DID CHESS PLAYERS HAVE BETTER MENTAL STATE AMIDST THE PANDEMIC? ~ AN ASSESSMENT THROUGH THE DASS INDEX AMONG INDIANS

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Background and Aim: The Covid 19 pandemic has created the most vulnerable health situation, forcing it to change the lives of billions. The main aim of this study is to evaluate the difference in mental health conditions between a chess-playing and non-chess-playing (control) group to determine the positive impacts of the game.

Methods: 400 participants were selected for the study (cases=100, controls=300) during the second wave of Covid-19 in India. An individual with a record of playing chess was included in the case group, while anyone who does not play chess was chosen as the control. This was a voluntary study wherein self-administered google forms were used as questionnaires to obtain data. Internal consistency, categorical analysis using Pearson Chi-Square Test at 95% confidence, t-test for the mean difference of DASS scores, and odds ratio at 95% confidence intervals were assessed.

Results: Internal consistency of the DASS index was high, with Cronbach's alphas of 0.9103 and 0.9443, respectively, for the chess-playing and control groups. Categorical analysis revealed that regularity and intensity had no association in alleviating mental health situations but reduced the risk of mental health deterioration among chess players (OR= 0.3628; 95% CI 0.166-0.789). Independent t-tests revealed significantly lower DASS scores for the chess-playing group concerning depression and total DASS index.

Conclusion: This study has generated preliminary evidence and calls for further research to understand the extent of this positive outcome. Enough evidence in this regard would appeal to the popularization and extensive coverage of chess.

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INTRODUCTION

Mental health is an elementary component of health, including mental well-being, prevention of mental disorders, treatment, and rehabilitation. It helps in the determination of stress-handling and contributes to making healthy choices. Yet, mental health remains a neglected issue in this fast-paced world. The Global Burden of Disease studies has identified mental health (mainly depression and anxiety) as one of the leading causes of disability globally [1]. Globally, there has been a substantial and inordinate increase in depressive and anxiety disorders, most of which have been exacerbated by the prevalence of the COVID-19 pandemic in the recent past [2]. The pandemic led to physical health deterioration and resulted in many psychological disorders instigated by fear, anxiety, depression, or insecurity [3]. The imposition of lockdowns and restrictive isolation has been a source of significant anxiety, anger, confusion, and stress among the patients [4].

Considering the pre-pandemic phase in an Indian context, as of 2017, 197.3 million Indians (about 14.3% of the total population) were suffering from numerous mental disorders [1]. These included depression, anxiety disorders, autism, and bipolar disorders. 45.7 million suffered from depression, and 44.9 million had anxiety disorders [2]. The economic loss resulting from mental health conditions is USD 1.03 trillion between 2012-2030[5]. Anxiety disorders (AD) and depression are much more impactful than adjustment disorders relating to a stressful event or change in life [6]. The Depression Anxiety Stress Scales (DASS) is a critical methodology concerning a tripartite model of anxiety, depression, and stress [7, 8]. Created by Lovibond (1993), this instrument is used as a subjective assessment for patients suffering from anxiety and depression [7] and figuring out the perceived severity of symptoms associated with depression, anxiety,

and stress [9]. The DASS index evaluates the emotional indications using a 4 Likert scale with 0 to 3. The three subscales, namely depression, anxiety, and stress, are scored by adding total item scores. The severity of the mental burden increases as the score rises. The original 42-item DASS of Lovibond has recently been modified into a briefer 21-item version [10] to provide a concise self-report measure of the indications. Several studies published worldwide confirm the reliability and validity of this measure and assure that DASS-21 is a well-established instrument in clinical and non-clinical samples [11,12,13].

Chess is viewed as a highly multifaceted game demanding cognitive training and expertise [14]. Chess players are often pigeonholed to be exceptionally intelligent or gifted with exceptional skills. Indeed, a few studies have associated the degree of intelligence with the psychometric aspects of chess players [15]. Positive outcomes arising from playing chess have fascinated researchers for a long time. Many studies have been conducted relating to the long-lasting impact of chess on memory, intelligence, and creativity [16, 17]. Chess instruction is believed to uplift the mathematical abilities of primary and middle school students. The "Chess Effect" Hypothesis has received much scientific support to withhold the mentioned claims. Apart from providing support through cognitive skill-building, chess acts as a valuable treatment to prevent or protect mental illnesses before disease onset. According to scientific research, chess affects specific areas of the human brain, the stimulation of which shifts with the problems faced by players in due course of the game [18]. Researchers have also correlated between playing chess and reducing the possibility of developing dementia, AD, and other incapacitating mental illnesses. People over 75 age indulging in leisure activities such as chess leading to brain stimulation are much less likely to develop signs of dementia than the people who did not

play [19]. Being considered a sport requiring massive psychophysiological efforts from players exposed to unusually high stress and cognitive load [20], chess is supposed to adapt to cope with hardships. Prior neuropsychological studies have shown the benefits of chess practice in executive functions, facilitating the adaptation to complex, non-routine situations [21]. Hence, chess players show exceptional aptitude for forecasting, self-control, coping, and problem-solving domains of life. According to existing literature, since mind-stimulating leisure activities like chess have been associated with reducing the development of mental illnesses, it is seen as a protective factor for prevention and after diagnosis. In line with these researches, we try to dig deeper into a chess player's mind and investigate their abilities to tackle adverse situations. As the Covid-19 pandemic has established itself as a situation of existential crisis, a chess player's personality, which is believed to modulate stress and cognitive relationships [22], is worth studying. The main focus of this study is on the effects of confinement and other restrictions due to Covid-19 on the mental state of chess players and compares it with a non-chess playing control group through a self-administered DASS index.

DATA AND METHODS:

This study was conducted on Indian residents during the peak of the second wave of the Covid-19 pandemic (May 2021). During those tough hours, the country had seen about 4 lakh daily cases, thousands of deaths, and an overwhelmed medical health condition. People were under severe stress due to worrying about financial situations, loss of employment, restrictions on venturing out, and threats to life. This study captures the worsening state of mental health experienced by the citizens during times of extreme crisis.

Cases: We have defined a case as any individual who has been exposed to the game of chess at any point in their lifetime and has played tournaments and trained seriously over a substantial period. Chess players from all over India were eligible to participate in this study. Many individuals had developed a passion for playing chess through online mode, mainly after the lockdown of the country due to the Covid crisis in March 2020. Although not professionals in their lifetime, these players were regularly in touch with the game through playing online tournaments or friendly matches. Such players were also eligible to participate in this study. Among the 100 cases who had willingly enrolled for the study, categories on their weekly duration of chess practice were noted. These categories included:

I play and prepare each and every day (professional players)

Sometimes (<4 days a week, but are professional players)

I play chess at times, but not regularly-This includes non-professional players enjoying the game or playing online at times but not at professional tournaments.

Controls: A potential control was any individual residing in India during the second wave of the Covid-19 pandemic. Controls were recruited from a variety of backgrounds, occupations, and regions. The total number of individuals in the controls arm was 300. Cases and controls were purposefully recruited from areas of a high incidence of the SARS-CoV-2 virus where maximum stress related to mental health was likely to occur.

Matching: Cases and controls were matched by the place of residence, i.e., India.

Data Collection: Written informed consent was obtained, and the authors conducted structured interviews using Google forms. Answers from the participants were saved digitally and later analysed. In particular, the questionnaire asked about gender, age, infection from SARS-CoV 2 virus (if any in the last two weeks), chess-playing status (only for the case group), and questions from the DASS-21 index questionnaire. DASS-21 index

is a self-report questionnaire consisting of 21 items consisting of 7 items per subscale: depression, anxiety, and stress. Participants were required to score every item on a scale from 0 (did not apply to me at all) to 3 (applied to me very much). Final sum scores were obtained by summing up all the scores per items per (sub)scale. Sum scores for each of the subscales may range from 0 to 21. Cut-off scores of 13, 9, and 16 were considered cut-off points for extremely severe depression, anxiety, and stress. The cut-off scores were derived from severity ratings as suggested by Lovibond and Lovibond [7]. For both cases and the control group, we have relied on the self-reported assessment of their mental state.

Statistical Analysis:

The data for the 21 items of the DASS 21 were screened for missing values, and then the DASS-21 scale index was summed up to arrive at a single score for three areas-depression, anxiety, and stress, concerning each individual. A chi-square test was performed to examine the association between chess playing status and mental health. An odds ratio (OR) at 95% confidence intervals was performed to evaluate the lesser effects of the combined score of depression, anxiety, or stress in chess players. We have calculated the OR based on the total DASS score in both groups. Severe to extremely severe states was considered the threshold for this purpose. To ensure the validity of the parametric test, normality was assumed to estimate that the distribution of means across samples is normal. An internal consistency check of both the groups was conducted through the computation of Cronbach alpha, which is mathematically expressed as:

$$\alpha = \frac{N\bar{c}}{\bar{v} + (N-1)\bar{c}}$$

Here, N is equal to the number of questions of the study in each group, $\bar{c}$ is the average inter-item covariance among the questions, and $\bar{v}$ is the average variance. Finally, a two-sample t-test was applied to test the significance of the difference in the DASS index between the case and control groups with a 5% level of significance. Data were analysed using MINITAB-17, SPSS-26, and MS-Excel.

RESULTS:

Table 1 reveals the background characteristics of the study. The study is mainly represented by men only (82% among the chess player, while 48% are female among the control arm. The mean age of chess players was 21.9 years between the age cohort 7-52 years for the chess-playing group as against the non-chess-playing group, whose mean age was 25.7 years between 15-72 years. Considering the pandemic situation in the country at the time of the study, it was found that a total of 34 participants (among both groups) had tested positive for Covid-19 in the past 14 days. The case-positivity rate for this sample group stood at 8.5%. The majority of chess players reported practicing chess each day (46%), followed by 25% of cases sometimes practiced (less than four days a week), and 29% played chess but not regularly.

Table 1: Percentage distribution of study participants according to background characteristics

	No. of Subjects - Chess Players (n=100)	No. of Controls - Non-Chess Players (n=300)	P-Value
Sex			
Male	82.0	51.3	0.000
Female	17.0	48.0	
Other	1.0	0.7	
Age Group			0.000

<20 years	31.0	5.3	
20-29 years	60.0	79.3	
Above 30	9.0	15.3	
Covid Status			
Infected	3.0	10.3	0.023
Not Infected	97.0	89.6	
Chess Playing Status			
Play and prepare each and every day	46.0	-	
Sometimes (<4 days a week)	25.0	-	-
I play chess at times, but not regularly	29.0	-	

Preliminary screening for missing values was performed, wherein no such anomalies were found. **Table 2** represents the mean scores for the DASS-21 items list and their distribution parameters for both groups. This table indicates that the distribution of each item showed a positive skewness. The normality of the distributions was assumed at the univariate level.

Table 2: Mean and Standard Deviation of DASS-21 scores for the two groups
Note: (a) denotes anxiety; (s) denotes stress; (d) denotes depression

Question No.	Abbreviated Item	CHESS PLAYERS		NON-CHESS PLAYERS	
		Mean	Standard Deviation	Mean	Standard Deviation
1	Hard to relax (s)	1.4	0.9	1.5	1.0
2	Dryness of my mouth (a)	0.7	0.9	0.7	1.0
3	No positive feeling at (d)	1.2	1.0	1.3	1.0
4	Breathing difficulty (a)	0.5	0.8	0.4	0.8
5	No initiative to do things (d)	1.4	1.1	1.5	1.1
6	Over-react (s)	1.3	1.0	1.4	1.1
7	Trembling (e.g., in the hands) (a)	0.4	0.7	0.5	0.9
8	Nervous energy (s)	1.0	0.9	1.7	1.1
9	Panic and make a fool of myself (a)	1.0	1.0	1.2	1.1
10	Nothing to look forward to (d)	1.0	1.0	1.1	1.1
11	Agitated (s)	1.2	1.0	1.3	1.1
12	Difficult to relax (s)	1.3	1.0	1.4	1.1
13	Down-hearted and blue (d)	1.0	1.0	1.2	1.1
14	Intolerant (s)	1.0	1.0	1.2	1.0
15	Close to panic (a)	0.9	0.9	1.1	1.1
16	Unable to become enthusiastic (d)	1.2	1.0	1.4	1.1

17	Not worth much (d)	0.9	1.0	1.2	1.1
18	Touchy (s)	0.9	0.9	1.1	1.1
19	Action of heart (a)	0.8	1.0	0.8	1.1
20	Scared without reason (a)	0.9	1.1	1.0	1.1
21	Life meaningless (d)	0.9	1.1	1.0	1.1

Cronbach alpha is satisfactorily high in both the case and control groups ($\alpha_c = 0.9103, \alpha_{NC} = 0.9443$); α_C signifies Cronbach alpha coefficient of chess players and illustrates Cronbach alpha coefficient of the control group). Categorical analysis was performed to understand the effect of the regularity of chess playing status and the impact of Covid-19 on DASS indices. The association of the duration of chess played with depression, anxiety, and stress index has been shown in **Table 3**. As can be seen, none of the P-values is less than 0.05, indicating a non-significant result. Thus, no association has been found between the consistency of chess practice to any of the DASS indice.

Table 3: Categorical Analysis of the effect of Regularity of Chess Playing Status on DASS Indices

DEPRESSION LEVEL							
	Mild	Moderate	Normal	Severe	Extremely Severe	All	P-Value
I play and prepare each and every day	5	11	17	8	5	46	
Sometimes (<4 days a week)	1	7	9	2	6	25	0.751
I play chess at times, but not regularly	4	5	11	5	4	29	
All	10	23	37	15	15	100	
ANXIETY LEVEL							
	Mild	Moderate	Normal	Severe	Extremely Severe	All	P-Value
I play and prepare each and every day	1	10	20	3	12	46	
Sometimes (<4 days a week)	0	3	16	2	4	25	0.198
I play chess at times, but not regularly	4	6	12	3	4	29	
All	5	19	48	8	20	100	
STRESS LEVEL							
		More than Moderate		More than Severe		All	P-Value
I play and prepare each and every day		35		11		46	0.528

Sometimes (<4 days a week)	19	6	25	
I play chess at times, but not regularly	25	4	29	
All	79	21	100	

Increased incidence of deplorable mental conditions (high score of DASS-21 index) was prominent in the control group (**Table 4**); for a

severe to extremely severe DASS score, the odds ratio for the chess-playing group was found to be 0.363 (95% CI 0.166-0.789).

Table 4: Odd's Ratio showing the effect of chess playing on mental health

	Odd's Ratio
Non-Chess Player®	1
Chess Player	0.363***(0.166,0.789)

®: Reference Group; ***: p<0.01

Independent-sample t-tests revealed that chess players obtained significantly lower scores than the control group on the depression subscale and even for the total of the three

subscales (**Table 5**). The anxiety and stress subscale difference did not achieve statistical significance.

Table 5: t-test showing the difference in components of mental health between chess players and non-chess players

	Chess Players		Control Group		P value
	Mean	Standard Deviation	Mean	Standard Deviation	
Depression	7.52	5.44	8.64	6.09	0.043
Anxiety	5.1	4.41	5.77	4.73	0.098
Stress	7.99	4.69	8.93	5.84	0.053
Total Scale	20.6	12.3	23.3	15.4	0.037

Discussion: In this study, we have evaluated the long-term effect of chess in upgrading the mental health conditions of individuals while dealing with an unprecedented crisis. DASS score, as a whole, is seen to show better results in the selected chess-playing subjects indicating a healthier mental state. The study has disclosed that the regularity status of practicing or playing chess did not affect DASS indices whatsoever. Thus, since all results obtained in this study points to a positive benefit reaped from the game, it is essential to understand that the intensity of practice or regularity had no specific impact

on improving mental health conditions. One of the many benefits of the game of chess has been illustrated in this study. The findings also clarify that a non-chess-playing individual is more likely to suffer from depression, anxiety, or stress under extreme, hostile circumstances. It has also been found that the moderate depression and total DASS scores were significantly lower for chess players. This suggests any individual who was introduced to the game and had frequent exposure to it was less likely to experience mental health crises than their non-chess-playing counterpart.

Our study has several limitations like study it is a self-administered questionnaire. At the same time, patients who had suffered from Covid-19 in the past 14 days may not have been able to explain their plummeting mental health conditions, leading to a possibility of recall bias. A moderate to high inter-correlation between the DASS indices was found in our study. However, the effect of Covid-19 seemed to have a statistically significant impact only on the status of depression. No impact of Covid-19 on stress and anxiety creates a paradoxical situation as there exists moderate association among the DASS indices. The sample size of our study was presumably small. Considering a vast country like India, case-control studies like this need to have a larger sample. More studies in this line are required to properly determine the actual extent of the benefits of the game with more details on socio-economic and bio-demographic characteristics.

This study suggested that chess playing has a deterministic positive impact on mental health. To address the validity of this study, further research involving a large sample is called for. A possible and better approach to understanding an effect on mental health would be to perform a randomized controlled trial (RCT) by teaching chess to apprentices and analysing their mental health conditions before and after the study period. If more evidence is found, steps to promote the game and popularize it among the masses must be thoroughly considered. Chess education may be made compulsory in schools. More funding and publicity are required to motivate individuals to learn the so-called "boring game," which may have several beneficial characteristics.

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