; CAAF Ranking: ranking of physical-activity-friendly cities based on a z score. PAILT: Physically-Active Individuals in Leisure Time, percentage of physically active individuals in leisure time relative for the year 2019, in state capitals.

On the other hand, the predictive variable related to RCAAF showed a direct association ($p = 0.039$) and a decimal increase in the capital city's z score predicts an increase of 6.284 points in the difference between the search volumes. The per capita family income also showed a direct association ($p = 0.012$) and one cent increase in this covariable predicts an increase of 0.035 points in the difference in search volume before and after isolation.

Discussion

The pandemic of COVID-19 imposed isolation measures around the world, restricting the practice of outdoor activities in parks, beaches, clubs or even in gyms and fitness centers. In Brazil, these measures were the subject of controversy despite the serious situation regarding contagion and the number of deaths.

One hypothesis in this scenario is that the practice of physical activity is strongly impacted, and that the sedentary lifestyle increases. This increase in sedentary lifestyle would also increase the chances of complications arising from COVID-19.⁽¹¹⁾

In an editorial published in the British Journal of Sports Medicine, using Google Trends data on physical exercise search behavior in the UK, Australia and USA was identified a significant increase in the relative volume of searches identified in the period analyzed by the authors when compared to projections based on previous search behavior.⁽²⁰⁾ Could this phenomenon also occur in Brazil, with its different economic and cultural reality from the afore mentioned countries, and with the significant differences among its own states?

Our results show that Google Trends was able to identify significant changes in the search pattern related to physical exercise coinciding with the adoption of the isolation measures, based on the date used as cutoff point. But was this change in the search volume influenced by the adoption of the isolation measures or was it just a coincidence? This argument is based on the characteristics of the tool itself, because by using a topic instead of terms, Google Trends returns the search volume for all terms related to that topic.⁽²⁾

As can be seen in figure 1, the terms included were clearly associated with the objective of the study, with no logical interference from the researchers. The results presented in figure 2 show the significant difference between the predicted and actual volume, confirming the first hypothesis that the increase in the observed search volume for the second week of March 2020 was unusual for that period.

However, we recognize that the Google Trends tool itself has limitations and that it is not possible to state that the increase in this search volume reflects an increase in the practice of physical exercise. In addition, it is also possible to question whether there is a link between the increase in searches and the isolation measures.

The next step was therefore to investigate whether this unusual behavior in the search volume was associated with the adoption of isolation measures. The linear regression model

described in table 1 was chosen for this analysis, and its results confirmed the hypothesis that there was an association between the search volume in 2020 and the GSRI, the index measuring a progression in restrictive measures based on public information.^(12,13) As such, a linear association between the search volume observed by Google Trends and the GSRI strengthens the hypothesis that a progression in the isolation measures increased the interest in terms related to the topic physical exercise in Brazil.

However, data on the increase or decrease in physical activity levels during the pandemic are still contradictory. An example is a report made available by the company Garmin®⁽²¹⁾ with data captured by wearables that identifies an increase in cycling and other indoor sports around the world. But the same report also shows data that suggest a drop in the number of daily steps across all countries and the preliminary data from a study released by Fiocruz, based on a digital survey, also indicate that there was a consistent drop in the practice of regular physical activity in Brazil.⁽²²⁾

Another doubt involves the possibility that other variables could explain these changes in the search volume. The second model made by us and described in table 2 presents information relevant to this issue. In this model, the per capita household income showed a significant and direct association. This information makes logical sense, since it can be inferred that households with a higher per capita income have more access to the Internet. These families have more means to purchase equipment or hire the services of professionals involved in physical exercise. The Brazilian states with better per capita household income indicators were therefore also likely to have such characteristics.

On the other hand, an inverse association was also observed between physical activity in leisure time and the dependent variable. This association suggests that the Brazilian state capitals whose people were less physically active in leisure time, had a greater change in the search for physical exercise after the isolation measures.

A hypothesis that could explain these results is that the spread of information on the association between diabetes, hypertension, obesity, and bad COVID-19 outcomes^(23,24,25) influenced the search for terms related to physical exercise. As such, Google Trends was confirmed as an effective surveillance tool to monitor the interest in physical exercise in Brazil. This interest is welcome at a time when space limitations, idleness, economic vulnerability, and other restrictions can further diminish the population's levels of physical activity and lead to other problems arising from a sedentary lifestyle.^(26,27)

But remember that these Google Trends data allow us to assess the levels of physical activity of individuals and it is not possible to conclude about an increase in the practice of exercise. However, this set of analyzes carried out allows us to speculate that more individuals were interested in the practice of physical exercise during social isolation in Brazil, even for a short time, and that these could be individuals who were previously sedentary or insufficiently active. We suggest that further studies be carried out to confront this hypothesis.

Conclusions

We conclude that Google Trends satisfactorily identified an increase in the search for terms related to the topic Physical Exercise and that this increase in search is in fact associated with isolation measures. Furthermore, it was also possible to conclude that - at regional levels - socioeconomic conditions and the percentage of active individuals are associated with changes in searches on the topic during the pandemic.

Despite its limitations, therefore, Google Trends proved to be an interesting tool to monitor behaviors related to a sedentary lifestyle and physical exercise. After all, a greater interest in physical exercise may reflect a greater tendency to practice some type of physical activity regularly, even with measures of social isolation.

References

1. Eysenbach G. Infodemiology: the epidemiology of (mis)information. The American Journal of Medicine. 2002;113(9):763-5. DOI: [https://doi.org/10.1016/S0002-9343\(02\)01473-0](https://doi.org/10.1016/S0002-9343(02)01473-0)
2. Mavragani A, Ochoa G. Google trends in infodemiology and infoveillance: Methodology framework. Journal of Medical Internet Research. 2019;21(5). DOI: <https://doi.org/10.2196/13439>

3. Mavragani A, Ochoa G, Tsagarakis KP. Assessing the methods, tools, and statistical approaches in Google trends research: Systematic review. *Journal of Medical Internet Research*. 2018;20(11):1-20. DOI: <https://doi.org/10.2196/jmir.9366>
4. Mavragani A. Infodemiology and infoveillance: Scoping review. *Journal of Medical Internet Research*. 2020;22(4). DOI: <https://doi.org/10.2196/16206>
5. Eysenbach G. Infodemiology and infoveillance: framework for an emerging set of public health informatics methods to analyze search, communication and publication behavior on the Internet. *Journal of medical Internet research*. 2009;11(1). DOI: <https://doi.org/10.2196/jmir.1157>
6. Varian HR, Choi H. Predicting the Present with Google Trends. *SSRN Electronic Journal*. 2012;37(8). DOI: <https://doi.org/10.2139/ssrn.1659302>
7. Askitas N, Zimmermann KF. Google Econometrics and Unemployment Forecasting. *Applied Economics Quarterly*. 2009;55(2):107-20. DOI: <https://doi.org/10.3790/aeq.55.2.107>
8. Vosen S, Schmidt T. Forecasting private consumption: survey-based indicators vs. Google trends. *Journal of Forecasting*. 2011;30(6):565-78. DOI: <https://doi.org/10.1002/for.1213>
9. Eysenbach G. Infodemiology: tracking flu-related searches on the web for syndromic surveillance. *AMIA. Annual Symposium proceedings/AMIA Symposium AMIA Symposium*; 2006:244-8.
10. Liu M, Caputi TL, Dredze M, Kesselheim AS, Ayers JW. Internet Searches for Unproven COVID-19 Therapies in the United States. *JAMA Intern Med*. 2020;180(8):1116-8. DOI: <https://doi.org/10.1001/jamainternmed.2020.1764>
11. Hall G, Laddu DR, Phillips SA, Lavie CJ, Arena R. A tale of two pandemics: How will COVID-19 and global trends in physical inactivity and sedentary behavior affect one another? *Progress in Cardiovascular Diseases*. 2020; 64(1):4-6. DOI: <https://doi.org/10.1016/j.pcad.2020.04.005>
12. Hale T, Webster S, Petherick A, Phillips T, Kira B. Oxford COVID-19 Government Response Tracker. 2020 [access 19/05/2020]. Available at: <https://ourworldindata.org/grapher/covid-stringency-index?tab=chart&country=~BRA>

13. Hale T, Petherick A, Phillips T, Webster S, Kira B. Oxford COVID-19 Government Response Tracker, Blavatnik School of Government. Working Paper. 2020 [access 19/05/2020]. Available at: www.bsg.ox.ac.uk/covidtracker
14. COVID-19 No Brasil: Várias Epidemias Num Só País Primeira Fase Do EPICovid19 Reforça Preocupação Com a Região Norte. 2020 [access 19/05/2020]. Available at: <https://epidemiio-ufpel.org.br/uploads/downloads/276e0cfc2783c68f57b70920fd2acfb.pdf>
15. IBGE. Pesquisa Nacional por Amostra de Domicílios Contínua-PNAD Contínua. 2018 [accessed 23/05/2020] Available at: <https://www.ibge.gov.br/estatisticas/sociais/populacao/17270-pnad-continua.html?edicao=23205&t=downloads>
16. Pinto CV, Costa MA. IPEA, Brasil Ministério da Saúde, World Health Organization. Radar IDHM : Evolução Do IDHM e de Seus Índices Componentes No Período de 2012 a 2017. 2019;24.
17. Hino AAF, Gonçalves PB, Reis RS. Relatório do Ranking das Capitais Brasileiras Amigas da Atividade Física. Veja Saúde. 2018 [access 07/06/2020]. Available at: <https://saude.abril.com.br/fitness/relatorio-do-ranking-das-capitais-brasileiras-amigas-da-atividade-fisica/>
18. Brasil: Ministério da Saúde. Vigitel Brasil 2019. 2020 [access 07/06/2020]. Available at: <https://www.gov.br/saude/pt-br/centrais-de-conteudo/publicacoes/publicacoes-svs/vigitel/relatorio-vigitel-2020-original.pdf/view>
19. Brasil: Ministério da Saúde. Portaria nº 356. Diário Oficial da União. 2020 [access 11/05/2020]. Available at: <http://www.in.gov.br/en/web/dou/-/portaria-n-356-de-11-de-marco-de-2020-247538346>
20. Ding D, del Pozo Cruz B, Green MA. Is the COVID-19 lockdown nudging people to be more active: a big data analysis. Br J Sports Med. 2020;54(20):1183-4. DOI: <https://doi.org/10.1136/bjsports-2020-102575>
21. Garmin. The Impact of the Global Pandemic on Human Activity: Part III. 2019 [accessed 14/05/2020] Available at: <https://www.garmin.com/en-US/blog/fitness/the-impact-of-the-global-pandemic-on-human-activity-part-iii/>

22. Fiocruz. ConVid: Pesquisa de comportamento. 2020 [access 14/05/2020] Available at: https://convid.fiocruz.br/index.php?pag=apresentacao_resultado
23. Lippi G, Wong J, Henry BM. Hypertension and its severity or mortality in Coronavirus Disease 2019 (COVID-19): a pooled analysis. Polish Archives of Internal Medicine. 2020;130(4) DOI: <https://doi.org/10.20452/pamw.15272>
24. Dietz W, Santos-Burgoa C. Obesity and its Implications for COVID-19 Mortality. Obesity. 2020;28(6):1005. DOI: <https://doi.org/10.1002/oby.22818>
25. Guo W, Li M, Dong Y, Zhou H, Zhang Z, Tian C, *et al.* Diabetes is a risk factor for the progression and prognosis of COVID-19. Diabetes/Metabolism Research and Reviews. 2020:e3319. DOI: <https://doi.org/10.1002/dmrr.3319>
26. Chen P, Mao L, Nassis GP, Harmer P, Ainsworth BE, Li F. Coronavirus disease (COVID-19): The need to maintain regular physical activity while taking precautions. Journal of Sport and Health Science. 2020; 9(2):103-4. DOI: <https://doi.org/10.1016/j.jshs.2020.02.001>
27. Jiménez-Pavón D, Carbonell-Baeza A, Lavie CJ. Physical exercise as therapy to fight against the mental and physical consequences of COVID-19 quarantine: Special focus in older people. Progress in Cardiovascular Diseases. 2020;63(3). DOI: <https://doi.org/10.1016/j.pcad.2020.03.009>.

Conflicto de intereses

Los autores declaran que no tienen conflicto de intereses.

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