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IMPACT OF LEISURE ACTIVITIES ON WELL-BEING IN COVID-19 PANDEMIC SITUATION, A CROSS SECTIONAL SURVEY

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ABSTRACT

Aims of Study: During COVID-19 people were forced to stay home and this increased the risk of limiting their PA and adaptation of sedentary behaviour hence our objective is to measure the impact of leisure activities on well-being during COVID-19.

Methodology: 366 participants were selected, using Non-probability convenient sampling from UOL and PGC. PA and well-being were assessed using IPAQ-short form and WHO-5 well-being questionnaire.

Results: IPAQ-short form with well-being Pearson Chi square was 638.012, Spearman correlation was 0.956 and p-value Asymptotic significance (2 sided) was .000 which means there is positive strong correlation between variables.

Limitations and Future Implication: Adults having ages 18-40yrs volunteered due to short time period and since our study limited to only 2 settings so to generalize our outcomes for mass population was not feasible. During lockdown gaining past medical history in data collection was impacted, it is suggested to include the role of Physiotherapist in improving health status by PA, create awareness among common population about role of PA and their relation with well-being also including diversity in age groups, ethnicity and localities is suggested.

Originality: Strong positive correlation between PA and well-being.

Conclusion: This study shows that during Covid-19 pandemic, those individuals who remained physically active had good impact on their health. Being physically active not only improves an individual's physical fitness level but also helps to cope with psychological problems degrading one's mental health so our study found out direct relation between physical activity levels and health status.

Keywords: *Covid-19, exercise, leisure activities, sedentary behavior, physical fitness, cardiorespiratory fitness, quarantine.*

Introduction

As coronavirus is an infectious disease whose etiology is a recently track down virus and according to The DG world health organization it was announced as a pandemic on 11 March 2020[1] as a result majority of the countries impose strict lockdown and this catastrophe condition effect the abilities of adults capacity to participate in the Physical activity and exercises[1].

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Before two year in Dec 2019 when the Covid-19 bloomed from the WAHUN the capital city of HUBAI province of CHINA) and broaden throughout the world more than 90 countries imposed immediate lockdown to minimize its spreading[2] When this article was in process there was almost 57.8 million coronavirus cases in the world and total No of deaths exceeded 1,377,395 according to world health organization[2].

Droplets that come into contact with mucus membranes were the main vector of COVID-19 spread and surprisingly not everyone who is exposed is affected. There are 3 main stages of this disease through it progress after the individual being infected. In Stage 1 the virus may or may not be clinically identifiable, and the incubation period is asymptomatic-pauci-symptomatic. Stage 2 is characterized by the presence of the virus and a period of non-severe clinical sickness that may cease or progress. This is where around 80% of infected people will end up.

Finally, in 3rd stage of disease very intensive respiratory illness and sever pneumonia like progressive condition that may be cause respiratory failure. The causes are diffuse alveolar damage and increase degree of inflammation, which lead to severe clinical damage and possible involvement of other organ sites such as cardiac, cutaneous, and vascular. Covid-19 virus attacks respiratory tract cells and is likely to infect endothelium cells and macrophages, based on immunological similarities[3].

The worldwide coronavirus disease is the etiology of sever acute respiratory syndrome. Many reports that were published in the beginning of this pandemic identified cough, fever and the shortness of breath are the marking symptoms of COVID-19 and for the purpose to testing and for identification of this disease these symptoms consider the most important findings[4]. A large number of symptoms were described in different reports so The Council of State and Territorial Epidemiologists (CSTE) included loss of taste and smell as a symptom in March 2020. A small number of reports suggested that these symptoms such as loss of taste and smell have closed contact with the COVID-19 prior to diagnose and outside the clinical setting[4].

In the beginning, In Wuhan, the Covid-19 pandemic began long before any public health treatment methods were implemented. Reproduction number of this COVID-19 were the basic findings to check the pandemic potential of this virus. The Reproduction number of coronavirus was approximate as 3 to 4 implying to every patient spreading disease to almost 4 to 5 new victims occurring every 4 days with doubling the speed[5]. Sanche et al. find out that the Reproduction number of this strain likely as high as 5.7[6] on the other hand Le et al. find out 2.03-2.77[7].

Physical activity prevents cardiovascular vulnerability, muscular atrophy, inflammation, degeneration, loss of bone and cartilage, and a decline in aerobic capacity[8].

In the beginning of pandemic it is consider only a respiratory disease. The individual having diseases like diabetes mellitus and hypertension (HTN) are more prone to the harmful effects of COVID-19. COVID-19 also causes myocardial damage and dysfunction through diverse pathways[9].

The spread of COVID-19 to various parts of China, the public health interventions such as lock down of cities, to prevent the transmission of a virus, social isolation and quarantine are used[10]. During confinement, participation in short-term and long-term physical activity, which has been demonstrated to benefit overall health, may be compromised[11].

The impact of exercise on wellbeing has been astounding. Regular, light exercise has been associated with a reduction in upper respiratory infections brought on by COVID-19[12].

In fact to control the spread of coronavirus and minimize its impacts on health system, people were forced or imposed to stay at home and avoid social interactivities. Government only allows people to leave home when they need to buy necessary items for daily living or for medical reasons. Therefore a large number of population were forced to live in home incarceration for weeks to months that increase the risk of limiting their physical activities and adoption of sedentary life style[13].

Health measures aimed at boosting activity levels in in-active people may be necessary to improve well-being[14] After only a few days of sedentary behaviour, type 1 fiber and type 2 fiber start to degeneration , resistant to insulin, and low-grade systemic inflammation develop[15].

Lifestyle of majority of population under lockdown effects by the prolonged self-isolation, that leads to the state of physical inactivity both in athletes and healthy individuals, individuals who are hypo-mobile and do not participate in any kind of PA are involved in inactivity related illness like decrease in endurance capacity VO2 max muscular strength, loss of muscle mass and obesity[16]. Frequent exercise enhances physical function, cardiovascular and metabolic health, and aerobic capacity[17].

A resting metabolic rate is described as the quantity of oxygen utilized while sitting quietly in a chair at rest, which is around 3.5 ml 02/kg/min. METs are a simple, straightforward, and practical method of calculating the energy expenditures of various activities[18].

The individuals who are involved in spare time activities were shown to have increase acquisition of preventive health behavior over the Covid-19 term, as well as incident interpersonal continence when playing in and outdoor physical activity alone[19].

Methodology

Study design and sampling method

Descriptive cross sectional study was completed by using Non-probability convenient sampling technique with the sample size of 366.

Study Settings

Participants were selected from two Educational institutes of District Gujranwala one was University of Lahore Gujrat Campus and other was Punjab College Wazirabad.

Inclusion Criteria

- Age ≥ 18 years and ≤ 40 years[20]
- Higher secondary, undergraduate and postgraduate students[21]

Exclusion Criteria

- Pregnancy[22]
- Disability (19) [Stroke, Recent bone fractures (2 months), Handicap, Bedridden].

Tools and apparatus

International Physical Activity Questionnaire - Short Form[23] Reliability ($r_w = 0.59$) and concurrent validity ($r_w = 0.55$)[24].
The 5-itemWorld Health Organization Well-Being (WHO-5) index(2)

$$\mathbf{n} = \frac{Z^2 \left(1 - \frac{\alpha}{s}\right) P\,(1 - P)}{d^2}$$

n = Sample size which was 385
P = Anticipated population proportion was 0.50
d = Absolute precision required was 0.05
1-α = confidence level was 95%

Data Collection Procedure

Data for research was obtained by using a Performa which include demographic data and International Physical Activity Questionnaire - Short Form and The 5-item World Health Organization Well-Being (WHO-5) index. In Performa there was simple questions related demographic data and in IPAQ-short form there was 3 main questions which describe participants overall physical activity either it was high, moderate or low. On the other hand WHO-5 have 5 questions which describe overall mental well-being of participants. The Performa and questionnaire were filled by researcher after describing it to the participants. At the end data were analyzed and results were obtained.

Results

The results were obtained after analyzing the data which were collected from 366 participants to measure the impact of Leisure activities on well-being. the mean age and Std. Deviation of participants were 20.8197±1.6031, Mean ±Std. deviation of BMI were 20.6178 ±2.6204 and WHO-5 WELL-BEING SCALE Mean ±Std. deviation was 69.7432±20.7103, IPAQ-short form with well-being Pearson Chi square was 638.012, Spearman correlation was 0.956 and p-value i.e. Asymptotic significance (2 sided) was .000 which means there is positive strong correlation between variables.

Outcome Measures

Table 1 shows the distribution of physical activity and health status among participants. 150 participants found highly active, 108 moderate and 108 mild. On the other hand 159 participant shows best health, 100 have good health status and 107 have poor health status .this table shows a strong association between leisure activities and health status.

Health status and IPAQ-short form Cross tabulation				
	IPAQ-short form			
Health Status	> 3000	600-2999	< 600	Total
Best health	149	8	2	159
Good health	1	97	2	100
Poor health	0	104	104	107
Total	150	108	108	366

Table 1: Health status and IPAQ-short cross tabulate

Table 3 shows association of Leisure activities with well-being in which for IPAQ-short form with well-being Pearson Chi square was 638.012, Spearman correlation was 0.956 and p-value i.e. Asymptotic significance (2 sided) was .000, The both variables are strongly associated with each other as per results.

Variables	Mean ±Std. Deviation	
Age of participants	20.8197±1.6031	
Body Mass Indus(BMI)	20.6178 ±2.6204	
WHO-5 WELL-BEING SCALE	69.7432±20.7103	
	Categories	**n(percentage)**
AGE GROUPS	18-24	362(98.9)
	25-30	4(1.1)
GENDER	Male	182(49.7)
	Female	184(50.3)
BMI GROUPS	<18.5	62(16.9)
	18.5-24.9	288(78.7)
	25-29.9	14(3.8)
	>30	2(0.5)

Tables 2: Variables showing patient demographics

Association	Pearson Chi square	(r)	p-value
IPAQ short form with Health status	638.012	0.956	0

Table 3: Association of Leisure activities with well-being

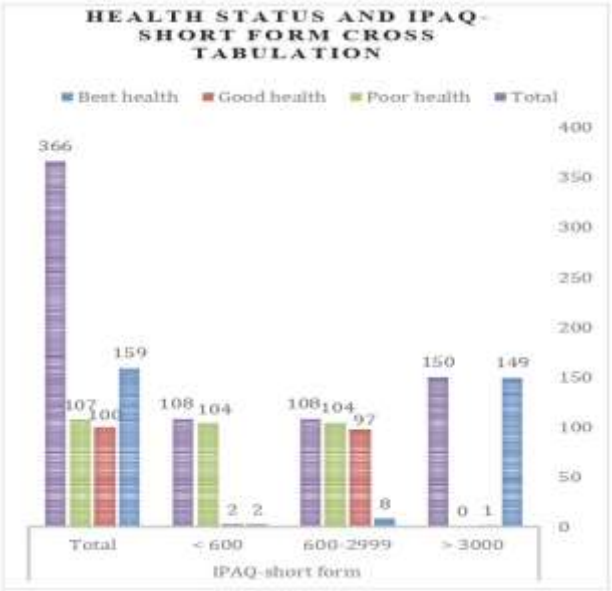

Figure 1: Cross tabulation of two variables

Discussion

None of the respondents (233 women, 29.8 11.5 years old) reported being infected with COVID-19. Before the lockdown, the vast majority (362, or 90.5 percent) were employed or students. During the shutdown, 196 (60%) people worked at home, 42 (12.0%) in their customary place of business, 14 (4.3%) did both, and 74 (20.23%) were unable to work. Prior to lockdown, the majority of respondents (393 participants, or 98.3%) said they were in good health. Sixty-eight percent of those who responded said they had a chronic illness, such as respiratory, cardiovascular, cancer, or metabolic disease. There was an increase in sitting time, reduction in weekly physical activity, a little reduction in moderate weekly physical activity, a greater reduction in intensive weekly physical activity[20].

MVPA was 400.25 minutes per week on average (SD = 325.02). Because MVPA's distribution was not normal, a square root transformation was used to approximate a normal curve. Skewness and kurtosis were checked for normality after MVPA was converted. MVPA was linked to psychological detachment, calm, mastery, leisure time control, needs fulfillment, subjective

vitality, and PA before lockdown. MVPA did not have a significant relationship with felt stress. In addition, need fulfillment and subjective vitality were significantly and favorably connected with the four recovery experiences, while perceived stress was adversely correlated. These findings suggest that, after controlling for sex and age, recovery experiences predict well-being in a positive way. We used an alternate model in which the direct channel between PA and well-being was included to corroborate the presumptive total mediation effect. The results indicated that this path was not significant (=0.016, p = 0.770) and that adding it to the model did not improve it significantly (2 (1) = 0.085, p = 0.771)[25].

During the lockdown, the majority of individuals (51.6%) were moderately active, with 32.1 percent being really active, 16.9 percent exhibiting small levels of physical activity. Almost half of the participants (54.3 percent; n = 171) said during the lockdown, exercise was more necessary than it was before the lockdown, The value of PA during lockdown was found to have a considerable impact on well-being [F(2,312) = 4.528; p = 0.012; 2 = 0.028], sadness [F(2,312) = 7.869; p 0.001;. Individuals who said physical activity was less important had significantly lower scores on all wellbeing measures (wellbeing p = 0.008, depression p 0.01, anxiety p 0.01, stress p = 0.05) than those who said it was equally important (wellbeing p = 0.008, depression p 0.01, anxiety p 0.01, stress p = 0.05)[26].

People who reported more physical activity than normal routine in Covid-19 pandemic situation had reduced symptoms of anxiety (p = 0.01, d = 0.020). Individual who were happy with the quality of their sleeps had reduced state and trait anxiety. Variation in PA level (high, moderate, low) was remarkably diverse between all groups having state of anxiety (p = 0.01) as well as trait anxiety (p= 0.01). Participants who exercised moderately to vigorously exhibited decrease degree of state and trait anxiety than those who exercised infrequently. Those who engaged in more PA showed decrease levels of state anxiety than those who engaged in moderate physical activity. There was no gender difference in the connection between increase degree of trait anxiety and increase degree of state anxiety. Anxiety, gender, and even behavioral substitute in sleep and physical activity should all be taken into account in interventions aimed at mentally supporting people during this outbreak[27].

X3 test and the Student's t-test for paired data were used to contrast pre-lockdown vs. lockdown differences. To uncover predictor variables that clarify compliance with PA recommendations, researchers performed a fixed-effects binary logistic regression analysis. The responses of 993 people were evaluated. Physical activity connected to transportation and leisure time reduced. Leisure activity suggestions were followed by 42.2 percent of the time and 29.4 percent of the time (chi2 (1, 1986) = 35.335, p 0.001, V = 0.13). Well-being dropped 16.3 points (d = 0.74), (t (990) = 23.405, p 0.001). During second COVID-19-related shutdown, German adults' physical activity and well-being decreased. Physical activity should be emphasized as well, given the growing body of data that it protects against COVID-19[28].

This study included 366 participants aged ≥ 18 years and ≤ 40 years old from two educational institutes, with mean and standard deviation values of 20.8197 and 1.6031, respectively. The participants' physical activities were measured in METs per minute per week using the standard questionnaire, the IPAQ-SHORT FORM, and their health state was assessed using the WHO-5 Well-Being Scale. The questionnaire and Performa values and responses were entered into SPSS software, and the details of the analyzed results were explained. The findings revealed that there is a direct link between physical activity and adult well-being.

The mean age and Std. Deviation of participants were 20.8197±1.6031, Mean ±Std. deviation of BMI were 20.6178 ±2.6204 and WHO-5 WELL-BEING SCALE Mean ±Std. deviation was 69.7432±20.7103. Physical activity and health status among participants as follows, 150

participants found highly active, 108 moderate and 108 mild. On the other hand 159 participant shows best health, 100 have good health status and 107 have poor health status, association of Leisure activities with well-being in which for IPAQ-short form with well-being Pearson Chi square was 638.012, Spearman correlation was 0.956 and p-value i.e. Asymptotic significance (2 sided) was .000, The both variables are strongly associated with each other as per result. Our findings shows that there was positive and strong significance between ours variables i.e. IPAQ-short form and Well-being.

Conclusion

This study shows that during Covid-19 pandemic, those individuals who remained physically active had good impact on their health. Majority of participants were found to be active so they overall had good health and functional status. Sedentary behavioral life style was also adopted by many due to activities like excessive sleeping, lack of proper physically engaging activities and extreme loneliness caused by social isolation so as a result they had poor health status. Being physically active not only improves an individual's physical fitness level but also helps to cope with psychological problems degrading one's mental health so our study found out direct relation between physical activity levels and health status.

AUTHORS' CONTRIBUTION:
The following authors have made substantial contributions to the manuscript as under:
Conception or Design: Shahzaib Hassan Syed
Acquisition, Analysis or Interpretation of Data: Shahzaib Hassan Syed, Maheen Mir
Manuscript Approval & Writing: Shahzaib Hassan Syed
All authors acknowledge their accountability for all facets of the research, ensuring that any concerns regarding the accuracy or integrity of the work are duly investigated and resolved.

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References

1. Meiring RM, Gusso S, McCullough E, Bradnam LJIJoER, Health P. The effect of the COVID-19 pandemic movement restrictions on self-reported physical activity and health in New Zealand: A cross-sectional survey. 2021; 18(4): pp 1719.

2. Ginoux C, Isoard-Gautheur S, Teran-Escobar C, Forestier C, Chalabaev A, Clavel A, Sarrazin P. Being active during the lockdown: The recovery potential of physical activity for well-being. International Journal of Environmental Research and Public Health. 2021 Feb;18(4): pp 1707.

3. Al-Benna SJIWJ. Pathophysiology of coronavirus disease 2019 for wound care professionals. 2020 Dec; 17(6): pp 1935-1940.

4. Dawson P, Rabold EM, Laws RL, Conners EE, Gharpure R, Yin S, Buono SA, Dasu T, Bhattacharyya S, Westergaard RP, Pray IW. Loss of taste and smell as distinguishing

symptoms of coronavirus disease 2019. Clinical Infectious Diseases. 2021 Feb 15;72(4): pp 682-685.

5. Pan A, Liu L, Wang C, Guo H, Hao X, Wang Q, Huang J, He N, Yu H, Lin X, Wei S. Association of public health interventions with the epidemiology of the COVID-19 outbreak in Wuhan, China. Jama. 2020 May 19;323(19): pp 1915-1923.

6. Sanche S, Lin YT, Xu C, Romero-Severson E, Hengartner N, Ke R. High contagiousness and rapid spread of severe acute respiratory syndrome coronavirus 2. Emerging infectious diseases. 2020 Jul;26(7):1470-1477.

7. Li R, Pei S, Chen B, Song Y, Zhang T, Yang W, Shaman J. Substantial undocumented infection facilitates the rapid dissemination of novel coronavirus (SARS-CoV-2). Science. 2020 May 1; 368(6490): pp 489-493.

8. Castrogiovanni P, Di Rosa M, Ravalli S, Castorina A, Guglielmino C, Imbesi R, Vecchio M, Drago F, Szychlinska MA, Musumeci G. Moderate physical activity as a prevention method for knee osteoarthritis and the role of synoviocytes as biological key. International journal of molecular sciences. 2019 Jan 25;20(3): pp 511.

9. Mahajan K, Chandra KS. Cardiovascular comorbidities and complications associated with coronavirus disease 2019. medical journal armed forces india. 2020 Jul 1;76(3): pp 253-260. https://doi.org/10.1016/j.mjafi.2020.05.004

10. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, Ren R, Leung KS, Lau EH, Wong JY, Xing X. Early transmission dynamics in Wuhan, China, of novel coronavirus–infected pneumonia. New England journal of medicine. 2020 Jan 29.

11. Khidri FF, Riaz H, Bhatti U, Shahani KA, Kamran Ali F, Effendi S, Rani K, Chohan MN. Physical activity, dietary habits and factors associated with depression among medical students of Sindh, Pakistan, during the COVID-19 pandemic. Psychology Research and Behavior Management. 2022 May 25: pp 1311-1323.

12. Ullah I, Islam MS, Ali S, Jamil H, Tahir MJ, Arsh A, Shah J, Islam SM. Insufficient physical activity and sedentary behaviors among medical students during the COVID-19 lockdown: findings from a cross-sectional study in Pakistan. International Journal of Environmental Research and Public Health. 2021 Sep 29;18(19): pp 10257.

13. Gallè F, Sabella EA, Ferracuti S, De Giglio O, Caggiano G, Protano C, Valeriani F, Parisi EA, Valerio G, Liguori G, Montagna MT. Sedentary behaviors and physical activity of Italian undergraduate students during lockdown at the time of COVID− 19 pandemic. International journal of environmental research and public health. 2020 Sep;17(17): pp 6171.

14. Lesser IA, Nienhuis CP. The impact of COVID-19 on physical activity behavior and well-being of Canadians. International journal of environmental research and public health. 2020 Jun;17(11): pp 3899.

15. Narici M, De Vito G, Franchi M, et al. Impact of sedentarism due to the COVID-19 home confinement on neuromuscular, cardiovascular and metabolic health: Physiological and pathophysiological implications and recommendations for physical and nutritional countermeasures. 2021; 21(4): pp 614-635.

16. Maugeri G, Musumeci G. Adapted physical activity to ensure the physical and psychological well-being of COVID-19 patients. Journal of Functional Morphology and Kinesiology. 2021 Jan 29;6(1): pp 13.

17. Font R, Irurtia A, Gutierrez J, Salas S, Vila E, Carmona GJBoS. The effects of COVID-19 lockdown on jumping performance and aerobic capacity in elite handball players. 2021; 38(4): pp 753-759.

18. Edwards TC, Guest B, Garner A, Logishetty K, Liddle AD, Cobb JP. The metabolic equivalent of task score: a useful metric for comparing high-functioning hip arthroplasty patients. Bone & Joint Research. 2022 May 18;11(5): pp 317-326.

19. Kim YJ, Cho JH, Park YJ. Leisure sports participants' engagement in preventive health behaviors and their experience of constraints on performing leisure activities during the COVID-19 pandemic. Frontiers in Psychology. 2020 Dec 9;11:589708.

20. Kim Y-J, Cho J-H, Park Y-JJFiP. Leisure Sports Participants' Engagement in Preventive Health Behaviors and Their Experience of Constraints on Performing Leisure Activities During the COVID-19 Pandemic. 2020 Dec 9; 11: pp 589708.

21. Chouchou F, Augustini M, Caderby T, Caron N, Turpin NA, Dalleau GJSm. The importance of sleep and physical activity on well-being during COVID-19 lockdown: reunion island as a case study. 2021; 77: pp 297-301.

22. Zhou J, Xie X, Guo B, Pei R, Pei X, Yang S, Jia P. Impact of COVID-19 lockdown on physical activity among the Chinese youths: the COVID-19 impact on lifestyle change survey (COINLICS). Frontiers in public health. 2021 Feb 4; 9: pp 592795.

23. Bourdas DI, Zacharakis ED. Impact of COVID-19 lockdown on physical activity in a sample of Greek adults. Sports. 2020 Oct 21;8(10): pp 139.

24. Srivastav AK, Sharma N, Samuel AJ. Impact of Coronavirus disease-19 (COVID-19) lockdown on physical activity and energy expenditure among physiotherapy professionals and students using web-based open E-survey sent through WhatsApp, Facebook and Instagram messengers. Clinical epidemiology and global health. 2021 Jan 1;9: pp 78-84.

25. Meh K, Jurak G, Sorić M, Rocha P, Sember V. Validity and reliability of IPAQ-SF and GPAQ for assessing sedentary behaviour in adults in the European Union: a systematic review and meta-analysis. International journal of environmental research and public health. 2021 Apr 26;18(9): pp 4602.

26. Ginoux C, Isoard-Gautheur S, Teran-Escobar C, Forestier C, Chalabaev A, Clavel A, Sarrazin P. Being active during the lockdown: The recovery potential of physical activity for well-being. International Journal of Environmental Research and Public Health. 2021 Feb;18(4): pp 1707.

27. Wood CJ, Barton J, Smyth N. A cross-sectional study of physical activity behaviour and associations with wellbeing during the UK coronavirus lockdown. Journal of Health Psychology. 2022 May;27(6): pp 1432-1444.

28. Frontini R, Rebelo-Gonçalves R, Amaro N, Salvador R, Matos R, Morouço P, Antunes R. The relationship between anxiety levels, sleep, and physical activity during COVID-19 lockdown: An exploratory study. Frontiers in Psychology. 2021; 12: pp 786.

29. Füzéki E, Schröder J, Reer R, Groneberg DA, Banzer WJS. Physical Activity and Well-Being during the Second COVID19-Related Lockdown in Germany in 2021. 2021 Jan; 13(21): pp 12172.