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EVIDENCE REVIEW

- 1167 Child abuse and psychopathy: Interplay, gender differences and biological correlates
di Giacomo E, Santorelli M, Pessina R, Rucco D, Placenti V, Aliberti F, Colmegna F, Clerici M

REVIEW

- 1177 Polyamines and polyamine-metabolizing enzymes in schizophrenia: Current knowledge and concepts of therapy
Bernstein HG, Keilhoff G, Laube G, Dobrowolny H, Steiner J
- 1191 Nuclear receptors modulate inflammasomes in the pathophysiology and treatment of major depressive disorder
Wang H, Kan WJ, Feng Y, Feng L, Yang Y, Chen P, Xu JJ, Si TM, Zhang L, Wang G, Du J
- 1206 Review of barriers and interventions to promote treatment engagement for pediatric attention deficit hyperactivity disorder care
Baweja R, Soutullo CA, Waxmonsky JG

MINIREVIEWS

- 1228 Newer antipsychotics: Brexpiprazole, cariprazine, and lumateperone: A pledge or another unkept promise?
Barman R, Majumder P, Doifode T, Kablinger A
- 1239 E-technology social support programs for autistic children: Can they work?
Wall NG, Smith O, Campbell LE, Loughland C, Wallis M, Henskens F, Schall U
- 1247 Factors related to compliance with the COVID-19 health regulations among young people
Jaureguizar J, Redondo I, Galende N, Ozamiz N
- 1259 Mechanism of olfactory deficit in neurotrauma and its related affective distress: A narrative review
Logan M, Kapoor S, Peterson L, Oliveira M, Han DY
- 1267 Physical activity and mental well-being during COVID-19 pandemic
Abdelbasset WK, Nambi G, Eid MM, Elkholi SM

ORIGINAL ARTICLE**Basic Study**

- 1274 Differential aberrant connectivity of precuneus and anterior insula may underpin the diagnosis of schizophrenia and mood disorders
Aryutova K, Paunova R, Kandilarova S, Stoyanova K, Maes MH, Stoyanov D

- 1288** Validity and reliability of the Dutch version of the displaced aggression questionnaire

Smeijers D, Denson TF, Bulten EH, Brazil IA

Case Control Study

- 1301** BDNF methylation and mRNA expression in brain and blood of completed suicides in Slovenia

Ropret S, Kouter K, Zupanc T, Videtic Paska A

- 1314** Developing a nomogram for predicting the depression of senior citizens living alone while focusing on perceived social support

Byeon H

Retrospective Study

- 1328** Affect regulation in psychoanalytic treatments of patients with a borderline personality disorder-psychoanalysis and psychodynamic psychotherapy-a comparison

Steinmair D, Wong G, Frantal S, Rohm C, Löffler-Stastka H

Observational Study

- 1346** Impact of lockdown relaxation and implementation of the face-covering policy on mental health: A United Kingdom COVID-19 study

Rathod S, Pallikadavath S, Graves E, Rahman MM, Brooks A, Soomro MG, Rathod P, Phiri P

SYSTEMATIC REVIEWS

- 1366** Autism spectrum disorder and personality disorders: Comorbidity and differential diagnosis

Rinaldi C, Attanasio M, Valenti M, Mazza M, Keller R

- 1387** Psychological impact of the COVID-19 pandemic on individuals with serious mental disorders: A systematic review of the literature

Fleischmann E, Dalkner N, Fellendorf FT, Reininghaus EZ

- 1407** Psychoeducation in bipolar disorder: A systematic review

Rabelo JL, Cruz BF, Ferreira JDR, Viana BM, Barbosa IG

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Editorial Board Member of *World Journal of Psychiatry*, Subho Chakrabarti, MD, FRCP, FAMS, Professor, Department of Psychiatry, Postgraduate Institute of Medical Education and Research, Chandigarh 16002, India. chakrabarti.subho@pgimer.edu.in

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Physical activity and mental well-being during COVID-19 pandemic

Walid Kamal Abdelbasset, Gopal Nambi, Marwa M Eid, Safaa M Elkholi

ORCID number: Walid Kamal Abdelbasset 0000-0003-4703-661X; Gopal Nambi 0000-0002-4203-5506; Marwa M Eid 0000-0002-2703-6033; Safaa M Elkholi 0000-0002-1100-4301.

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Walid Kamal Abdelbasset, Gopal Nambi, Department of Health and Rehabilitation Sciences, College of Applied Medical Science, Prince Sattam Bin Abdulaziz University, Al-Kharj 11942, Riyadh, Saudi Arabia

Walid Kamal Abdelbasset, Department of Physical Therapy, Kasr Al-Aini Hospital, Cairo University, Giza 12613, Egypt

Marwa M Eid, Department of Physical Therapy, College of Applied Medical Sciences, Taif University, Taif 26571, Saudi Arabia

Safaa M Elkholi, Department of Rehabilitation Sciences, Faculty of Health and Rehabilitation Sciences, Princess Nourah bint Abdulrahman University, Riyadh 11564, Saudi Arabia

Corresponding author: Walid Kamal Abdelbasset, PhD, Academic Research, Associate Professor, Department of Health and Rehabilitation Sciences, College of Applied Medical Science, Prince Sattam bin Abdulaziz University, 1 University District, Al-Kharj 11942, Riyadh, Saudi Arabia. walidkamal.wr@gmail.com

Abstract

The corona virus disease 2019 (COVID-19) pandemic has resulted in most nations deciding upon self-isolation and social distancing policies for their citizens to control the pandemic and reduce hospital admission. This review aimed at evaluating the effect of physical activity on mental well-being during the COVID-19 pandemic. It was concluded that the COVID-19 pandemic may lead to augmented levels of angiotensin-converting enzyme (ACE)-2 that led to cardiovascular and neurological disorders associated with highly inflammatory effects of viral infection affecting the brain tissues leading to damage of the nervous system and resulting in cognition dysfunction, insulin sensitivity reduction, and behavioral impairments. Anxiety and depression may lead to negative effects on various quality of life domains, such as being physically inactive. Regular physical activities may reduce inflammatory responses, improve ACE-2 responses, and improve mental well-being during self-isolation and social distancing policies related to the COVID-19 pandemic. Further studies should be conducted to assess the different intensities of physical activities on cardiovascular function, and mental well-being during the COVID-19 pandemic.

Key Words: COVID-19; Physical activity; Mental well-being; Pandemic; Angiotensin-converting enzyme-2

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Core Tip: The corona virus disease 2019 (COVID-19) pandemic has resulted in most nations deciding upon self-isolation and social distancing policies for their citizens to control the pandemic and reduce hospital admission. This review aimed at evaluating the effect of physical activity on mental well-being during the COVID-19 pandemic. COVID-19 may lead to cardiovascular and neurological disorders associated with inflammatory effects of viral infection affecting brain tissues, leading to nervous system damage and cognitive dysfunction, insulin sensitivity reduction, and behavioral impairments. Regular physical activities may reduce inflammatory responses, improve angiotensin-converting enzyme-2 responses, and mental well-being during self-isolation and social distancing.

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INTRODUCTION

The corona virus disease 2019 (COVID-19) pandemic caused by the novel coronavirus SARS-CoV-2 appeared in China in 2019[1]. The infection probably resulted from a usual assortment of animal hosts prior to zoonotic spread that affected populations worldwide and caused thousands of deaths[2]. Through a cellular membrane receptor known as angiotensin-converting enzyme-2, SARS-COV-2 influences host cells, affects lungs with insufficient oxygen supply, and accordingly may affect cardiac and brain tissues[3]. With the rapid progress of COVID-19, most nations decided upon self-isolation and social distancing policies for their citizens and residents to control the pandemic and reduce hospital admission, with a recommendation of self-isolation and social distancing to successfully control the pandemic outbreak[4].

At this time, it is important for all populations to understand the local characteristics of COVID-19 transmission and social distancing policy as the transmission of COVID-19 is predicted to occur up to 2024, and intermittent or extended social distancing may be continued to 2022 and will cause major lifestyle changes among people worldwide[5]. Therefore, it is doubtful during these policies that individuals can continue their sedentary behaviors to maintain their healthy condition[6]. Government policies of social isolation and distancing during the COVID-19 pandemic can increase disturbance of mental health, including anxiety and depression[7]. **Figure 1** presents the negative effects of the COVID-19 pandemic on physical activity and mental health.

Nutritional deprivation may affect cognitive status and lead to mood disorders[8]. Poor physical activity levels during COVID-19 quarantine can also lead to sedentary behaviors that could lead to the development of chronic cardiovascular, metabolic and mood disorders[9,10]. Several studies have reported that regular physical activity and exercise training are considered effective nonpharmacological interventions in several chronic disorders[9].

MENTAL HEALTH AND COMMUNITY

Generally, the development and prevalence of mental health impairments are associated with social and physical determinants[11]. Community service integration may promote awareness of mental well-being, reduce discrimination and stigma, support social recovery, and prevent mental dysfunction[12,13].

International guidelines accentuate community care for mental well-being and the World Health Organization also has suggested stipulations of integrated and comprehensive social care for mental well-being, including prevention and interventional protocols in the community incorporating the perceptions of families and service providers[14]. It is reported that individuals with psychological impairment should be encouraged to live without assistance among populations[15].

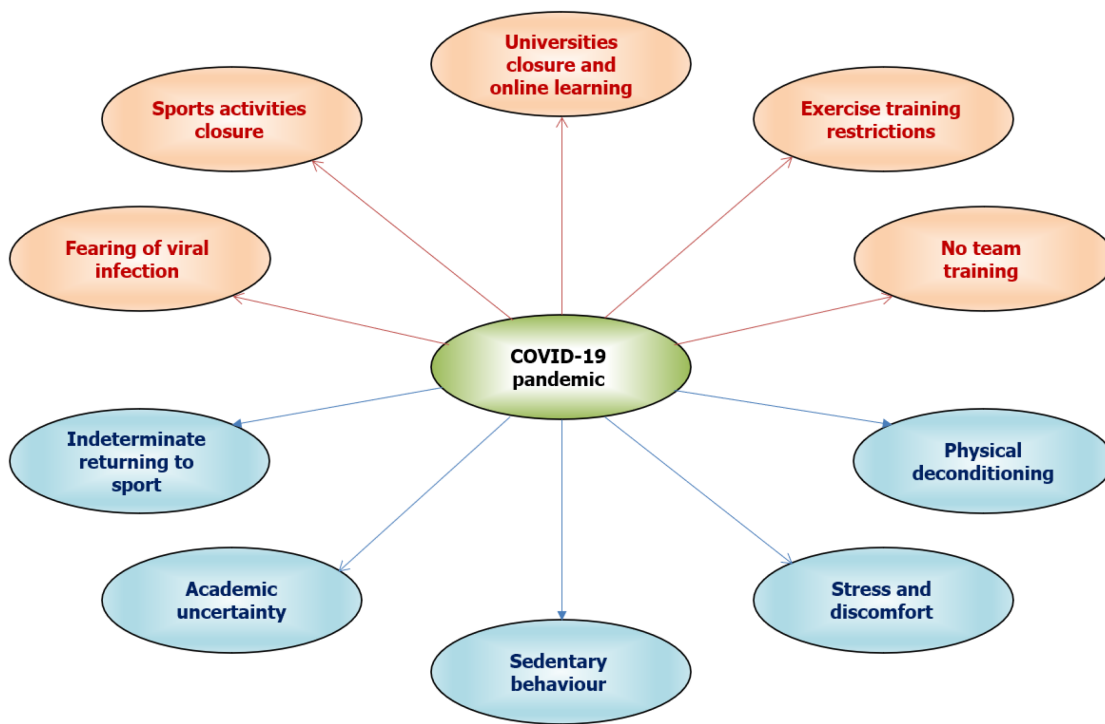


Figure 1 Negative effects of COVID-19 pandemic on physical and mental well-being.

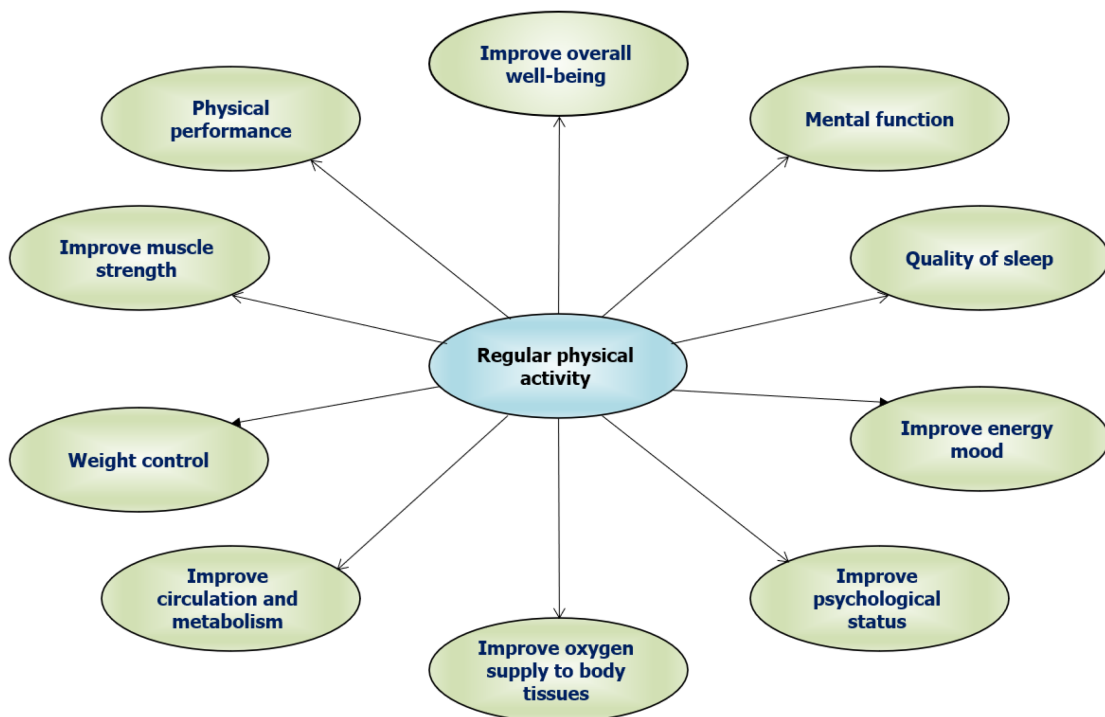


Figure 2 Positive effects of regular physical activity on physical and mental well-being.

NEUROLOGICAL MANIFESTATIONS RELATED TO COVID-19

Brain tissues may be affected by viral infection due to infected nerve cells through infected vascular endothelium, or leukocyte migration into the brain circulation[16]. Although headache and anosmia are the major prevalent neurological disorders related to COVID-19, neurophysiological impairments have been documented, including encephalopathy, seizures, consciousness impairment, and stroke[17,18].

Table 1 Physical activity and mental health during COVID-19 pandemic

Refs	Measures	Findings and recommendations
Wright <i>et al</i> [32], 2021	Incidence of fear, physical activity, and mental well-being indicators questionnaires	Physical activity may improve mental well-being and protect against the undesirable impacts of COVID-19. Regular physical activities should be encouraged to improve mental well-being during COVID-19 pandemic.
Xiao <i>et al</i> [33], 2021	Lifestyle and home environment, physical and mental well-being, and occupational environment questionnaires	Significant reduction in physical and mental well-being including impaired physical activity, increased junk food intake, and absence of coworker communications
Faulkner <i>et al</i> [34], 2021	Short form of IPAQ, WHO-5 well-being index, and depression, anxiety and stress scale-9	Negative changes in physical activity before COVID-19 containment policies presented poor mental well-being, while positive physical activity behavior showed better mental well-being
Meyer <i>et al</i> [35], 2020	Self-reported physical activity, anxiety and depression status, social connection, loneliness, and stress	Adherence to physical activity contributions and restrictive screening time during unexpected societal alterations may alleviate the consequences of mental well-being
Carriedo <i>et al</i> [36], 2020	International Physical activity questionnaire (IPAQ), 6-item self-report scale of depression symptoms, Connor-Davidson CD-RISC resilience scale, and positive and negative affect schedule	Regular moderate or vigorous physical activity provide positive resilience and reduce depression symptoms during COVID-19 quarantine
Maugeri <i>et al</i> [37], 2020	IPAQ and psychological general well-being index	Reduced physical activity have a greatly undesirable effects on psychological status and mental well-being. Adherence to a regular physical activity program is the main approach for improving physical and mental well-being during COVID-19 confinement.
López-Bueno <i>et al</i> [38], 2020	Short form of physical activity vital sign and single-item question for mood and anxiety	Adherence to regular physical activities associated with better mood and lower anxiety with WHO recommendations during COVID-19 quarantine
Duncan <i>et al</i> [39], 2020	Online survey on perceived changes in physical activity due to COVID-19 mitigation and mental well-being using 10-item perceived stress scale and 6-item anxiety subscale	COVID-19 mitigation policies may affect physical activity and mental well-being. Participants with reduced physical activity levels showed higher anxiety and stress levels.
Jacob <i>et al</i> [40], 2020	Self-reported physical activity questionnaire, Beck anxiety and depression inventories, and 7-item short Warwick-Edinburgh mental well-being scale	During COVID-19 social distancing, participants adherent to vigorous and moderate physical activity showed better mental well-being

COVID-19: Corona virus disease 2019.

It was reported that approximately 36% of COVID-19 patients suffered from neurological symptoms such as impaired consciousness and cerebrovascular disorders associated with inflammatory effects of viral infection[19]. This inflammation may affect the brain tissues leading to damage of the nervous system and cognitive dysfunction, insulin sensitivity reduction, and behavioral impairments[20]. Also, these inflammatory reactions associated with viral infection may develop primitive neurological manifestations[21].

Due to impaired neural plasticity, the initial fatality of nerve cells, and disturbed neurotransmitter production, psychoses, impaired memory, and post-traumatic stress disorders may occur with COVID-19[22]. In addition, angiotensin-converting enzyme (ACE)-2 is expressed with COVID-19 in several brain areas, such as the olfactory system, striatum, and cortex, and on various types of nerve cells such as astrocytes, microglia, neurons, and oligodendrocytes[23]. The primary projected mechanism that affects the function of the nervous system is ACE-2 activation associated with COVID-19 through augmentation of inflammatory responses[20,23].

PHYSICAL ACTIVITY AND MENTAL HEALTH

A recent cross-sectional study found that individuals who conducted a regular physical exercise for one month had good life satisfaction during quarantine, while the individuals who stayed at home and without physical exercise suffered from poor health conditions[24]. It was also reported that isolation and social distancing related to COVID-19 led to a greater incidence of anxiety and depression[25]. Accordingly, these reports suggest that individuals who conducted physical exercise during COVID-19 should be regularly observed as they may be particularly irritated by self-isolation. Therefore, exercise training for a long time does not indicate good mental well-being, but it may be a predictor of developing mood disorders[25].

It can be assumed that overtraining or prolonged exercise training may lead to pessimistic health conditions such as mood disorders[20]. The quarantine associated with COVID-19 may increase the development of a sedentary lifestyle among different populations including adolescents[26]. Regular exercise training improves immune function, lowers the severity of symptoms, and reduces the mortality rate in individuals exposed to viral infection[10]. Conducting physical activity or sports during the COVID-19 pandemic may provide a complementary and alternative treatment to develop mental well-being[27].

It is documented that COVID-19 may be associated with neurotropism, neuroinvasion, and neuroinflammation that could clearly affect the outcomes of mental well-being including acute myelitis, cerebrovascular disorders, encephalitis, and encephalopathy[28]. Several exercise training programs and different laboratory investigations should be conducted to assess the influence of exercise training on COVID-19 and how it prevents disturbances of mental well-being. Regrettably, studies that suggest or explain the ideal exercise protocol conducted during the COVID-19 pandemic and its influence on mental and cardiovascular well-being are limited, and therefore the relationship between exercise training, cardiovascular function, and mental well-being should be investigated.

Anxiety and depression are the most frequent mental disorders, with varied incidence rates among different ages, including adults, adolescents, children, and particularly aged individuals[29]. It is reported that anxiety and depression may lead to negative effects on various quality of life domains, such as being physically inactive [30]. The pathophysiology of anxiety and depression is still not clearly explained, and an abundance of biomarkers have been recommended to identify the sequences and development of mental disorders[30,31].

Recent studies have proved that adherence to physical activities and exercise training programs during COVID-19 quarantine is associated with better mental health and lower anxiety and depression levels. However, poor physical activity levels are associated with higher levels of anxiety and depression in addition to poor mental health and well-being[32-40] (Table 1).

Exercise training and physical activity have been suggested as nonpharmacological interventions to eliminate the complications associated with self-isolation and social distancing during the COVID-19 pandemic [27]. The effects of different exercise programs are not being clearly investigated during the COVID-19 pandemic. Physical activity may improve mental well-being and protect against the undesirable impacts of COVID-19. Regular physical activities should be encouraged to improve mental well-being during the COVID-19 pandemic[32-40]. Figure 2 shows the positive effects of regular physical activity on physical and mental well-being.

CONCLUSION

The COVID-19 pandemic may lead to augmented levels of ACE-2 that led to cardiovascular and neurological disorders associated with inflammatory effects of viral infection, affecting the brain tissues and leading to damage to the nervous system and cognitive dysfunction, insulin sensitivity reduction, and behavioral impairments. Anxiety and depression may lead to negative effects on various quality of life domains, such as being physically inactive. Regular physical activities may reduce inflammatory responses, improve ACE-2 responses and mental well-being during self-isolation and social distancing related to the COVID-19 pandemic. Further studies should be conducted to assess the different intensities of physical activities on cardiovascular function, and mental well-being during the COVID-19 pandemic.

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