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Physical fitness and its impact on psychological health during the COVID-19 lockdown

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ABSTRACT

Both the countrywide lockdowns as well as the worldwide lockdown and social isolation norms had an immense psychological impact on the population as a consequence of the major change in lifestyle. The present study aimed to determine changes in physical activity during the second lockdown in the Indian population, and the impact of exercise on psychological health during the same time period. The study was conducted through circulation of online questionnaire and data was collected by snowball technique. The type of physical activity done by most people was under the low international physical activity questionnaire (IPAQ) category (56.36%) which increased during lockdown (63.57%). The IPAQ category of moderate activity showed a drop in numbers from 26.46% to 18.56% while high IPAQ scores were almost the same before and during lockdown. People with high and moderate IPAQ scores had a better psychological health status as compared to the Low category.

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1. INTRODUCTION

COVID-19 or Sars-CoV-2 is an infectious disease with its first outbreak as a 'pneumonia of unknown origin' in December 2019 in Wuhan city of central Hubei province of China [1], [2]. The WHO on January 5th, 2020 apprised the world about a certain-"pneumonia of unknown cause" in China, followed by an announcement on January 20th, 2020, wherein it also confirmed human to human transmission of the disease. On 30th January, the WHO called the outbreak an emergency of international concern and a few days later, on 11th March, it was announced as a pandemic [3]. In order to control the spread of disease, second regional lockdown and curfews were imposed following April 4th, 2021, because of the up rise of a second wave in some states of the country like Maharashtra, Kerala, Uttar Pradesh and the National Capital Region [4].

Both the countrywide lockdowns as well as the worldwide quarantine and social isolation norms had an immense psychological impact on the people as a consequence of the major change in lifestyle. It is likely that prolonged home stay may lead to increased sedentary behaviors, such as spending excessive amounts of time sitting, reclining, or lying down for screening activities (playing games, watching television, using mobile devices); reducing regular physical activity (hence lower energy expenditure); or engaging in avoidance activities that, consequently, lead to an increased risk for and potential worsening of chronic health conditions. Therefore, there is a strong health rationale for continuing physical activity in the home to stay healthy and maintain immune system function in the current precarious environment [5]. Studies during the first lockdown in Italy and Norway show that because of the severe limitations, 43% of Italians declared to

have suffered from physical symptoms, in particular migraine, sleep disorders, persistent exhaustion, and difficulty of concentration. The level of anxiety tripled, in relation to the pre-pandemic period, and 30% of males and 41% of females declared to have severe levels of depression. Participants with high levels of optimism and hopefulness showed a stronger resilience against anxiety and depression [6], [7]. Similarly, in Indians too, increased anxiety, frustration, panic attacks, insomnia and depression were noted. Factors like being single, student status, prior physical and mental illness, being uncertain about exposure status may act as predisposing factors and add to the growing psychological illnesses [8]–[11]. Keeping the aforementioned evidences in mind, the present study aims to determine changes in physical activity during self-quarantine in the Indian population, and the impact of exercise on psychological health in the country during the same time period of the second lockdown.

2. METHOD

2.1. Research design

The present study was conducted after the approval of the Institutional Ethics Committee (REF: BVDUMC/IEC/30; dated June 30th, 2021). It is a cross-sectional study conducted over a period of three months. For the purpose of data collection, an online Google form web questionnaire with mostly closed ended questions was circulated through Whatsapp messages to personal contacts of the researchers. A generated QR code was presented to the community during field visits to different areas of the city. Snowballing technique was further used to collect data. Before filling the form, the participants consented to a statement of confidentiality, anonymity and a guarantee of the aggregate data being used for research purposes only.

2.2. Population and sample

The sample size estimated was based on a study conducted in Italy [8] taking into consideration standard deviation of 15.3 and mean difference of 2.5. The calculated sample size was 288. Indians fulfilling the inclusion criteria of any gender and occupation, above the age of 18 years (with no upper limit), from numerous cities of the country and knowing the English language were allowed to participate in the study. They were required to have a working smartphone, an internet connection and a Whatsapp account. Consent of anonymity was taken before filling the online questionnaire. Exclusion criteria included participants indulging in more than 150 minutes of physical activity or only performed sitting activities on a normal day of the week and a person with co-morbidities like cardiovascular diseases and risks, or any other condition that prevented them from doing any level of physical activity.

2.3. Data collection

The pre-tested, structured questionnaire administered to the participants comprised of 28 questions under 3 classifications. The primary section contained general information: age, sex, occupation, health restrictions and anthropometric details. The next section covered the questions related to physical activity by using an adapted version of the short form of the international physical activity questionnaire (IPAQ) [12], [13]. The questions related to physical activity were divided under 4 subheadings: strict physical activity, moderate physical activity, walking activities and sitting activities. The time period was restricted to the last four weeks of the second lockdown of India, and the data collected was compared to the physical activity done by the same candidate, before the lockdown was implemented. The last section was based on the short form of the psychological general well-being index (PGWBI) [14], in order to evaluate the psychological well-being of the candidate. This part of the questionnaire comprised of 6 questions, each representing 1 of the 6 psychological conditions-anxiety, depression, positive well-being, self-control, vitality, and general health.

2.4. Data analysis

The collected data using Google form was downloaded as an Excel sheet and used for data analysis. The statistical analysis was done using statistical package for social sciences (SPSS) version 25.0 software. All the quantitative data acquired in the questions for estimating physical fitness was used to calculate physical activity energy expenditure before and during quarantine in metabolic equivalent task minutes per week (MET–min/week). [One MET is approximately 3.5 ml of oxygen consumed per kilogram of body weight per minute]. The given MET average for each type of activity according to the IPAQ scoring protocol was multiplied by the total number of minutes and days per week that the activity was done, to estimate the MET-min/week. The MET-min/week of each strict, moderate and walking activities were added to give a total MET-min/week score to the participant. Furthermore, the MET-min/week was used to categorize the participants into 3 categories of low, moderate and high based on the IPAQ scoring protocol [12].

To calculate the score of PGWBI, each of the options in the 6 multiple choice questions in the last section, were given a score from 0-5. The first option being given a score of 5, the score decreased towards

the last option, thus getting a low score of 0. Hence, the highest possible score of a candidate could be 5×6=30, and the lowest could be 0×6=0. Therefore, the lower a participant's total score, the lower the psychological health of the person. All the scores of each question were used to find the mean score and standard deviation of that question (representing 1 of the 6 psychological conditions-anxiety, depression, positive well-being, self-control, vitality, and general health). Along with this the total PGWBI score was used to find the mean score and standard deviation which was compared using the qualitative data [14], [15].

3. RESULTS AND DISCUSSION

3.1. Results

Chi-square test of significance was used along with Kappa statistics for the agreement graph with level of significance p-value <0.05 (considered significant). Most of the participants (65.29%) were in the age group of 18-25 years. Males (51.2%) and females (48.8%) were almost equally represented. Majority of the participants were students going to college (60.82%) followed by people having their workplace outside their homes (25.77%). As can be seen in Table 1 there is a statistically significant association between the change in IPAQ scores and the age and occupation of the candidate, although it was not seen with sex.

Table 1. Demographic variable by status of IPAQ

Demographic variable	Status of IPAQ score	p-value	Demographic variable	Status of IPAQ score	p-value
Age group (in years)	No change	Negative change in IPAQ	Positive change in IPAQ	Total	
18-25	101	44	45	190	<0.001
	53.16	23.16	23.68		
25-35	9	4	0	13	
	69.23	30.77	0.00		
35-45	18	0	2	20	
	90.00	0.00	10.00		
More than 45	49	18	1	68	
	72.06	26.47	1.47		
Sex (Sex)					
Female	91	27	24	142	0.3403
	64.08	19.01	16.90		
Male	86	39	24	149	
	57.72	26.17	16.11		
Occupation (Occupation)					
Workplace outside	56	15	4	75	<0.001
home	74.67	20.00	5.33		
Home maker	2	4	0	6	
	33.33	66.67	0.00		
Student (college going)	97	37	43	177	
	54.80	20.90	24.29		
Work from home	22	10	1	33	
	66.67	30.30	3.03		
Total	177	66	48	291	

According to Table 2, there is a statistically significant association of the PGWBI score with the age and sex of the participants but not with occupation. A good score is observed in the age group of 18-25 years (18.95%) and in females (19.01%). Table 3 demonstrates that people with high and moderate IPAQ scores had a better psychological health status as compared to the low category.

Figure 1 is the plot of cumulative frequency with two related categorical variables used to show the agreement among the paired observations of IPAQ scores determined before and during the lockdown within the sampled population. The dark blue shaded region shows the density of the population which exactly agrees with the respective category; light blue shows a partial agreement with the category; and the white region shows there is no agreement at all among the subjects of that category. Majority of the region is dark blue and light blue in the low IPAQ score depicting exact to partial agreement. Similarly, in the moderate category partial agreement was observed, while in the high category of IPAQ score there is no agreement observed at all. This means the majority of people among low category agree that they are not affected by the lockdown with respect to their physical activity. Likewise, in the Moderate category majority partially agreed to being affected by lockdown. However, in the high category it is observed that the majority of people agreed to their physical activity potentially being affected.

Table 2. Demographic variable by PGWBI score

Demographic variable	PGWBI score			PGWBI score
Age group (in years)	Bad (>15)	Good (<=15)	Total	
18-25	154	36	190	0.0053
	81.05	18.95		
25-35	12	1	13	
	92.31	7.69		
35-45	19	1	20	
	95.00	5.00		
More than 45	66	2	68	
	97.06	2.94		
Sex (Sex)				
Female	115	27	142	0.0108
	80.99	19.01		
Male	136	13	149	
	91.28	8.72		
Occupation				
Workplace outside home	68	7	75	0.1140
	90.67	9.33		
Home maker	6	0	6	
	100.00	0.00		
Student (college going)	146	31	177	
	82.49	17.51		
Work from home	31	2	33	
	93.94	6.06		
Total	251	40	291	

Table 3. Cross table of IPAQ score and PGWBI score

IPAQ Score During lockdown	N Obs	Variable of PGWBI scoring	Median	Lower quartile	Upper quartile	Quartile range
High	55	Anxiety	4.00	3.00	4.00	1.00
		Depression	4.00	3.00	4.00	1.00
		Positive well-being	3.00	2.00	3.00	1.00
		Self-control	3.00	3.00	4.00	1.00
		General health	4.00	4.00	5.00	1.00
		Vitality	3.00	3.00	4.00	1.00
		Total score	22.00	19.00	25.00	6.00
Low	185	Anxiety	4.00	3.00	4.00	1.00
		Depression	4.00	3.00	5.00	2.00
		Positive well-being	2.00	2.00	3.00	1.00
		Self-control	3.00	3.00	4.00	1.00
		General health	4.00	4.00	5.00	1.00
		Vitality	3.00	3.00	4.00	1.00
		Total score	21.00	17.00	24.00	7.00
Moderate	54	Anxiety	4.00	3.00	4.00	1.00
		Depression	4.00	4.00	5.00	1.00
		Positive well-being	3.00	2.00	4.00	2.00
		Self-control	4.00	3.00	4.00	1.00
		General health	4.00	4.00	5.00	1.00
		Vitality	4.00	3.00	4.00	1.00
		Total score	24.00	19.00	25.00	6.00

The type of physical activity done by most people was under the low IPAQ category (56.36%) which increased during lockdown (63.57%). The IPAQ category of moderate activity showed a drop in numbers from 26.46% to 18.56%. High IPAQ scores were almost the same before and during as inferred from Figure 2.

3.2. Discussion

In the present study, we observed that in the age group of 18-25 years, there was more positive change of IPAQ (23.68%) as seen in Table 1 which may be due to the large subset of this age group (65.29% of sample size). This percentage is comparable to a study among the South Americans by Sadarangani *et al.* [16]. Participants had no change in their IPAQ category which is 60.82%, suggesting that most people tried to keep up with their physical activity while 57.89% of the remaining participants had a negative change in IPAQ which may be suggestive of a probable lowering of psychological health. This is also consistent with studies in Spain, France and Switzerland [17], [18]; and the USA, by Meyer *et al.* [19]. Majority of people grew accustomed to a sedentary lifestyle with less physical activity, fewer daily step counts, and rarely exercise [20]. A relation can be made with the low psychological health that is noticed among all age groups

during lockdown, with 86.25% of the people in the Bad psychological health category as calculated from Table 2. According to a study in the UK by Ingram *et al.* and Haider *et al.* [21], [22], those participants that were less active were associated with a lower negative mood score on their psychological panel which supports this result. The same study forms the basis for this conclusion as they observed an improvement in negative mental health conditions quickly after the easing of lockdown the lowered mental health may be due to confinement, lowered social interactions, and restricted recreational activities [23]. An Italian study by Tommasi *et al.* [6] showed that factors like being single, student status, prior physical and mental illness, being uncertain about exposure status may act as predisposing factors and add to the growing psychological illnesses. Similarly, according to a study in Indians too conducted by Hazarika *et al.* [9], increased anxiety, frustration, panic attacks, insomnia and depression were noted.

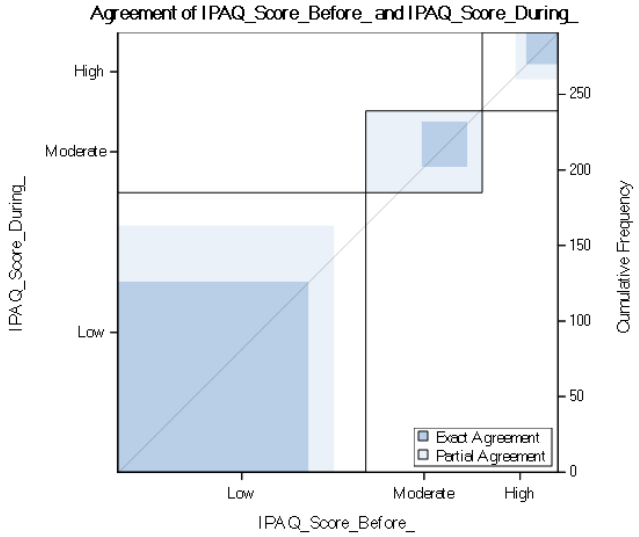

Figure 1. Agreement graph for IPAQ score before and during lockdown

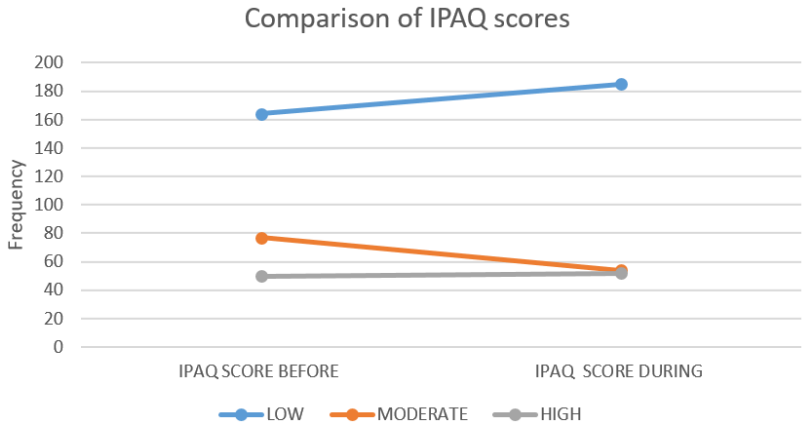

Figure 2. Comparison of IPAQ score before and during lockdown

An almost equal proportion of males and females had no change in their IPAQ status during lockdown which shows that males and females had similar effects resulting from the consequences of the pandemic restrictions. The same can be inferred from the psychological score wherein around 80-90% of both males and females had low mental health. Those with an occupation that required stepping out of the house, mostly had no change in their IPAQ score could be attributed to them being able to keep up with their usual day to day activities compared to those that stayed at home. Students were able to keep up a fairly positive change in their IPAQ category as college hours were less time consuming, whereas those who worked from home or had a business presented with a reasonable negative change which might be a cause of the increased work and adjustment to the new work environment. However, results from a study in the UK by

Ingram, Maciejewski *et al.* [21], is contrasting to this where students had a decreased Physical activity which may be attributed to a higher sample size and a difference in pattern of education and lifestyle. This information is enhanced by other studies such as those conducted in USA and Spain which also suggest a lowering of physical activity among students [24], [25]. Graph-2 suggests that there was an increased frequency in the low-level category of physical activity, which may signify a relative sedentary lifestyle. Table 1 affirms this by the high sample set undergoing a negative change or no change at all in IPAQ category. Observations have been made in a study in Italy by Maugeri *et al.* [10] where the percentage of low active individuals increased by 16.56%. Those present in the high IPAQ category before lockdown continued to preserve their physical health, as observed in Figure 2. This result is reinforced by an article with similar results by Lim and Pranata [20]. Moreover, government guidelines for COVID precautions also recommended a decent level of exercise to keep up their health [26], [27]. Results from Figure 1, can be inferred as the people in the High IPAQ category agreed to being affected the most and hence Table 1 shows a higher negative change in IPAQ scores for all subsets of the sample population, but due to a substantial population having a positive change, the people in the high category remains relatively constant as seen in Figure 2. In India people were encouraged to work out at their homes to maintain their physical and mental health as many other countries like Italy [10], Belgium [28] and France [29], [30].

A reasonable number of people were in the low IPAQ category which may signify people losing their interest of indulging in a regular moderate intensity healthcare activity. Adding on to this, the negative change in the moderate activity scores implies people turning to low intensity workouts and sedentary lifestyle during lockdown. High IPAQ scores were almost the same before and during which may be understood as people with high discipline tried to keep up their physical health during these hard times as also suggested by Figure 1. Sustenance of the high intensity workouts can be credited to desire for feelings of competence and accomplishment which drove their need to continue with their fitness regime despite challenging circumstances [23].

4. CONCLUSION

A co-relation between physical fitness and psychological well-being was found with both positive and negative changes seen in physical activity in different groups of people. There was a drop in the moderate level IPAQ category during lockdown, which may be attributed to people turning to simple workouts to maintain their health, due to lack of facilities during lockdown. The high level IPAQ scores were maintained during lockdown which may be due to the fact that a few participants were already motivated and wanted to keep up their discipline and fitness regime. A high psychological well-being score was noticed in the high and moderate IPAQ category participants indicating that the physical fitness has a positive impact on the psychological health. The findings of the study may not be generalized as snowballing technique was used to enroll participants.

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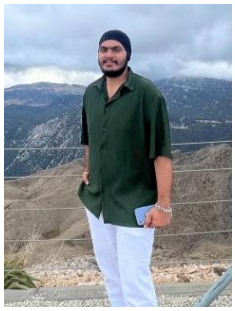

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