



# Correlation Between Cognitive Deficits, Quality of Life and Coping Strategies in Post COVID-19 Survivors

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## Abstract

**Background:** Coronavirus disease 2019 (COVID-19) has imposed a significant impact on populations and healthcare systems. Symptoms of post-COVID syndrome (PCS) persist for at least 12 months following COVID-19 infection leading to significant negative effects on these patients' cognition, ability to work, physical activity, social interaction, and overall quality of life. **Objective:** This study aimed to investigate the relation between cognitive deficits, quality of life (QOL) and coping strategies in post COVID-19 survivors. **Subjects and Methods:** A hundred COVID-19 survivors from both genders participated in this study. Their cognition was evaluated using Montreal Cognitive Assessment (MoCA), the WHO Quality of Life Instrument-Short Form (WHOQOL-BREF) was employed to evaluate patients' QOL and the Brief Coping Orientation to Problems Experienced (Brief-COPE) was used to assess their coping strategies. **Results:** A significant positive correlation was found between the scores of MoCA and all HRQOL domains (Physical health, Psychological, Social relationships, Environment, General health and General QOL). Also, a significant negative correlation was noted between scores of MoCA and Brief-COPE (Mal-Adaptive strategies) while no significant correlation was found between MoCA scores and Brief-COPE (Adaptive strategies). **Conclusion:** There is a relation between cognition deficits, QOL and non-adaptive coping strategies in post COVID-19 survivors, while, there is no relation between cognition deficits and adaptive coping strategies in PCS patients.

**Key Words:** COVID-19, Post COVID-19, cognitive deficits, quality of life, coping strategies.

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## Introduction

In 2019, China reported the outbreak of COVID-19 which shortly spreads to other countries all over the globe, (Liu et al., 2020). In March 2020, COVID-19 was considered a pandemic and a global public health emergency after declaration from The World Health Organization (WHO), (Mahase, 2020). The first COVID-19 infection in Egypt was identified on February 14th, 2020, (Medhat & El Kassas, 2020).

Even though a lot of individuals with COVID-19 get better within weeks, some people still have symptoms which may last for months after being infected for the first time, or may have new or recurring symptoms. This may occur in individuals who had been infected with COVID-19 regardless the severity of the initial symptoms.

This condition is known as "long-haulers." or "long COVID", (CDC, 2021).

Cognitive deficits are widely reported after long COVID. It is prevalent in about 70% of cases, (Bliddal et al., 2021; Davis et al., 2021). Memory, language, and executive function are specifically affected, (Alemanno et al., 2021).

SARS-CoV-2 causes neuronal destruction with subsequent negative effects on cognitive functions, QOL and daily functioning. Therefore, new reports indicate that after recovering from COVID-19, a majority of the survivors experience long-term cognitive problems, such as memory and concentration problems for several months, (Miskowiak et al., 2021).

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Unfortunately, the long-lasting COVID symptoms and their impact on Health-related Quality of Life (HRQOL) have not been on the surface long enough to be studied effectively, (Bryson, 2021).

It is undeniable that the positive coping strategies can alleviate COVID-19's impact on one's health, and this is why effective coping strategies must be provided to people whose health has been compromised after the pandemic, (Xiang et al., 2020). In the previous studies, participants often showed signs of anxiety, depression, and trouble sleeping. However, little or no researches have been conducted on the coping strategies adopted by people in the hard-hit countries to combat the pandemic. (Ogueji et al., 2021).

Therefore, the current research was designed to investigate the correlation between cognitive deficits, QOL and coping strategies in post COVID-19 survivors.

### Subjects and Methods

This cross-sectional observational study was carried out in El Menofia governorate/Egypt in the period from December 2021 to February 2022. The study protocol obtained approval of the Ethical Committee of the Faculty of Physical Therapy, Cairo University (No: P.T. REC/012/003563).

Before participation and initial assessment, a detailed explanation of the nature and significance of the research was given to all potential participants and they signed a written informed consent.

### Participants

One hundred COVID-19 survivors from both genders were included. They were diagnosed to have had COVID-19 based on SARS-CoV-2 reverse transcription-polymerase chain reaction (RT-PCR) of nasopharyngeal swab and/or SARS-CoV-2 antibody and/or by chest computed tomography (CT) scan. Patients were considered eligible for participation if they had mild/moderate COVID-19 according to the Egyptian Ministry of Health and Population, they were between 30 and 55 years of age, the duration of illness was within 6 months after recovery from COVID-19, they were medically stable, they were able to understand and follow instructions and had cognitive impairment of a mild degree (<26 on MoCA scale), (Nasreddine et al., 2005). Patients who did not fulfill these criteria were deemed ineligible for participation in addition to patients who had any concomitant neurological disorder that affected their cognitive or mental status, severe psychiatric disorder, alcohol or drug

abuse, impairments in hearing or vision or they were undergoing active treatment for a mental condition.

### Procedures:

#### Assessment of Cognition

The Montreal Cognitive Assessment (MoCA) was established as a fast and easy tool to screen for Mild Cognitive Impairment (MCI), (Nasreddine et al., 2005).

The Arabic version of MoCA can be utilized as test to screen for MCI; it had a high sensitivity for detecting MCI (92.3 %), (Rahman & El Gaafary., 2009). Memory, language, visuo-spatial skills, executive functions, abstraction, attention, concentration, orientation and calculation are among the cognitive domains assessed by MoCA. It is a paper-and-pencil tool which takes about ten minutes to be completed and is scored out of 30 points, (Pistarini et al., 2021). Every participant was asked to answer every domain of the Arabic version of MoCA. It assessed eight cognitive domains over the course of 13 tests. The trail-making and clock-drawing tests, as well as copying a cube, were used to assess visuospatial/executive function. Patients were asked to identify animals that appeared in three pictures in order to test their naming ability. While they were asked to remember five different words in two trials as a test for memory. Patients' attention tested by asking them to repeat numbers forwards and backwards, and to recognize letters, (Athilingam et al., 2011). Testing language was performed by repeating two simple sentences and by identifying no less than 11 words starting with the letter 'F' in a duration of one minute. Patients' abstraction was examined by instructing them to identify different tools of measurements and different modes of transportation. Delayed recall was examined by requesting patients to recall five words from a memory test. At last, patients were asked to recall the date, day, month, year, and location in order to assess their orientation, (Athilingam et al., 2011). We utilized the original cutoff advised by the test's creator, (Nasreddine et al., 2005), who recommended a cut-off score equal to 26, with those scoring  $\leq 25$  suspected to have MCI.

#### Assessment of quality of life:

Quality Of Life (QOL) was assessed using the validated Arabic version of WHOQOL-BREF questionnaire, (Ohaeri and Awadalla., 2009). This questionnaire contains 26 items that assess different domains and subdomains. The first two questions assess patients' overall rating of their quality of life (OQoL) and the extent to which they are satisfied



with their health. The rest of the items evaluate four domains, (i.e., physical and psychological health (seven and six questions respectively), social relations (three questions) and environment (eight questions), (Slimani et al., 2020). Participants are given scores on the scale from 1- 5 based on their answers. The lowest score indicates (very poor/very dissatisfied/ none/ never) while the highest score indicates (very good/very satisfied/extremely/always). After scores have been recorded for the four domains, they are summed and ordered in an ascending manner. The higher score the participants get, the better QOL they have (Elaraby et al., 2022). Participants were asked to read every domain of the scale carefully before marking their response, (Slimani et al., 2020).

**Assessment of coping strategies:**

The Brief Coping Orientation to Problems Experienced (Brief-COPE) was introduced to evaluate the different coping strategies used by post COVID-19 individuals, (Carver, 1997). It is a validated, short version of the original 60-items COPE scale, which was derived theoretically from various coping models, (Carver et al., 1989). It is a 28-items self-report questionnaire which assesses effectiveness of coping strategies in the face of a stressful life event, (Matsumoto et al., 2020). This scale evaluates 14 various responses to cope with a given situation, scored on a Likert scale of 1–4, (Monzani et al., 2015). The Brief-COPE is designed to explore 14 methods that are used to cope with distress and negative events; these methods include: denial or acceptance, self-distraction or self-blame, religion, humour, replanning and positive reframing, venting and seeking emotional support, disengagement and using instrumental support or substance abuse. Every one of these subscales is given a score out of 4 points in which 1 indicates (I usually do not do this at all) to 4 which indicates (I usually do this a lot). Each dimension is also given a score from 2 to 8. The higher the patient scores, the more coping strategies he practices, (El-Monshed et al., 2021). Literature has categorized all 14 subscales into: a) adaptive strategies (such as looking for emotional or informational support, framing, planning and actively coping with or accepting the problem, humor, and religion), and b) maladaptive strategies (such as blaming or beating oneself up, denial, substance abuse, venting, and behavioral disengagement), (Rettie and Daniels, 2021). Participants were instructed to carefully read questions of the Brief-COPE -- Arabic version and to mark their responses on a 4-point scale [in which 1

indicates (never done this) and 4 indicates (doing this a lot).

**Statistical analysis:**

Statistical analyses of data were performed via SPSS v.28 (IBM, Armonk, NY, USA). Data that are quantitative in nature were examined for normality by conducting the Shapiro-Wilk test as well as direct data visualization while means and standard deviations were used to analyze and express quantitative data. Categorical data were expressed on form of numbers and percentages. Correlation analyses were conducting via Pearson’s correlation. All tests used in the analytical process were two-sided and the level of significant was set to P-values < 0.05.

**Results**

**General characteristics of the participants:**

The sample studied in this research comprised of 100 participants. The mean values of their ages and duration of illness were 37.74 ± 8.18 years and 3.09 ± 1.66 months respectively as shown in (Table 1). The distribution of sex was 30 males and 70 females. Among them, 34 patients have a mild severity of illness while 66 patients have a moderate severity of illness, as represented in (Table 2).

Table 1: Age and duration of illness in the participants.

	Mean ±SD	Minimum	Maximum
Age (years)	37.74 ± 8.18	30.0	55.0
Duration of illness (months)	3.09 ± 1.66	1.0	6.0

Data were expressed as mean ±SD

Table 2: Distribution of gender and severity of illness in the participants.

Gender	No. (%)
Males	30 (30 %)
Females	70 (70 %)

  

Severity of illness	No. (%)
Mild	34 (34 %)
Moderate	66 (66 %)

**Results of the measured variables:**

Table (3) illustrates the range and mean values of all variables in the participants.



**Table 3: Range and mean values of measured variables in the participants.**

	Mean ±SD	Minimum	Maximum
Total MoCA Score	23.40 ±1.41	20.0	25.0
QOL-scores:			
Physical Health	39.88 ±15.44	13.0	69.0
Psychological	37.88 ±13.61	6.0	69.0
Social relationships	44.41 ±19.15	19.0	75.0
Environment	38.16 ±11.13	6.0	63.0
General health	2.90 ±0.64	1.0	4.0
General QOL	3.13 ± 0.82	1.0	4.0
Coping strategies:			
Adaptive strategies	2.11 ±0.36	1.15	3.10
Mal-adaptive strategies	2.39 ±0.37	1.50	3.30

**Correlation between scores of MoCA and domains of HRQOL:**

There were significant positive correlations between scores of MoCA and Physical Health ( $r = 0.611, P = 0.0001$ ), Psychological ( $r = 0.520, P = 0.0001$ ), Social relationships ( $r = 0.360, P = 0.0001$ ), Environment ( $r = 0.411, P = 0.0001$ ), General health ( $r = 0.286, P = 0.0001$ ), and General QOL ( $r = 0.268, P = 0.005$ ). Table (4)

**Table 4: Correlation between scores of MoCA and domains of HRQOL in the participants.**

HRQOL scores	MoCA (scores)	
	R-value	P-value
Physical Health	0.611*	0.0001
Psychological	0.520*	0.0001
Social relationships	0.360*	0.0001
Environment	0.411*	0.0001
General health	0.286*	0.0001
General QOL	0.268*	0.005

r: Correlation coefficient; \* Significant

**Correlation between scores of MoCA and domains of Brief- COPE:**

There were significant negative correlations between MoCA score and Mal-adaptive strategies scores ( $r = -0.243, P = 0.011$ ), whereas no significant correlation was noted between MoCA scores and Adaptive strategies ( $r = -0.056, P = 0.546$ ), ( $r = -0.243, P = 0.011$ ). Table (5)

**Table 5: Correlation between scores of MoCA and domains of Brief- COPE in the participants.**

	MoCA (score)	
	R-value	P-value
Adaptive strategies	-0.056	0.546
Mal-adaptive strategies	-0.243*	0.011

r: Correlation coefficient; \* Significant

**Discussion**

This study was conducted to investigate the relation between cognitive deficits, QOL and coping strategies in post COVID-19 survivors. The results revealed a significant positive correlation between scores of MoCA and all domains of HRQOL indicating that cognitive deficits affect physical health, psychological, social, environmental, general health and general QOL of HRQOL in post COVID-19 survivors.

These results are in agreement with Vanderlind and colleagues, (2021) who reviewed thirty-three studies in their systematic review and reported that cognitive and psychiatric deficits associated with COVID-19 could negatively affect social and occupational functioning of COVID patients during and after the recovery.

Moreover, the outcomes agreed with those of Miskowiak et al., (2021) who conducted a study of 29 COVID-19 participants 3-4 months after discharge from the hospital. Fifty-nine percent of the participants were found to have cognitive impairment with the most affected functions being verbal learning and executive functions. In addition, more than 80% of participants had severe cognitive impairments in their day-to-day life. Cognitive impairments are often linked to a decreased work function and poor QOL in the affected individuals.

Trihandini et al., (2022) also conducted a study with a sample size of 172 patients with SARS-CoV-2 infections for at least one month. They found that individuals with long COVID were more likely to have a decreased QOL in terms of physical, psychological, and social domains. However, their findings on the environmental domain were contradictory to the current study as they reported that long-COVID symptoms had no evident effect on the QOL as regard to the environmental domain.

On the contrary, Hawlader et al., (2021), examined the QOL of 3244 COVID-19 survivors in Bangladesh and reported improvement in physical, social and environmental QOL. However, the psychological domain was deemed the most affected by COVID-19 infection.



The current study also revealed a significant negative correlation between MoCA scores and Brief-COPE (Mal-Adaptive strategies) as (denial, self-blame, substance use, venting, behavioral disengagement, and self-distraction), while there was no significant correlation between MoCA scores and Brief-COPE (Adaptive strategies) as (planning, seeking emotional support, positive re-framing, active coping, acceptance, seeking informational support, humor, religion).

As far as we know, no previous studies have been conducted on the relation between coping strategies and the cognitive deficits in post COVID-19 survivors, yet, analysis of this correlation was performed in variable studies for disorders other than COVID-19 (e.g., multiple sclerosis), (Grech et al., 2016), and returning war veterans. (Martindale et al., 2016).

Moreover, Talarowska et al., (2020) conducted a research to investigate the mental condition in the first few weeks of COVID-19 epidemic in Poland. They revealed that one in every four participants (more than 26%) was more at risk for mental disorders and that those whose mental health is significantly reduced tend to use mal-adaptive strategies to cope with their stresses. For instance, they may deny the existence of their problems, incline towards using substances, blame of themselves for negative events, or show discontinuation or emotional discharge. The respondents also mainly complained about everyday life problems, being dissatisfied of oneself, tension, sleep problems, and exhaustion.

Furthermore, the outcomes of our study were in line to those of Wolters et al., (2015) who performed a cross-sectional study to explore the correlation between coping, depressive symptoms, executive functioning, and QOL in patients with neuropsychiatric manifestations as a result of acquired brain injury (ABI). They revealed that patients who demonstrated more affection in their executive functions following ABI were more likely to use maladaptive passive coping strategies, which is an important thing to consider in the treatment plan.

Another study conducted by Kegel et al., (2014) investigated the correlation between executive functioning and coping strategies in a group of chronic stroke patients. They reported that deficits in executive functioning were linked to higher tendency of avoidant coping. Unlike predicted, no significant correlation was found between executive functioning and active coping. Furthermore, post-

hoc analyses indicated that executive functioning could significantly predict avoidant coping when demographics were controlled.

In contradiction, Jackson et al., (2018), explored the correlation between executive functioning, emotional stress and coping among adolescents and emerging adults (AEAs), in addition to young adults (YAs) with congenital heart disease (CHD). Their outcomes indicated that YAs with CHD who self-reported problems in their executive functioning are more likely to struggle with secondary control coping. For instance, cognitive acceptance and reconstruction, that are often taught in cognitive behavioral therapy. These participants may also require further assistance with bolstering these skill sets.

### Conclusion

In light of the results of this study, a conclusion has been drawn that cognitive deficits, QOL and non-adaptive coping strategies are closely correlated in post COVID-19 survivors. Further and more thorough follow-up plans must be made for early detection and management of any cognition deficits in order to prevent more serious complications.

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### Conflict of interest

Authors declare no conflict of interest.

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