



# How does the COVID-19 Outbreak in Saudi Arabian Affect PA Behavior and Psychological Health of Females Compared to the Men Population?

RESEARCH

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## ABSTRACT

Since the beginning of the COVID-19 pandemic, researchers and scientists in different domains have tried to study the various aspects of this virus to identify a future solution and strategy for managing similar crises. Physical activity and psychological health were the most important subjects. Our research aimed to explore the change in physical activity behavior in Saudi citizens during the COVID-19 outbreak and its relationship with psychological health in the three most affected regions of Saudi Arabia. The questionnaire was designed by multidisciplinary academic specialists in physical activity and psychology and shared in the Arabic language through an electronic form. The participants were 2980 volunteers, including 1508 women and 1472 men participate in this study. Results show a significant relationship between PA groups, gender variables and psychological health. The percentage of active females increased from 40% to 50% during the COVID-19 outbreak compared to before. Active women seem less affected in psychological health by confinement than inactive women and men. We found a significant difference between active and inactive women, in depression level, Anxiety and somatic symptoms. In conclusion, this study highlighted the importance of physical activity during the COVID-19 outbreak in KSA specially for women. It also suggests that physical activity can be a solution to fight the negative effect of future similar pandemics on psychological health.

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## 1. INTRODUCTION

Since the announcement of the World Health Organization declaring COVID-19 as a Mondial pandemic, many researchers in different domains have explored the multiple effects of the confinement caused by the COVID-19 virus on the psychological, mental, and social aspects and sedentariness. This disease has caused a long period of confinement with total social restriction. Consequently, the lifestyle of people has been negatively affected, and chronic diseases, as well as mental and psychological problems, have appeared. Several studies try to determine the consequences of the COVID-19 outbreak on lifestyle behaviors, social participation, and life satisfaction (Rogowska et al., 2020; Bentlage et al., 2020), mental and psychological health (Huckins et al., 2020; Zhang et al., 2020; Ammar et al., 2021), sleep quality (Trabelsi et al. 2021), digital technology (Bastoni et al., 2021) and physical activity behavior (Violant-Holz, et al., 2020; Akbari et al., 2021, Meyer et al., 2020). These studies established the negative effect of the COVID-19 outbreak on anxiety, stress, sleep disorders, social isolation, and psychological well-being.

Importantly, several research projects (Lesser et al., 2020, Bentlage et al., 2020; Trabelsi et al. 2021) present physical activity (PA) as a coping strategy that can improve mental and psychological health and maintain an active lifestyle during the COVID-19 pandemic. Given to Violant-Holz, et al., 2020, one hundred eighty papers exposed an association between the confinement caused by COVID-19, mental health distress (stress, anxiety, depressive symptoms, social isolation, and psychological distress) and physical activity. Additionally, the percentage of sedentariness was continually augmented because of the mobility restriction imposed by health authorities (Meyer et al., 2020). Moreover, Maugeri et al., (2020) states that active individuals practiced more outdoor PA and had higher mental health scores than inactive participants had. As well, Pieh et al., (2020) analyses PA as a coping strategy and they prove that a low PA was associated with mediocre mental well-being. Results confirmed that active participants expressed the best psychological well-being. Thus, PA and mental health seems significantly related. In contrast, the results of Ozdemir et al., (2020) study showed a weak negative relation between PA and quality of life. The literature review (Bentlage et al., 2020, Rogowska et al., 2020) claims that PA improves social integration, sleep quality, mental health, and psychological well-being. On the other hand, some researchers (Akbari et al., 2021) present physical activity as a preventive strategy for a future pandemic.

In Saudi Arabia (KSA), several studies confirm the results found in different countries in the world and indicate that the negative lifestyle behavioral changes caused by confinement were significantly associated with stress and anxiety (Alamri et al., 2020; Boughattas and Tolba, 2021; Abd El-Fatah et al., 2022). The study of Alfawaz et al., (2021) show that 58% of the participants suffered from anxiety, depression, and insomnia. Moreover, it seems that there was “evidence of psychological distresses” among the adults in KSA (Alfawaz et al., 2021). Authors suggest that it is necessary to adopt effective health promotion strategies. Extensive research was conducted to find a solution for the negative effect of the COVID-19 outbreak in Saudi Arabia. PA appeared as the best solution for mental and psychological health. The results of (Alotaibi et al., 2021) study conclude that participants who do not practices PA present anxiety disorders, especially women. On the other hand, Asdaq et al., (2020) research confirms a significant change in PA and dietary habits of adult’s females in KSA. Finally, Alzamil et al., (2019) study focused only on Saudi women and shows a high percentage of inactive women directly associated with increased anxiety, stress, and depression. The authors suggest urgent psychological counseling for Saudi females.

In reality, sedentariness and physical activity, in KSA, are becoming more important in society day by day because of unhealthy lifestyle habits and a higher percentage of obesity, especially in females. Many studies (Al-Hazzaa, 2018, Al-Zalabani et al., 2015) reported that women were less active than men. Rather, they together present a very low daily time of PA practices. According to Saudi statistics (Al-Hazzaa, 2018), the youth in KSA present a minimal percentage of practices when compared to the Mondial overage. Al-Hazzaa (2018) affirms that the percentage of inactive women in KSA exceeds 80%. Saudi men are more likely to practice PA, in contrast to females. The culture of the practice of PA is not yet prevalent among women, families, and society. Another study of the PA profile in KSA indicates that unhealthy lifestyle habits, including physical inactivity, were prevalent in Saudi female college students.

Given this specific context, this study was, as a part of the overall framework of COVID-19, specifically on mental and psychological health in relation to PA, designed and conducted to explore, exclusively, the effect of the COVID-19 outbreak on Saudi women’s lifestyle, especially on their psychological health and PA behavior, in comparison to men. Its objective is to highlight the effect of the COVID-19 outbreak on the psychological health of females in comparison to males. This study also investigates the impact of PA on the psychological health of women during the same period. We hypothesize that the COVID-19 pandemic has affected the psychological health and PA behavior of female Saudi citizens more than that of men.

## 2. METHOD

### 2.1. PARTICIPANTS

For this study, the population consisted of citizens from the three most affected regions in KSA during the COVID-19 outbreak (Makkah El moukaramah, Riath; and Madinnah el mounawarrah). The sample involved 2980 participants aged between 18 and 65 years with an average of 33.4 years (M = 33,4, ET = 5,88). All participation was voluntary, and participants were permitted to provide only their region because it is the only criteria for including them. This population included 1508 women (50.6%) and 1,472 men (49.4%). According to the demographic information, most participants were employed (46%), especially men (52.8%), as presented in Table 1.

DEMOGRAPHIC VARIABLE	TOTAL (N/%)	MALES (N/%) (1472)	FEMALES (N/%) (1508)
<b>Region</b>			
Makkah El moukaramah	1408 (47,2)	652 (46,3)	756 (53,7)
Riath	970 (32,6)	575 (59,3)	395 (28,1)
Madinnah el mounawarrah	602 (20,2)	245 (40,7)	357 (59,3)
<b>Age</b>			
24–18	781 (26,2)	131 (16,8)	650 (83,2)
35–25	373 (12,5)	169 (45,3)	204 (54,7)
45–36	774 (26,0)	484 (62,5)	290 (37,5)
55–46	720 (24,2)	575 (79,9)	145 (20,1)
55+	332 (11,1)	113 (34,0)	219 (66,0)
<b>Social situation</b>			
Married	2462 (82,6)	1375 (55,8)	1087(44,2)
Divorced/single	518 (17,4)	97 (18,7)	421 (81,3)
<b>Level of education</b>			
High school graduate	583 (19,6)	187 (31,9)	397 (68,1)
University graduate	2397 (80,4)	1286 (53,7)	1111 (46,3)
<b>Employment</b>			
Student	1127 (37,8)	425 (37,7)	702 (62,3)
Employed	1387 (46,5)	733 (52,8)	654 (47,2)
Retired	466 (15,6)	314 (67,4)	152 (32,6)
<b>Chronic disease</b>			
Yes	956 (32,1)	626 (65,5)	330 (34,5)
No	2024 (67,9)	846 (41,8)	846 (41,8)

**Table 1** Demographic characteristic of participants.

### 2.2. MEASURES (SURVEY)

Participants were invited to complete a questionnaire containing three parts. In the first section, we asked them about their sociodemographic characters (seven items: region, age,

gender, level of education, marital status, job and health situation). In the second section, participants were asked about their physical activity behavior using four items. The third section includes items related to the adopted Arabic psychological health questionnaire (29 items).

This survey was designed, reviewed, and edited by a group of academic specialists in physical activity and psychology with the help of two linguists, based on existed Arabic version of psychological health evaluation and physical activity measurement. A pilot study conducted during the design of this survey to verify the psychometric properties of the measuring instruments. Statistical analysis showed good to excellent test-retest reliability coefficients for different questionnaire dimensions ( $r = 0.81-0.95$ ).

### 2.2.1. Physical activity evaluation

We asked participants to report information about the frequency and duration by a week of different types of physical activity (aerobic exercises, walking activities, bicycling, or exercises at home) practices before and during confinement. Four items evaluated the level of PA before and during the COVID19 confinement.<sup>1</sup> We first asked the participants: (1) “before the COVID-19 outbreak, how many days per week did you practice physical activity?” (2) “During the COVID-19 outbreak, how many days per week did you practice physical activity?”, Participants’ responses for these two questions were ranked on an 8-point scale ranging from 0 to 7 days, (3) “before COVID-19 outbreak, how many minutes per day did you practice physical activity?”, (4) “During the COVID-19 outbreak, how many minutes per day did you practice physical activity?” These two items were an open questionnaire, and participants had to write a response by stating the average duration of PA practice per day. Responses were converted to an average score of PA practices, calculated by multiplying the number of days by the number of minutes/days (Ammar et al., 2021). Based on their average, the participants were classified into two different groups active, if more than 150 min by week, and inactive, if less than 150 min by week (Rogowska et al., 2020).

### 2.2.2. Psychological health evaluation

We adopted the Arabic version for the symptomatic distress questionnaire, the SCL test (Abdel-Khalek, 2012), to the context of this study (COVID-19 outbreak). The questionnaire used in this study was employed in previous similar research in KSA (Boughattas and Tolba, 2021, Alhwimani et al., 2021) to detect the existence and level of symptoms of psychological distress. It allowed the measurement of all psychological parameters needed to access the effect of covid-19 on psychological and mental health. This survey measured the psychological symptoms of the confinement based on five dimensions: anxiety (ANX, seven items, which reflects anxiety symptoms and tension),<sup>2</sup> depression (Dep, five items, which reflects depressive symptoms, as well as lack of motivation<sup>2</sup>), obsessive-compulsive disorder (OBS, five items, which reflects obsessive-compulsive symptoms<sup>2</sup>), interpersonal sensitivity (INT, seven items, which reflects feelings of personal inadequacy and inferiority in comparison with others<sup>2</sup>), and somatic symptoms (SOM, seven items, which reflects distress arising from bodily perceptions<sup>2</sup>). We asked the participant to choose, according to a five-point Likert scale, from 1 = “Never” to 5 = “Always”, the responses corresponding to their sensations during the COVID-19 outbreak. As we explained, this questionnaire constitutes the third part of the survey used in this study, in which the psychometric character was statistically verified ( $r = 0.81-0.95$ ).

## 2.3. PROCEDURE

Given the unique conditions during the preparation of this study (COVID-19 outbreak), we opted an electronic survey (Google forms) to collect data for this research. This survey is conforming to the recommended standards for conducting and reporting web-based surveys (CHERRIES) (Muller et al., 2021). A summary of the setting and the objective of the survey is included on the first page, along with the information ethics. The electronic survey granted the anonymity and confidentiality of the participants’ answers via Google’s privacy policy (Eysenbach 2004).

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<sup>1</sup> During the COVID-19 outbreak: is a prevention measures for health crises, consisting on lockdown policies for all citizens except for essential services (Violant-Holz et al., 2020).

<sup>2</sup> Urbán, R., et al., Bifactor structural model of symptom checklists: SCL-90-R and Brief Symptom Inventory (BSI) in a non-clinical community sample. *Psychiatry Research* (2014).

All the participants were requested to be as sincere as possible in their responses. We specify that these responses were used only for research purposes. They were not authorized to deliver any personal information that was not demanded in this study such as their names or contact information. Moreover, the participants had to complete all the sections of the electronic survey, acknowledging their voluntary participation. The survey was shared through social media tools (WhatsApp and e-mail).

## 2.4. STATISTICAL ANALYSIS

All statistical analyses for this study were performed using SPSS (version 26). The reliability of the instruments was estimated by factor analysis, and Cronbach alphas were computed. Participants' characteristics were described by means and by standard deviations (SD) for continuous variables and percentages for categorical variables. Participants were classified according to their gender and physical activity (PA) level. The chi-square and t-test were applied to compare the categorical and numerical variables between gender and PA behavior. Then, we use the paired samples t-tests to estimate a significant difference in the level of PA behavior between "before" and "during" the confinement period. After that, a series of two-way ANOVA was performed to assess the difference in PA levels between women and men and their level of psychological health. A partial eta-squared ( $\eta^2$ ) was used to verify the effect of size by describing the variance ratios enlightened in the dependent variable by a predictor in the ANOVA model. A Pearson's correlation coefficient ( $r$ ) analysis was applied to examine the associations between psychological health variables, PA, and gender variables. Multiple linear regression was accomplished to assess the association of psychological health (dependent variable), with sociodemographic variables (gender) and change in PA. A  $p$ -value  $\leq 0.05$  was considered statistically significant.

## 3. RESULT

### 3.1. CHANGE IN PA BEHAVIOR

Table 2 presents the statistical data relative to PA practice status in Saudi participants in this study, based on gender variables. Participants who practice physical activity (PA) more than 150 min by week are considered "active". Before the COVID-19 outbreak, men are more active than women, contrary to during quarantine; results show a slightly higher percentage (women 49%/men 51%) of active and inactive women and men.

PERIOD	PA GROUP	FEMALE		MALE		ALL PARTICIPANTS	
		N	%	N	%	N	%
Before covid -19	Active (>150 mn)	602	40,2	894	59,8	1496	50,2
	Inactive (<150 mn)	906	61,1	578	38,9	1484	49,8
During outbreak	Active	1290	49,6	1313	50,4	2603	87,3
	Inactive	218	57,8	159	42,2	377	12,7

**Table 2** Change in Pa practice status (active/inactive) based on gender variables.

Table 3 presents the descriptive statistics of PA groups based on gender and sociodemographic variables. First, the participants from "Madinah El Munawara" show the lowest percentage of active people, especially females (0% women) before COVID-19. However, during the COVID-19 outbreak, we registered a radical change in PA behavior (active people, 100% women). For the other regions of KSA, we note that men in "Makkah El moukaramah" were more active than women before and during the COVID-19 outbreak, contrary to the "Riyadh" region, which demonstrates a higher percentage of active women before COVID-19 and a rate very close to that during confinement.

In the second place, the age variable was not related to the gender variable. The result demonstrates an identical percentage for active and inactive women, for most of the age categories, before and during the COVID-19 outbreak. Except for people aged 36 to 45, women were more inactive before COVID-19. We note that married women were more active before the COVID-19 outbreak for the social situation variable. However, no difference is noticed

DEMOGRAPHIC VARIABLE	GENDER VARIABLE	BEFORE COVID-19		DERING OUTBREAK	
		NOT ACTIVE	ACTIVE	NOT ACTIVE	ACTIVE
<b>Region</b>					
Makkah El moukaramah	Male	232 (35,6)	420 (64,4)	32 (5,2)	620 (95,1)
	Female	379 (50,1)	377 (49,9)	167 (28,4)	589 (77,9)
Riath	Male	112 (19,5)	463 (80,5)	116 (25,3)	459 (79,8)
	Female	170 (43,0)	225 (57)	51 (14,8)	344 (87,1)
Madinnah el mounawarrah	Male	234 (95,5)	11 (4,5)	11 (4,7)	234 (95,5)
	Female	357 (100)	0 (0)	0 (0)	357 (100)
<b>Age</b>					
24–18	Male	87 (66,4)	44 (33,6)	26 (24,8)	105 (80,2)
	Female	419 (64,5)	231 (35,5)	147 (29,2)	503 (77,4)
35–25	Male	120 (71,0)	49 (29)	39 (30)	130 (76,9)
	Female	104 (51,0)	100 (49)	48 (30,8)	156 (76,5)
45–36	Male	240 (84,5)	44 (15,5)	3 (13,6)	646 (88)
	Female	122 (42,1)	168 (57,9)	9 (3,2)	281 (96,9)
55–46	Male	319 (55,5)	256 (44,5)	34 (28,1)	250 (78,1)
	Female	90 (62,1)	55 (37,9)	58 (66,7)	87 (60)
55+	Male	82 (72,6)	31 (27,4)	0 (0)	97 (100)
	Female	71 (32,4)	148 (67,6)	4 (1,9)	215 (98,2)
<b>Social situation</b>					
Married	Male	47 (38,4)	847 (61,6)	148 (12,1)	1227 (89,2)
	Female	225 (82,0)	196 (18,0)	106 (10,8)	981(90,3)
Divorced/ single	Male	50 (73,2)	528 (26,8)	11(12,8)	86 (88,7)
	Female	681 (21,6)	406 (78,4)	112 (36,2)	309 (73,4)
<b>Level of education</b>					
High school graduate	Male	88 (47,3)	98 (52,7)	82 (48,8)	104 (55,9)
	Female	198(49,9)	199 (50,1)	100 (33,7)	297 (74,8)
University graduate	Male	71 (37,9)	26 (62,1)	77 (6,4)	1209 (94)
	Female	91 (63,7)	330 (36,3)	118 (11,9)	993 (89,4)
<b>Employment</b>					
Student	Male	140 (32,9)	285 (67,1)	65 (18,1)	360 (84,7)
	Female	338 (48,1)	364 (51,9)	185 (35,8)	517 (73,6)
Employed	Male	357 (48,7)	376 (51,3)	58 (8,6)	675 (92,1)
	Female	503 (76,9)	151 (23,1)	76 (13,1)	578 (88,4)
Retired	Male	81 (25,8)	233 (74,2)	36 (12,9)	278 (88,5)
	Female	65 (42,8)	87 (57,2)	0 (0)	152 (100)
<b>Chronic disease</b>					
Yes	Male	441 (70,4)	185(29,6)	85 (15,7)	541 (86,4)
	Female	177 (53,6)	153 (46,4)	134 (41,6)	196 (59,4)
No	Male	405 (47,9)	441 (52,1)	74 (9,6)	772 (91,3)
	Female	729 (86,2)	117 (13,8)	134 (18,8)	712 (84,2)

**Table 3** Change in Pa practice status (active/inactive) based on gender variables and sociodemographic variables.

between the percentage of active and inactive people during confinement for married people (women/men) and single participants (men/women).

Concerning the variable “level of education,” university graduated women present a higher percentage of inactivity compared to men in the same category and with school graduates who did not show any change in PA behavior before and during the COVID-19 outbreak. Before confinement, employed and retired men were more active than women and students (women and men). However, we observe a very high percentage of active people for all employment situation variables, men, and women.

Finally, comparing women and men based on the “chronic disease” variables demonstrates that women who suffered from chronic disease were more active than men before the COVID-19 outbreak. The same was noted for men without chronic disease. During the COVID-19 outbreak, men suffering from chronic disease became more active than women. For the other categories, women present the same percentage.

### 3.2. PA AND PSYCHOLOGICAL HEALTH

Table 4 establishes the result of the two-way ANOVA test with the psychological health variable as the dependent variable and gender and PA groups (active/inactive) as independent variables. We find that interaction between PA and gender variables was statistically significant. The result demonstrates a significant difference between women/men and active/inactive persons for the majority of the psychological health variables. We note that both PA groups and gender variables were statistically significant factors for anxiety, obsessive-compulsive disorder, and somatic symptoms. Inactive men were more anxious than inactive and active women. The same was observed for the obsessive-compulsive disorder and somatic symptom variables. Moreover, the results show that inactive women present a higher level of anxiety, obsessive-compulsive disorder, and somatic symptoms than active women do, contrary to men who, whether active or inactive, present a similar level for these three variables.

VARIABLES	FEMALE		MALE		ANOVA				
	M	SD	M	SD	EFFECT	F	P	$\eta_p$	
Anxiety	<b>PA groups</b>				<b>S</b>	29,05	<,00	,01	
	<b>Active</b>	3,46	0,96	3,86	0,81	<b>PA</b>	10,87	,00	,00
	<b>inactive</b>	3,74	0,83	3,89	0,77	<b>S X PA</b>	15,81	,00	,00
Depression	<b>PA groups</b>				<b>S</b>	17,03	<,00	,00	
	<b>Active</b>	3,29	0,91	3,91	0,82	<b>PA</b>	94,93	,00	,00
	<b>inactive</b>	3,75	0,82	3,50	0,30	<b>S X PA</b>	,26	,60	,00
Obsessive-compulsive disorder	<b>PA groups</b>				<b>S</b>	75,07	<,00	,02	
	<b>Active</b>	<b>3,29</b>	<b>0,95</b>	3,89	0,79	<b>PA</b>	24,44	,00	,00
	<b>inactive</b>	<b>3,68</b>	<b>0,79</b>	3,85	0,27	<b>S X PA</b>	15,92	,00	,00
interpersonal sensitivity	<b>PA groups</b>				<b>S</b>	35,80	<,00	,00	
	<b>Active</b>	3,29	0,95	3,89	0,79	<b>PA</b>	6,30	,01	,00
	<b>inactive</b>	3,68	0,79	3,85	0,27	<b>S X PA</b>	5,06	,02	,01
somatic symptoms	<b>PA groups</b>				<b>S</b>	52,20	<,00	,00	
	<b>Active</b>	3,28	0,83	3,68	0,80	<b>PA</b>	62,88	,00	,00
	<b>inactive</b>	3,50	0,91	3,66	0,47	<b>S X PA</b>	3,13	,07	,00

**Table 4** Tow-way ANOVA statistic for psychological health based on gender variable.

On the other hand, results establish that gender and PA were statistically significant factors for depression but without an interaction effect. We observe the lowest level of depression for active women in comparison to inactive women, inactive men, and active men. Contrary to women, active and inactive men did not differ in their depression levels.

For “interpersonal sensitivity,” we do not perceive a significant interaction effect between PA and gender. Identically to depression, we show a significant difference between active women

and inactive women and men and active men. The “interpersonal sensitivity” level was similar between active and inactive men.

The result of correlation analyses (based on Pearson’s correlations coefficients), presented on Table 5 show that anxiety ( $r = 0.07$ ,  $p < 0.00$ ), depression ( $r = 0.11$ ,  $p < 0.00$ ), obsessive-compulsive disorder ( $r = 0.12$ ,  $p < 0.00$ ) and interpersonal sensitivity ( $r = 0.160^{**}$ ,  $p < 0.00$ ) were positively associated to gender variable. Nevertheless, the five subscales of psychological health were negatively correlated to physical activity (PA). No significant correlation was observed between “somatic symptoms” and the gender variable.

	PA	ANXIETY	DEPRESSION	OBSESSIVE COMPULSIVE DISORDER	INTERPERSONAL SENSITIVITY	SOMATIC SYMPTOMS
gender	-,16**	,07**	,11**	,12**	,16**	-,02
PA		-,16**	-,34**	-,36**	-,34**	-,08**
anxiety			,84**	,67**	,86**	,95**
depression				,88**	,92**	,79**
obsessive compulsive disorder					,88**	,76**
interpersonal sensitivity						,55**

Multivariate regression analyses were conducted separately for each subscale of psychological health as dependent variables and as predictor variables (PA) and gender variables; the result was detailed in Table 6. We observe the same results found by correlation analyses; namely, all psychological health subscales were related to gender variables and PA except somatic symptoms, which were not related to PA. This result means that gender was a significant predictor of psychological health variables. Gender was more related to depression than the other psychological variable; ( $t = 9.90$ , 95% CI from 0.35 to 0.53,  $p = 0.000$ ). On the other hand, gender explained “interpersonal sensitivity” less than the other variables ( $t = 2.84$ , 95% CI from 0.04 to 0.22,  $p = 0.005$ ).

**Table 5** Correlation between psychological health subscales, PA and gender variables. \*\* Correlation is significant at the 0.01 level (2-tailed).

VARIABLE	B	SE	T	95% CI	P
<b>Anxiety</b>					
PA	0,10	0,03	3,63	0,05–0,16	,00
Gender	0,17	0,04	3,86	0,08–0,26	,00
<b>depression</b>					
PA	0,16	0,03	5,68	0,11–,22	,00
Gender	0,44	0,04	9,90	0,35–0,53	,00
<b>obsessive compulsive disorder</b>					
PA	0,24	0,02	8,57	0,19–0,30	,00
Gender	0,24	0,04	5,52	0,15– 0,32	,00
<b>interpersonal sensitivity</b>					
PA	0,20	0,03	6,51	0,14–0,26	,00
Gender	0,13	0,04	2,84	0,04–0,22	,00
<b>somatic symptoms</b>					
PA	–0,04	0,03	–1,48	–0,10–0,01	0,139
Gender	0,24	0,04	5,26	0,15–0,34	,00

**Table 6** Multivariate regression analyses on psychological health, PA and gender. B—unstandardized beta coefficient; SE—standard error; CI—confidence interval; PA—physical activity assessed.

Contrary to gender, PA significantly explained only anxiety, depression, obsessive-compulsive disorder, and interpersonal sensitivity. Also, PA was not significantly associated with “somatic symptoms.” Regression analyses demonstrated that PA was less related to psychological health variables than gender was.

This study focused on the effect of the COVID-19 outbreak on the impact of PA in improving the psychological health of women. The main finding of the study was that the percentage of sedentariness appears high among Saudi females (Al-Hazzaa, 2018, Al-Zalabani et al., 2015). In the same line, PA appears as a health strategy, which improves psychological health during the COVID-19 outbreak in KSA. Numerous studies highlight the psychological distress of Saudi Arabia citizens (Alfawaz et al., 2021; Alotaibi et al., 2021; Asdaq et al., 2020). A major finding in this study was the increase in PA behavior for females in Saudi during the COVID-19 outbreak and its effect on the improvement of psychological health. We suggest that inactive females present a high level of anxiety and depression than active women do.

The initial hypotheses of this research suggest that the COVID-19 outbreak has negatively affected the level of psychological health variables (anxiety, depression, obsessive-compulsive disorder, interpersonal sensitivity, and somatic symptoms) of women more than men, as well as the PA behavior. This result is in accord with those from a cross-sectional study conducted in some North African and West Asian countries (Ammar et al., 2021). This result reveals that confinement negatively affects mental and emotional wellbeing.

Furthermore, our study also stipulates that PA ameliorates psychological health. We determine that confinement positively affected PA in women more than men. Indeed, the percentage of active females increased from 40% to 50%. This result contradicts other studies (Huckins et al., 2020) which state that sedentariness increased during the early phases of the COVID-19 pandemic. In KSA, the study of Alfawaz et al., (2021) affirm that the percentage of participants who practiced PA more than four times per week decreased during the pandemic (before vs. during, 30.5% vs. 29.1%). PA can potentially minimize the risk factors associated with the worst COVID-19 outcomes (Akbari et al., 2021).

Moreover, the actual study found that men and women present a slightly higher percentage (women 49%/ men 51%) of active and inactive people during quarantine, contrary to the period before the COVID-19 outbreak, which shows that men are more active than women. This means that women's PA behavior increased more than men. This result contradicts those of Zhang et al., (2020) study, that proves that men are more active than women. Considering sociodemographic variables, university-graduated women present a higher percentage of inactive people than men in the same category and with school graduates who did not change PA behavior before and during the COVID-19 outbreak.

This result means that women aged 36 to 45 were more inactive before COVID-19 (before vs. during, 57% vs. 96%). For social situation variables, no difference is noted between the percentage of active and inactive people during confinement for married (women/men) and single participants (men/ women). We observe a significantly higher rate of active persons for all employment situation variables for men and women. Finally, the comparison between women and men based on the "chronic disease" variable demonstrates that women who suffered from chronic diseases were more active than men before the COVID-19 outbreak; the same was noted for men without chronic disease. During the COVID-19 outbreak, men suffering from chronic disease become more active than women. For the other categories, women present the same percentage. Our results agree with the previous research conclusions (Asdaq et al., 2020, Alzamil et al., 2019). Moreover, negative composite lifestyle changes and obesity positively increase the possibility of developing anxiety (Alfawaz et al., 2021). Another study (Pieh et al., 2020) confirms that under 35 years, women and people with no job and low income are more inactive and suffer more from the negative mental effect of the COVID-19 outbreak.

Concerning the relation between PA and psychological health, this study establishes that PA groups and gender variables were statistically significant factors for anxiety, obsessive-compulsive disorder, and somatic symptoms. Additionally, the results conclude that women are more affected by confinement than men are. Hence, they try to fight and improve their psychological health by practicing PA (women become more active than men during the outbreak). Moreover, inactive men are more anxious and depressed than active men, inactive women, and active women are the same was observed in women's groups. These results mean that women's psychological health was more affected than men's and that active participants presented a better level of psychological health, especially depression and anxiety.

Our conclusion confirms numerous other research activities (Alfawaz et al., 2021), which state that KSA females present an abnormal mental status. Moreover, the gender variable was a significant predictor of psychological health, especially anxiety (Boughattas et Tolba, 2021). As did our study, the authors highlighted the significant relationship between PA and mental health. On the other hand, our conclusions contradict another study (Pieh et al., 2020) that declares that PA does not affect mental or psychological health. In general, this study exposes the facts concerning females' psychological health and PA behavior in the three most affected cities in KSA. Our results and conclusion were a part of a set of scientific studies concerning the COVID-19 pandemic, which can be used in future research on developing a pandemic strategy for public health authorities.

## RECOMMENDATION

This study highlights the importance of PA practice in preserving the psychological health of female Saudi citizens during the COVID-19 outbreak. So, we suggest that the health authorities give more significance to females and PA on their pandemic management program. We also recommended that PA programs be generalized in educational institutions (school, college, high school, and university) and public administration and private companies. This program can be a means to encourage people to practice PA in daily life and to increase this culture of practice in all situations, not only in the pandemic.

## ETHICS AND CONSENT

The informed consent was obtained from all participants included during original data collection.

## COMPETING INTERESTS

The author has no competing interests to declare.

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