Review



# The Impact of Stress from Social Isolation During the COVID-19 Pandemic on Neuropsychiatric Disorders: An Analysis from Scientific Literature

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# The Impact of Stress from Social Isolation During the COVID-19 Pandemic on Neuropsychiatric Disorders: An Analysis from Scientific Literature

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**Abstract** The COVID-19 Pandemic generated, in addition to severe symptoms, hospitalizations, and deaths worldwide, stress from the fear of the disease and social uncertainties, from restriction measures and social isolation. Stress from social isolation impacts mental health, aggravating conditions, and triggering neuropsychiatric symptoms in individuals with biopsychosocial vulnerability. During and immediately after the period of social restriction imposed by the Pandemic, the scientific community carried out several research protocols. It revealed results that relevantly demonstrate the harmful effect of the stress induced by the Pandemic situation. This review reports and discusses research results demonstrating impairments in neuropsychiatric disorders such as autism spectrum disorder, dementia, eating disorders, schizophrenia, anxiety, and depression. In addition to studies showing the effect of social isolation on disorders, research results are reported and discussed that evaluated protocols with some possible therapeutic intervention strategies during times of social restriction.

**Keywords:** COVID-19; Social isolation stress; Neuropsychiatric disorders; Biopsychosocial vulnerability; Therapeutic strategies

**Highlights:**

- The social isolation imposed by COVID-19 impacts the mental health of the world's population.
- The stress of social isolation exacerbated neuropsychiatric disorders.
- The stress generated by the Pandemic situation can trigger neuropsychiatric symptoms in vulnerable individuals.
- Non-pharmacological therapeutic intervention strategies reduce the negative impacts on mental health.

## 1. Introduction

The COVID-19 Pandemic resulted in thousands of hospitalizations and deaths, causing instability in global social, political, and health systems. However, the impacts of this Pandemic were not limited to just that since new health issues were raised based on the need for quarantine [1]. The social isolation imposed by the quarantine led to the increase and worsening of multiple physical and mental disorders, sometimes capable of interacting with each other or impacting pre-existing diseases, putting the health of countless individuals at risk [2].

According to the World Health Organization (WHO), health encompasses the individual's physical, mental, and social well-being [3]. In this sense, it is known that social isolation can negatively impact physical and psychological well-being and, therefore, health in general [4]. During the COVID-19 Pandemic, it was no different. Social isolation impacted the health conditions of other groups, from teenagers to the elderly [2,5].

In addition to the already known effects caused by SARS-CoV-2, social isolation was able to generate serious consequences for world populations due to the stress it generates and its implications in most different systems [6]. A study by Socrates and colleagues noted a genetic correlation between social isolation and autism spectrum disorder, schizophrenia, and depression [7]. Accordingly, studies indicate that some of the changes that were very evident during the Pandemic were those related to brain functions and psychological processes, pointing to Pandemic social isolation as a trigger for the onset and worsening of these conditions [5,8].

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## 2. Impact of Social Isolation on Neuropsychiatric Disorders

### *2.1. Autism Spectrum Disorder*

Autistic Spectrum Disorder (ASD) was first described in 1942 as an alteration in the individual's neurodevelopment. Characteristics of ASD include deficits in communication and social interaction and restricted and repetitive patterns of behavior and interests [9]. The difficulty in adapting to changes, such as routine interruption, associated with a lack of individual support, exacerbates the negative behaviors present in ASD [10].

Social isolation is a characteristic of individuals with ASD, and several studies and treatments aim to improve this characteristic. Despite the importance of controlling the social isolation of individuals with ASD during the COVID-19 Pandemic, this was inevitable. The damage caused directly affected the mental health of the population in general and, with greater emphasis on individuals with ASD [11].

An observational study described the relationship between the genetic risk of social isolation and its impact on various mental health-related outcomes, including ASD. Although not well characterized, studies suggest the existence of genetic risks of social isolation associated with an increased risk of developing autism, as well as other neuropsychiatric disorders such as depression and psychosis. The authors suggest that genetics may play an essential role in developing certain behavioral and psychological traits, including a propensity for social isolation, and that these traits may increase the risk of developing disorders, including autism [7]. It is, therefore, possible to consider that individuals with ASD are even more likely to develop negative pathological symptoms in moments of established social isolation.

Breaking the pre-pandemic routine was a relevant harmful factor, both for individuals with ASD and for their family members. When schools moved their classes to the remote format, families of individuals with ASD found it more difficult and unfeasible to organize a new routine that could have less negative impact on family life. Therefore, anxiety levels were higher in children with ASD and their families than those without it [9].

Several clinical studies targeting ASD must be adapted for development during the Pandemic. Clinical trials had to be stopped due to COVID-19. Some clinics temporarily closed, suspending research and face-to-face behavioral intervention activities such as parenting therapy and training. Subsequently, the experimental protocols were adapted to enable their continuity [12].

### *2.2. Learning Disabilities*

According to the APA-5 (American Psychiatric Association, 2013 - Diagnostic and Statistical Manual of Mental Disorders, 5th Edition Washington, DC), "learning disabilities" are a broad category of disorders that can affect a person's ability to learn or use specific academic, social, or

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practical skills. Individuals with this condition may struggle with reading, writing, math, or communication. These difficulties are not caused by intellectual disabilities, lack of motivation, or poor teaching; they persist over time [13]

Such a condition can significantly impact an individual's life, as it increases the propensity for low academic performance, mental health problems, difficulties in the job market, and lower quality of life [14]. The risk of developing learning disabilities may be related to genetic predisposition and environmental factors, such as poverty and exposure to toxins, thus affecting brain development and culminating in diagnosing these conditions [15].

There are some forms of learning disabilities, such as dyslexia, dysgraphia, dyscalculia, and auditory processing disorder [16]. Each of the disabilities affects a specific area of learning and can manifest itself in different ways. Therefore, it is essential to understand the various manifestations of each, as symptoms can vary widely from one individual to another [13].

Social isolation can harm the academic performance of students with learning disabilities, as it affects social issues related to feelings of loneliness, such as peer rejection and distancing. When socially isolated, these students may miss opportunities to learn from peers, practice social skills, and develop positive self-esteem. Furthermore, social isolation can lead to a lack of motivation and learning engagement, negatively affecting academic performance [17].

For students with a learning disability, online classes and social isolation can result in fewer opportunities to practice social skills and develop meaningful relationships with peers. Furthermore, the sudden shift to online learning can create additional challenges, such as a need for access to assistive resources and technologies, teacher interaction, and direct support [17].

Students or not, all individuals with learning disabilities are negatively affected by social isolation. One study observed that the COVID-19 Pandemic and social distancing measures resulted in significant changes in the daily lives of adults with learning disabilities, including interruption of routine activities and lack of social interaction with family, friends, and health professionals. These measures impacted their mental and physical health and their ability to carry out daily activities and work. The study evaluated occupational therapy referrals received before and during the height of the COVID-19 Pandemic and found an increase in referrals related to anxiety, depression, and social skills, emphasizing the importance of occupational therapy for these adults [18].

Although they are still few, studies have shown that the interruption of routine activities and the lack of social interaction with friends and health professionals have an impact on the mental and physical health of individuals with learning disabilities, as well as on their ability to carry out daily activities and work.

### *2.3. Schizophrenia*

Schizophrenia is a complex and chronic mental disorder that affects approximately 1% of the global population. A combination of positive symptoms, such as hallucinations and delusions, negative symptoms, such as reduced emotional expression and motivation, and cognitive symptoms, including concentration and memory difficulties, characterizes it [19].

Social isolation can contribute to worsening symptoms and quality of life in individuals with schizophrenia. Individuals who experienced social isolation during the Pandemic had significantly higher psychological distress levels than the control group. More specifically, individuals with schizophrenia reported higher anxiety, depression, and stress symptoms and lower levels of subjective well-being and social support. These results suggest that social isolation measures implemented during the COVID-19 Pandemic harmed the psychological well-being of hospitalized patients with schizophrenia. The lack of social interactions and reduced access to support systems may have contributed to these individuals' increased psychological distress [20]

### *2.4. Dementia*

Dementia is a neurodegenerative condition that mainly affects memory, thinking, behavior, and the ability to carry out daily activities, with Alzheimer's being its most common form. Social isolation is a common phenomenon among people with dementia, and it can occur due to several factors, such

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as stigma, communication difficulties, and physical limitations. The relationship between dementia and social isolation is complex and can significantly negatively affect the health and well-being of those affected [21].

Studies have shown that social isolation is associated with a higher risk of developing and progressing dementia. A meta-analysis of longitudinal studies showed that social isolation is associated with a 50% increase in the risk of dementia in the elderly [22]. Additionally, loneliness and social isolation have been linked to faster cognitive decline in people diagnosed with dementia [23].

Unlike other conditions already mentioned, social isolation can also negatively impact the mental health of people with dementia. A study by Victor et al. (2012) showed that social isolation is associated with a higher risk of depression in these individuals [24]. Loneliness and isolation can also lead to symptoms of anxiety and stress, worsening the quality of life of people with dementia [25].

In addition to increasing behavioral symptoms of psychiatric disorders, social isolation and lack of support in individuals diagnosed with dementia can cause reduced cognitive functionality. A qualitative study evaluated the experiences and perceptions of people with dementia and their caregivers regarding the closure of social support services during the COVID-19 Pandemic, identifying the significant negative impact of these services on quality of life and well-being. -emotional being of both patients and caregivers [26].

Individuals with dementia may have atypical clinical symptoms of infectious diseases, such as COVID-19, in which subtle or less specific symptoms can be identified, making accurate diagnosis difficult. Of note is the importance of considering underlying cognitive impairment when assessing and monitoring patients with dementia during unusual periods [27].

Systematized studies are still needed to assess the impact of social isolation in individuals with dementia. However, the scientific literature already points to some results revealing a greater risk of disease development and progression, faster cognitive decline, mental health problems, and caregiver burden associated with measures during the Pandemic.

### *2.5. Depression and Anxiety*

Depression and anxiety are prevalent mood disorders worldwide. Its etiology and pathophysiology are complex and multifactorial. A persistent state of sadness, hopelessness, and loss of interest or pleasure in day-to-day activities characterizes depression. These symptoms cause significant impairment in social, occupational, or other vital areas of the person's life. Anxiety is characterized by excessive worry or persistent fear disproportionate to the circumstances and interferes with the person's normal functioning. Anxiety can be classified in many ways, such as generalized anxiety disorder, panic disorder, and post-traumatic stress disorder [13].

Stressful situations contribute to the triggering or worsening of disorders. The COVID-19 Pandemic created a favorable environment based on social isolation and fear of the unknown. Diagnoses of depression and anxiety have increased significantly in recent years [28]. According to WHO data, there was an increase of at least 25% in cases of depression and anxiety in the first year of the Pandemic alone, which may have been even more significant in the following years [29].

During the second wave of the Pandemic, a study in Myanmar identified 38.7% of patients infected with COVID-19 with depressive symptoms, and the significantly associated factors were age equal to or greater than 40 years, family with less than four people, low family income and infection in family members [30]. In another study, low serum 25-hydroxyvitamin D levels and a diagnosis of depression were identified as predictors of greater vulnerability to the stressful impact of the COVID-19 outbreak [31].

Levels of anxiety and depression increased in patients with myasthenia gravis during the COVID-19 Pandemic and quarantine period in India. Furthermore, the negative impact on mental health was more pronounced in patients with greater disease severity [32]. Individuals placed in quarantine centers due to the Pandemic in Nepal also had increased levels of anxiety and depression. Such conditions were related to fear, loneliness, and frustration associated with quarantine [33].

The comorbidity between depression and insomnia has become more prevalent, mainly affecting patients who contract COVID-19. Combining these two disorders can lead to a negative

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cycle, where depression can exacerbate insomnia and vice versa. In addition, quarantine and social isolation have contributed to increased emotional stress and sleep disturbances, further aggravating the relationship between depression and insomnia. In patients positive for COVID-19, this comorbidity may be even more pronounced due to the physical and psychological impacts of the disease. Uncertainty surrounding recovery, health concerns, and the possibility of complications can intensify depressive symptoms and difficulty sleeping [34].

Most research revealed a significant increase in the number of diagnoses and worsening of anxiety and depression, both due to the stress caused by the psychosocial situation of the Pandemic and by the SARS-CoV-2 infection [28].

### *2.6. Bipolar Disorder*

Bipolar disorder (BD) is a chronic condition with a high risk of suicide and characterized by alternating episodes of (hypo)mania and depression intertwined with euthymic phases, relatively free of symptoms. BD can be subdivided into BD type I and type II, and what differs in the category is that in BD type II, there are depressive and hypomanic episodes without a complete manic episode [35].

In general, social isolation increases the probability of mortality when associated with BD. One study identified a significant effect of social isolation on the chances of mortality, with the increased probability of death being 26% for reported loneliness, 29% for social isolation, and 32% for the living alone factor. Some indicators of social isolation involve living alone, having few social network ties, and having infrequent social contact, conditions usually present in BD's clinical symptomatology [36].

Durante o isolamento social, as pessoas com diagnóstico de THB podem enfrentar desafios adicionais. A falta de interação social e suporte emocional pode levar a sentimentos de solidão, isolamento e agravamento dos sintomas depressivos. A falta de rotina e estrutura social também pode afetar negativamente o curso do transtorno. Além disso, o isolamento social pode levar a uma redução das atividades sociais e de lazer, o que pode interferir na qualidade de vida e no bem-estar emocional dos indivíduos com THB. A falta de interação social pode, ainda, dificultar a identificação e o manejo dos sintomas do THB, além de aumentar o risco de recaídas [37].

During the quarantine period, a 32-year-old woman with no previous psychiatric diagnosis had an acute manic episode during a stressful situation at the beginning of the Pandemic. Symptoms included elevated mood, increased energy, fast speech, grandiose thoughts, and impulsive behaviors [38].

Few studies still relate THB to the effects caused by social isolation and quarantine of COVID-19. Despite this, published research corroborates that the COVID-19 Pandemic and social isolation measures can also predispose or intensify BD cases. Physical isolation, social distancing, and social interaction restrictions can lead to a greater sense of loneliness, increased stress, and decreased social support, which can negatively affect the mental health of these patients. In addition, limitations in accessing mental health services due to the Pandemic may also contribute to greater stigmatization and difficulties in inadequate treatment.

### *2.7. Eating Disorders*

Eating disorders are psychiatric conditions characterized by eating behavior, body image, and weight perception disturbances. These conditions may include anorexia nervosa, bulimia nervosa, binge eating disorder, and other unspecified eating disorders [39]. They are considered complex conditions resulting from a vast interaction of genetic, neurobiological, psychological, and social factors affecting individuals worldwide, diagnosed mainly in adulthood [40].

The Pandemic has significantly impacted eating disorders, with reports of increased symptoms and risk for these disorders. Major concerns include changing eating patterns, increasing restrictive behavior, and increasing concern about weight and body shape. Social isolation associated with Pandemic-related stress and disruption of mental health services contributes to worsening symptoms [41].

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In a study conducted in Australia, participants who reported a history of eating disorders indicated an increase in dietary restriction and the number of binge eating. In contrast, the general population reported increased consumption of unhealthy foods and reduced physical activity. These changes can be attributed to several factors, including the availability of specific foods, increased stress, anxiety, and depressive symptoms caused by social distancing measures. These results suggest that the Pandemic has significantly impacted eating and exercise behaviors in individuals with eating disorders and the general population [42].

Another study of people in the United States and the Netherlands showed that the Pandemic significantly impacted individuals with eating disorders. About 62% of participants reported that the Pandemic had worsened their symptoms, while just 8% reported an improvement. The most affected symptoms were a preoccupation with weight, body shape, and food restrictions. Additionally, most participants reported changes in eating behaviors during the Pandemic. About 30% of participants reported an increase in food restriction, 21% reported an increase in binge eating episodes, and 28% reported a rise in exercise-related preoccupation. Corroborating with the other studies discussed, the factors contributing to these negative changes included social isolation, fear of gaining weight during confinement, and interruption of face-to-face treatments and therapies [43].

A survey carried out in Germany noted that most individuals diagnosed with anorexia nervosa reported a worsening of symptoms during the Pandemic. About 62% of participants reported an increase in concern about weight and body shape, and 36% reported an increase in dietary restriction. Additionally, 39% of participants reported an increase in concern about exercise. Contributing factors to these negative shifts included social isolation, discontinuation of face-to-face treatments and therapies, fear of gaining weight during lockdown, and limited access to proper food and exercise [44].

A randomized controlled clinical trial with two groups, one that was exposed to thoughts related to social distance and a control that was exposed to neutral ideas, found that thoughts related to the experience of social distancing had a significant impact on dietary intake and hypothesized trend. for episodes of binge eating. Participants exposed to thoughts of social distancing reported increased food intake and a greater propensity for binge eating episodes compared to the control group. The results suggest that the experience of social distancing during the COVID-19 Pandemic may trigger changes in eating behavior, leading to greater food consumption and a greater tendency towards binge eating episodes [45].

Female college students with body dissatisfaction and risk of developing eating disorders experienced a negative effect on body perception and body-related behaviors during the COVID-19 Pandemic. There has been increased body dissatisfaction, concern about body weight and shape, and compensatory practices such as dietary restriction and excessive exercise by these women during the Pandemic [46].

Individuals with a previous diagnosis of binge eating disorder have also been affected by the COVID-19 Pandemic. Research conducted during the first lockdown in Germany revealed increased frequency and severity of binge eating episodes and increased compensatory behaviors such as food restriction and excessive exercise. Furthermore, these individuals reported increased symptoms of depression and anxiety during the Pandemic, possibly related to increased disordered eating behaviors [47].

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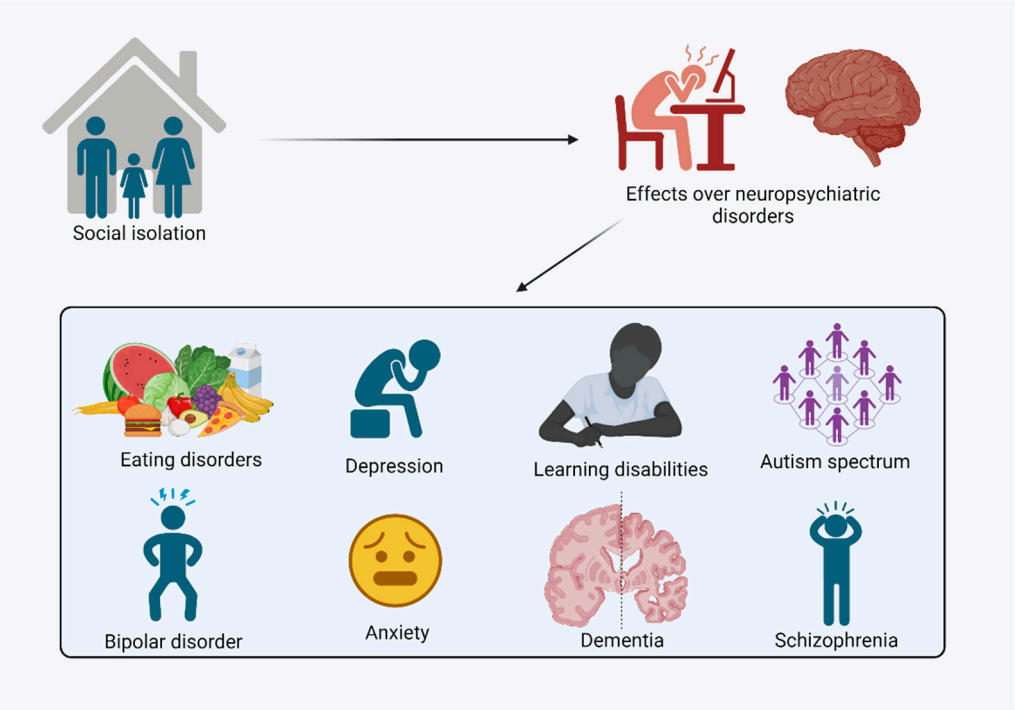


**Figure 1. Main disorders affected by social isolation.** Social isolation stress can lead to neurologic and psychiatric disorders. In this sense, among the main neuropsychiatric disorders triggered or modified by social isolation stress are learning disabilities, dementia, schizophrenia and autism spectrum disorder, eating disorders, anxiety, depression, and bipolar disorder.

## 3. Strategies for Mitigating Neuropsychiatric Impairments

The COVID-19 Pandemic has unleashed a series of global challenges that go beyond physical health issues. Social isolation measures, essential to contain the spread of the virus, have significantly impacted the mental health and quality of life of individuals worldwide, especially those who already face neurological and neuropsychiatric conditions. The restrictions imposed by social distancing, the interruption of daily routines, and the lack of social interactions have contributed to the worsening of the symptoms of these conditions, increasing the risk of emotional crises and worsening the quality of life. In this context, non-pharmacological therapeutic strategies emerge as promising approaches to mitigate the adverse effects of the Pandemic and isolation, offering holistic support adapted to individual needs. This topic explores studies on strategies used to minimize the neuropsychiatric damage arising from the Pandemic and, consequently, improve the quality of life of vulnerable individuals.

Regarding ASD, regular access to health care is essential to monitor its development concerning social communication, perceptual-motor, and cognitive comorbidities. During the Pandemic, health interventions through telehealth were necessary, as they allowed health professionals to effectively guide families on performing games and activities that could improve the child's strength, resistance, executive functioning, and social skills with TEA. The family-centered telehealth approach has shown positive results and allowed families to maintain or carry out training, monitoring the child's development even during social isolation [10].

For children between 3 and 6 years of age diagnosed with ASD, a training intervention for parents based on the Developmental Intervention Program (DIR/Floortime) approach, carried out by psychologists and occupational therapists, was beneficial. The intervention ensured significant improvement in ASD symptoms regarding emotional, functional development, and adaptive behavior. Additionally, parents of children with autism who received the training intervention reported significantly reduced stress levels. Therefore, parent training intervention may be effective in improving autism symptoms and emotional and functional development in children with ASD and reducing parental stress [48].

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The Pandemic had unfavorable effects on people receiving mental health care, leading to the use of digital health tools. Because of this, the use of smartphones and social media has become increasingly common among individuals with neuropsychiatric disorders. Given this, exploratory research analyzed the impact of smartphones and social media on mental health, including their potential influence on relapse rates in schizophrenia, and found that social interaction can be a possible supporting therapeutic strategy in several contexts of limited resources. [49], as in the COVID-19 Pandemic.

Another study found that smartphone-facilitated social activity may be an essential metric for determining the risk of relapse in individuals with schizophrenia. Monitoring digital data can provide access to sensitive, meaningful, and ecologically valid information previously unavailable in routine care. Researchers followed individuals with schizophrenia at high risk of relapse for a year who used smartphones with a behavioral detection system called CrossCheck. The study aimed to examine the relationships between social behavior and the occurrence of relapses. The research showed that reductions in the number and duration of calls made and in the number of text messages were associated with relapses [50].

Another research analyzed the effect of animal-assisted therapy, showing a positive impact on social interaction and quality of life in patients with schizophrenia during the COVID-19 Pandemic. Participants reported improvement related to social interactions and more effective communication, in addition to experiencing a greater sense of satisfaction. In addition, quality of life in general, including the physical, psychological, social, and environmental domains, showed significant improvement after involvement in therapeutic sessions [51].

Additional measures are needed to ensure the safety and well-being of people with dementia when social isolation is unavoidable. These measures include implementing infection prevention strategies such as proper hygiene, using personal protective equipment, restricting visits to long-term care facilities, promoting cognitive activities, effective communication, and managing challenging behaviors. It is also necessary to ensure emotional and psychosocial support for patients and their caregivers, who may face social isolation, interruption of support services, and increased stress 52].

In adolescents, an intervention that included educational materials and activities focused on improving resilience and well-being significantly protected stress levels and enhanced physiological outcomes, reducing cortisol, heart rate and blood pressure, and psychological consequences. , with improved self-perception and better ability to deal with stressful situations [53].

The mindfulness-based mobile health (mHealth) intervention, performed using a mobile application with a convenient and flexible platform, also effectively reduced psychological distress and improved well-being. Participants in the intervention group demonstrated increased mindfulness, self-compassion, and psychological resilience skills. The randomized clinical trial was conducted on university students between March and April 2020, the critical quarantine period for COVID-19 [54]. Another study with undergraduate students in the quarantine period showed that higher levels of social support were associated with lower levels of depression, anxiety, and stress [55].

Video sessions with cognitive-behavioral intervention in university students with severe COVID-19 anxiety reduced anxiety, suggesting once again that technology-mediated interventions are beneficial to lowering stress symptoms caused by the Pandemic [56]. Similarly, another study on isolated individuals during the first lockdown in Italy found that online psychological counseling significantly reduced anxiety symptoms and adverse effects, increased well-being, and decreased psychological distress [57].

Corroborating with the above studies, a randomized clinical trial involving individuals diagnosed with COVID-19 revealed that an integrated intervention associating cognitive-behavioral therapy and progressive muscle relaxation sessions significantly improved immunological biomarkers. Individuals who received the intervention also showed a reduction in the severity of COVID-19 and slower progression of the disease compared to the control group, as well as a decrease in stress, anxiety, and depression [58].

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Psychoeducation is a therapeutic strategy used in individuals diagnosed with BD and their families. One study observed that psychoeducation positively impacted family members' attitudes toward psychological disorders. The group that received psychoeducation sessions showed significantly improved knowledge and understanding of THB and reduced levels of internalized stigma. The study highlights the importance of involving family members in the treatment and support process, as their attitudes and beliefs can significantly impact the well-being and recovery of individuals with BD [59].

Specific inhibitory control training for food, a technique that aims to improve people's ability to control impulses, make more rational decisions, and avoid impulsive behaviors, through a mobile application, enabled positive effects in reducing perceived hunger, liking food energy-dense foods and on symptoms of depression in people with disinhibited eating behaviors. However, no significant effects were observed in reducing binge eating symptoms. The results of this randomized clinical trial suggest that food-specific inhibitory control training may have a limited impact on binge eating. Combining this approach with other types of exercise may be necessary to achieve better results in this area [60].

A reward retraining protocol consisted of cognitive-behavioral training to help participants reconnect healthy rewards and reduce cravings for unhealthy foods, effectively reducing binge eating episodes and improving quality of life eating-related life in individuals with binge eating episodes during the COVID-19 Pandemic [61].

The COVID-19 Pandemic has brought unique challenges for individuals already struggling with a neuropsychiatric disorder. However, non-pharmacological therapeutic strategies have emerged as a fundamental approach to improving quality of life and reducing social isolation's adverse effects. By implementing interventions such as teletherapy, self-care practices, adapted physical activity, relaxation techniques, and the promotion of virtual social interactions, it is possible to provide comprehensive support that addresses both the physical and emotional aspects of these individuals. While pharmacological solutions play a crucial role, non-pharmacological approaches can empower patients to face today's challenges more resiliently and positively.

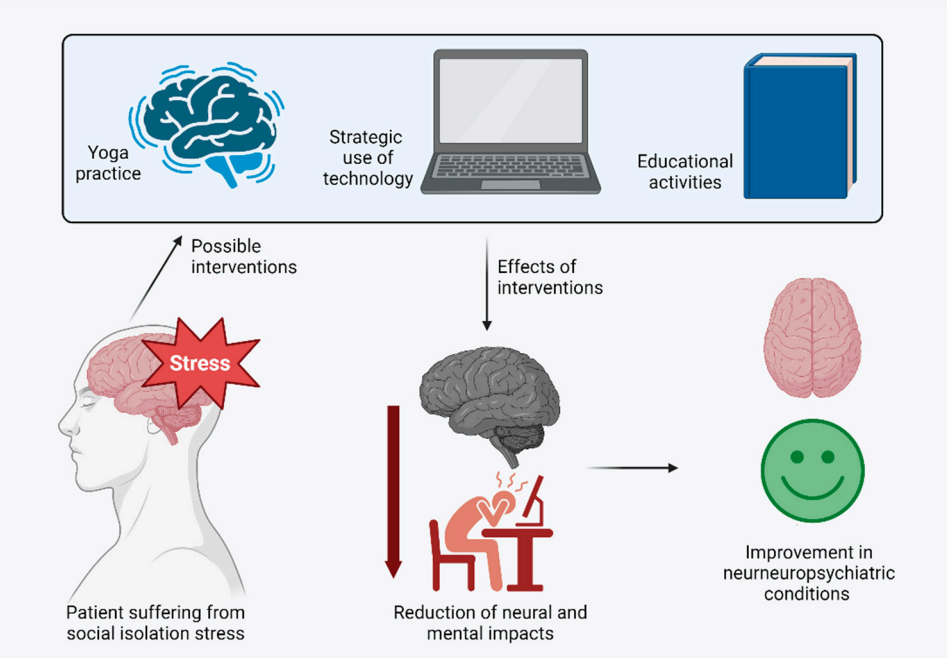


**Figure 2. Possible therapeutic strategies against social isolation stress effects.** To reduce the neuropsychiatric impact of social isolation stress, some of the measures that presented successful outcomes were the practice of yoga, the strategic use of technology, allowing health services to execute activities respecting the isolation and educational activities, explaining the nature of the

disorders and some manners of dealing with them. As a result, these measures reduced the stress's impacts on mental and neural status, improving neuropsychiatric conditions.

## 4. Considerations and Conclusions

The COVID-19 Pandemic has had many impacts on global health, with social isolation being responsible for a surprisingly large number of losses experienced by a large part of the world's population. In this sense, the psychological effects caused by the stress of isolation were relevant, demonstrating the importance of understanding the mechanisms involved in these processes. We sought to centralize the main effects and their possible causes; however, further studies are still needed to deepen the understanding of the stress caused by the biopsychosocial phenomena associated with the COVID-19 Pandemic.

Even with the lack of understanding of the biological and psychological mechanisms impacted by social isolation, the influence of the shared environment on population health is evident. Thus, modifying social habits represents, in addition to a break in habits and routine for some individuals, a contradiction with human nature, which requires interaction and social coexistence to achieve total health conditions in a community way. In this way, one can understand the origin of the wide incidence of disorders during the period of isolation and the importance of this type of analysis for both individual and collective health.

It is essential to mention this type of study's relevance and relate it to individual psychological issues that generate self-imposed isolation. This reality is very present today, often as a consequence of the Pandemic itself, which can adversely affect individuals' health physically and mentally.

Data from the scientific literature on studies carried out during and immediately after the period of social restriction imposed by the COVID-19 Pandemic bring a lot of evidence that stress has a relevant impact on the mental health of individuals. The stress generated by fear of the disease and social uncertainties increased the symptoms and suffering of people who already had a neuropsychiatric disorder and precipitated the onset of disorders in individuals with some biopsychosocial vulnerability.

However, even with the scientific community racing for research that could reveal the impact of the Pandemic on health, there is still time to conclude about the real results that the stress generated may trigger. In this sense, post-COVID-19 studies, which are on the rise in the world, have the potential to reveal significant results that support the possibilities of therapeutic intervention.

On the other hand, the results regarding intervention strategies during the Pandemic reveal the beneficial effects of specific behaviors to reduce the damage caused by isolation. The strategy's results may become future protocols to be implemented and research protocols that can be associated with other interventions, enabling a breakthrough in the production of therapeutic intervention strategies to alleviate the damage caused by the Pandemic.

It is relevant to mention the importance of adaptations of digital tools and other technologies implemented during this period to make mental care possible in isolation since the demand for this care practice model has many potentialities and can also be used in other contexts of the Pandemic, as its benefits have proven to be relevant.

Finally, studies that gather data on specific mental health conditions help professionals build a unique therapeutic plan to qualify the assistance, aiming at more excellent resolution in the treatment. Thus, the conclusions of these analyses can be inserted in the context of the clinic, offering better handling and precision in patient care.

## References

1. Banerjee, D.; Rai, M. Social Isolation in Covid-19: The Impact of Loneliness. *Int J Soc Psychiatry* **2020**, *66*, 525–527, doi:10.1177/0020764020922269.
2. Sepúlveda-Loyola, W.; Rodríguez-Sánchez, I.; Pérez-Rodríguez, P.; Ganz, F.; Torralba, R.; Oliveira, D.V.; Rodríguez-Mañas, L. Impact of Social Isolation Due to COVID-19 on Health in Older People: Mental and Physical Effects and Recommendations. *J Nutr Health Aging* **2020**, *24*, 938–947, doi:10.1007/s12603-020-1500-7.

3. Health and Well-Being Available online: https://www.who.int/data/gho/data/major-themes/health-and-well-being#:~:text=The%20WHO%20constitution%20states%3A%20%22Health,of%20mental%20disorders%20or%20disabilities (accessed on 23 August 2023).
4. Segre, M.; Ferraz, F.C. O Conceito de Saúde. *Rev. Saúde Pública* **1997**, *31*, 538–542, doi:10.1590/S0034-89101997000600016.
5. Jones, E.A.K.; Mitra, A.K.; Bhuiyan, A.R. Impact of COVID-19 on Mental Health in Adolescents: A Systematic Review. *IJERPH* **2021**, *18*, 2470, doi:10.3390/ijerph18052470.
6. De Sousa, R.A.L.; Improta-Caria, A.C.; Aras-Júnior, R.; de Oliveira, E.M.; Soci, Ú.P.R.; Cassilhas, R.C. Physical Exercise Effects on the Brain during COVID-19 Pandemic: Links between Mental and Cardiovascular Health. *Neurol Sci* **2021**, *42*, 1325–1334, doi:10.1007/s10072-021-05082-9.
7. Socrates, A.; Mullins, N.; Gur, R.; Gur, R.; Stahl, E.; O'Reilly, P.; Reichenberg, A.; Jones, H.; Zammit, S.; Velthorst, E. *Polygenic Risk of Social-Isolation and Its Influence on Social Behavior, Psychosis, Depression and Autism Spectrum Disorder*; In Review, **2023**.
8. Xiong, Y.; Hong, H.; Liu, C.; Zhang, Y.Q. Social Isolation and the Brain: Effects and Mechanisms. *Mol Psychiatry* **2023**, *28*, 191–201, doi:10.1038/s41380-022-01835-w.
9. Amorim, R.; Catarino, S.; Miragaia, P.; Ferreras, C.; Viana, V.; Guardiano, M. Impacto de la COVID-19 en niños con trastorno del espectro autista. *RevNeurol* **2020**, *71*, 285, doi:10.33588/rn.7108.2020381.
10. Cleffi, C.; Su, W.-C.; Srinivasan, S.; Bhat, A. Using Telehealth to Conduct Family-Centered, Movement Intervention Research in Children With Autism Spectrum Disorder During the COVID-19 Pandemic. *Pediatric Physical Therapy* **2022**, *34*, 246–251, doi:10.1097/PEP.0000000000000872.
11. Pellicano, E.; Brett, S.; Den Houting, J.; Heyworth, M.; Magiati, I.; Steward, R.; Urbanowicz, A.; Stears, M. COVID-19, Social Isolation and the Mental Health of Autistic People and Their Families: A Qualitative Study. *Autism* **2022**, *26*, 914–927, doi:10.1177/13623613211035936.
12. Berruti, A.S.; Schaaf, R.C.; Jones, E.A.; Ridgway, E.; Dumont, R.L.; Leiby, B.; Sancimino, C.; Yi, M.; Molholm, S. Notes from an Epicenter: Navigating Behavioral Clinical Trials on Autism Spectrum Disorder amid the COVID-19 Pandemic in the Bronx. *Trials* **2022**, *23*, 691, doi:10.1186/s13063-022-06635-9.
13. American Psychiatric Association *Diagnostic and Statistical Manual of Mental Disorders*; DSM-5-TR.; American Psychiatric Association Publishing, 2022; ISBN 9780890425756.
14. Alnahdi, G.H. The Interaction between Knowledge and Quality of Contact to Predict Saudi University Students' Attitudes toward People with Intellectual Disability. *International Journal of Developmental Disabilities* **2021**, *67*, 202–208, doi:10.1080/20473869.2019.1638582.
15. Christodoulou, J.A.; Cyr, A.; Murtagh, J.; Chang, P.; Lin, J.; Guarino, A.J.; Hook, P.; Gabrieli, J.D.E. Impact of Intensive Summer Reading Intervention for Children With Reading Disabilities and Difficulties in Early Elementary School. *J Learn Disabil* **2017**, *50*, 115–127, doi:10.1177/0022219415617163.
16. Shaywitz, S.E.; Shaywitz, B.A. Dyslexia (Specific Reading Disability). *Biological Psychiatry* **2005**, *57*, 1301–1309, doi:10.1016/j.biopsych.2005.01.043.
17. Bruefach, T.; Reynolds, J.R. Social Isolation and Achievement of Students with Learning Disabilities. *Social Science Research* **2022**, *104*, 102667, doi:10.1016/j.ssresearch.2021.102667.
18. Haythorne, R.; Cruz, D.M.C.D.; Turner, H. Occupational Therapy Interventions for Adults with Learning Disabilities: Evaluating Referrals Received Pre and during the Height of the COVID-19 Pandemic. *Cad. Bras. Ter. Ocup.* **2022**, *30*, e3308, doi:10.1590/2526-8910.ctoao253133082.
19. Owen, M.J.; Sawa, A.; Mortensen, P.B. Schizophrenia. *The Lancet* **2016**, *388*, 86–97, doi:10.1016/S0140-6736(15)01121-6.
20. Ma, J.; Hua, T.; Zeng, K.; Zhong, B.; Wang, G.; Liu, X. Influence of Social Isolation Caused by Coronavirus Disease 2019 (COVID-19) on the Psychological Characteristics of Hospitalized Schizophrenia Patients: A Case-Control Study. *Transl Psychiatry* **2020**, *10*, 411, doi:10.1038/s41398-020-01098-5.
21. Dementia Available online: https://www.who.int/news-room/fact-sheets/detail/dementia (accessed on 23 August 2023).
22. Kuiper, J.S.; Zuidersma, M.; Oude Voshaar, R.C.; Zuidema, S.U.; Van Den Heuvel, E.R.; Stolk, R.P.; Smidt, N. Social Relationships and Risk of Dementia: A Systematic Review and Meta-Analysis of Longitudinal Cohort Studies. *Ageing Research Reviews* **2015**, *22*, 39–57, doi:10.1016/j.arr.2015.04.006.
23. Holwerda, T.J.; Deeg, D.J.H.; Beekman, A.T.F.; Van Tilburg, T.G.; Stek, M.L.; Jonker, C.; Schoevers, R.A. Feelings of Loneliness, but Not Social Isolation, Predict Dementia Onset: Results from the Amsterdam Study of the Elderly (AMSTEL). *Journal of Neurology, Neurosurgery & Psychiatry* **2014**, *85*, 135–142, doi:10.1136/jnnp-2012-302755.
24. Victor, C.R.; Scambler, S.J.; Bowling, A.; Bond, J. The Prevalence of, and Risk Factors for, Loneliness in Later Life: A Survey of Older People in Great Britain. *Ageing and Society* **2005**, *25*, 357–375, doi:10.1017/S0144686X04003332.

25. Giebel, C.; Sutcliffe, C.; Verbeek, H.; Zabalegui, A.; Soto, M.; Hallberg, I.R.; Saks, K.; Renom-Guiteras, A.; Suhonen, R.; Challis, D. Depressive Symptomatology and Associated Factors in Dementia in Europe: Home Care versus Long-Term Care. *Int. Psychogeriatr.* **2016**, *28*, 621–630, doi:10.1017/S1041610215002100.
26. Giebel, C.; Cannon, J.; Hanna, K.; Butchard, S.; Eley, R.; Gaughan, A.; Komuravelli, A.; Shenton, J.; Callaghan, S.; Tetlow, H.; et al. Impact of COVID-19 Related Social Support Service Closures on People with Dementia and Unpaid Carers: A Qualitative Study. *Aging & Mental Health* **2021**, *25*, 1281–1288, doi:10.1080/13607863.2020.1822292.
27. Bianchetti, A.; Rozzini, R.; Guerini, F.; Boffelli, S.; Ranieri, P.; Minelli, G.; Bianchetti, L.; Trabucchi, M. Clinical Presentation of COVID19 in Dementia Patients. *J Nutr Health Aging* **2020**, *24*, 560–562, doi:10.1007/s12603-020-1389-1.
28. Bertollo, A.G.; Leite Galvan, A.C.; Dama Mingoti, M.E.; Dallagnol, C.; Ignácio, Z.M. Impact of COVID-19 on Anxiety and Depression - Biopsychosocial Factors. *CNSNDDT* **2024**, *23*, 122–133, doi:10.2174/1871527322666230210100048.
29. World Mental Health Report: Transforming Mental Health for All Available online: https://www.who.int/publications-detail-redirect/9789240049338 (accessed on 23 August 2023).
30. Htun, Y.M.; Thiha, K.; Aung, A.; Aung, N.M.; Oo, T.W.; Win, P.S.; Sint, N.H.; Naing, K.M.; Min, A.K.; Tun, K.M.; et al. Assessment of Depressive Symptoms in Patients with COVID-19 during the Second Wave of Epidemic in Myanmar: A Cross-Sectional Single-Center Study. *PLoS ONE* **2021**, *16*, e0252189, doi:10.1371/journal.pone.0252189.
31. Di Nicola, M.; Dattoli, L.; Moccia, L.; Pepe, M.; Janiri, D.; Fiorillo, A.; Janiri, L.; Sani, G. Serum 25-Hydroxyvitamin D Levels and Psychological Distress Symptoms in Patients with Affective Disorders during the COVID-19 Pandemic. *Psychoneuroendocrinology* **2020**, *122*, 104869, doi:10.1016/j.psyneuen.2020.104869.
32. Kalita, J.; Tripathi, A.; Dongre, N.; Misra, U.K. Impact of COVID-19 Pandemic and Lockdown in a Cohort of Myasthenia Gravis Patients in India. *Clinical Neurology and Neurosurgery* **2021**, *202*, 106488, doi:10.1016/j.clineuro.2021.106488.
33. Bahadur, C., U.B.; Pokharel, S.; Munikar, S.; Wagle, C.N.; Adhikary, P.; Shahi, B.B.; Thapa, C.; Bhandari, R.P.; Adhikari, B.; Thapa, K. Anxiety and Depression among People Living in Quarantine Centers during COVID-19 Pandemic: A Mixed Method Study from Western Nepal. *PLoS ONE* **2021**, *16*, e0254126, doi:10.1371/journal.pone.0254126.
34. Yan, L.; Li, Z.-X.; Zhang, Y.; Liang, X.-S.; Li, J.-J.; Wu, M.; Shi, G.-A.; Chen, R.-M.; Ji, X.; Zuo, S.-Y.; et al. [Effect of Shugan Tiaoshen acupuncture combined with western medication on depression-insomnia comorbidity due to COVID-19 quarantine: a multi-central randomized controlled trial]. *Zhongguo Zhen Jiu* **2023**, *43*, 255–260, doi:10.13703/j.0255-2930.20221030-k0004.
35. Kraiss, J.T.; Ten Klooster, P.M.; Frye, E.; Kupka, R.W.; Bohlmeijer, E.T. Exploring Factors Associated with Personal Recovery in Bipolar Disorder. *Psychol Psychother Theory Res Pract* **2021**, *94*, 667–685, doi:10.1111/papt.12339.
36. Holt-Lunstad, J.; Smith, T.B.; Baker, M.; Harris, T.; Stephenson, D. Loneliness and Social Isolation as Risk Factors for Mortality: A Meta-Analytic Review. *Perspect Psychol Sci* **2015**, *10*, 227–237, doi:10.1177/1745691614568352.
37. Eidelman, P.; Gershon, A.; Kaplan, K.; McGlinchey, E.; Harvey, A.G. Social Support and Social Strain in Inter-Episode Bipolar Disorder. *Bipolar Disord* **2012**, *14*, 628–640, doi:10.1111/j.1399-5618.2012.01049.x.
38. Yin, X.; Sun, Y.; Zhu, C.; Zhu, B.; Gou, D.; Tan, Z. An Acute Manic Episode During 2019-NCoV Quarantine. *Journal of Affective Disorders* **2020**, *276*, 623–625, doi:10.1016/j.jad.2020.07.112.
39. Smink, F.R.E.; Van Hoeken, D.; Hoek, H.W. Epidemiology of Eating Disorders: Incidence, Prevalence and Mortality Rates. *Curr Psychiatry Rep* **2012**, *14*, 406–414, doi:10.1007/s11920-012-0282-y.
40. Treasure, J.; Claudino, A.M.; Zucker, N. Eating Disorders. *The Lancet* **2010**, *375*, 583–593, doi:10.1016/S0140-6736(09)61748-7.
41. Rodgers, R.F.; Lombardo, C.; Cerolini, S.; Franko, D.L.; Omori, M.; Fuller-Tyszkiewicz, M.; Linardon, J.; Courtet, P.; Guillaume, S. The Impact of the COVID -19 Pandemic on Eating Disorder Risk and Symptoms. *Int J Eat Disord* **2020**, *53*, 1166–1170, doi:10.1002/eat.23318.
42. Phillipou, A.; Meyer, D.; Neill, E.; Tan, E.J.; Toh, W.L.; Van Rheenen, T.E.; Rossell, S.L. Eating and Exercise Behaviors in Eating Disorders and the General Population during the COVID -19 Pandemic in Australia: Initial Results from the COLLATE Project. *Int J Eat Disord* **2020**, *53*, 1158–1165, doi:10.1002/eat.23317.
43. Termorshuizen, J.D.; Watson, H.J.; Thornton, L.M.; Borg, S.; Flatt, R.E.; MacDermod, C.M.; Harper, L.E.; Furth, E.F.; Peat, C.M.; Bulik, C.M. Early Impact of COVID -19 on Individuals with SELF-REPORTED Eating Disorders: A Survey of ~1,000 Individuals in the United States and the Netherlands. *Int J Eat Disord* **2020**, *53*, 1780–1790, doi:10.1002/eat.23353.
44. Schlegl, S.; Maier, J.; Meule, A.; Voderholzer, U. Eating Disorders in Times of the COVID -19 Pandemic—Results from an Online Survey of Patients with Anorexia Nervosa. *Int J Eat Disord* **2020**, *53*, 1791–1800, doi:10.1002/eat.23374.

45. Yi-Chi Chang, Y.; Wu, P.-L.; Chiou, W.-B. Thoughts of Social Distancing Experiences Affect Food Intake and Hypothetical Binge Eating: Implications for People in Home Quarantine during COVID-19. *Social Science & Medicine* **2021**, *284*, 114218, doi:10.1016/j.socscimed.2021.114218.
46. Zhou, Y.; Wade, T.D. The Impact of COVID -19 on Body-dissatisfied Female University Students. *Int J Eat Disord* **2021**, *54*, 1283–1288, doi:10.1002/eat.23521.
47. Giel, K.E.; Schurr, M.; Zipfel, S.; Junne, F.; Schag, K. Eating Behaviour and Symptom Trajectories in Patients with a History of Binge Eating Disorder during COVID-19 Pandemic. *Eur Eat Disorders Rev* **2021**, *29*, 657–662, doi:10.1002/erv.2837.
48. Akhani, A.; Dehghani, M.; Gharraee, B.; Hakim Shooshtari, M. Parent Training Intervention for Autism Symptoms, Functional Emotional Development, and Parental Stress in Children with Autism Disorder: A Randomized Clinical Trial. *Asian Journal of Psychiatry* **2021**, *62*, 102735, doi:10.1016/j.ajp.2021.102735.
49. Sikira, H.; Janković, S.; Slatina, M.S.; Muhić, M.; Sajun, S.; Priebe, S.; Džubur Kulenović, A. The Effectiveness of Volunteer Befriending for Improving the Quality of Life of Patients with Schizophrenia in Bosnia and Herzegovina – an Exploratory Randomised Controlled Trial. *Epidemiol Psychiatr Sci* **2021**, *30*, e48, doi:10.1017/S2045796021000330.
50. Buck, B.; Scherer, E.; Brian, R.; Wang, R.; Wang, W.; Campbell, A.; Choudhury, T.; Hauser, M.; Kane, J.M.; Ben-Zeev, D. Relationships between Smartphone Social Behavior and Relapse in Schizophrenia: A Preliminary Report. *Schizophrenia Research* **2019**, *208*, 167–172, doi:10.1016/j.schres.2019.03.014.
51. Shih, C.-A.; Yang, M.-H. Effect of Animal-Assisted Therapy (AAT) on Social Interaction and Quality of Life in Patients with Schizophrenia during the COVID-19 Pandemic: An Experimental Study. *Asian Nursing Research* **2023**, *17*, 37–43, doi:10.1016/j.anr.2023.01.002.
52. Wang, H.; Li, T.; Barbarino, P.; Gauthier, S.; Brodaty, H.; Molinuevo, J.L.; Xie, H.; Sun, Y.; Yu, E.; Tang, Y.; et al. Dementia Care during COVID-19. *The Lancet* **2020**, *395*, 1190–1191, doi:10.1016/S0140-6736(20)30755-8.
53. Yeager, D.S.; Bryan, C.J.; Gross, J.J.; Murray, J.S.; Krettek Cobb, D.; H. F. Santos, P.; Gravelding, H.; Johnson, M.; Jamieson, J.P. A Synergistic Mindsets Intervention Protects Adolescents from Stress. *Nature* **2022**, *607*, 512–520, doi:10.1038/s41586-022-04907-7.
54. Sun, S.; Lin, D.; Goldberg, S.; Shen, Z.; Chen, P.; Qiao, S.; Brewer, J.; Loucks, E.; Operario, D. A Mindfulness-Based Mobile Health (MHealth) Intervention among Psychologically Distressed University Students in Quarantine during the COVID-19 Pandemic: A Randomized Controlled Trial. *Journal of Counseling Psychology* **2022**, *69*, 157–171, doi:10.1037/cou0000568.
55. Guo, K.; Zhang, X.; Bai, S.; Minhat, H.S.; Nazan, A.I.N.M.; Feng, J.; Li, X.; Luo, G.; Zhang, X.; Feng, J.; et al. Assessing Social Support Impact on Depression, Anxiety, and Stress among Undergraduate Students in Shaanxi Province during the COVID-19 Pandemic of China. *PLoS ONE* **2021**, *16*, e0253891, doi:10.1371/journal.pone.0253891.
56. Shabahang, R.; Aruguete, M.S.; McCutcheon, L. Video-Based Cognitive-Behavioral Intervention for COVID-19 Anxiety: A Randomized Controlled Trial. *Trends Psychiatry Psychother* **2021**, doi:10.47626/2237-6089-2020-0056.
57. Carbone, G.A.; Zarfati, A.; Nicoli, M.S.; Paulis, A.; Tourjansky, G.; Valenti, G.; Valenti, E.M.; Massullo, C.; Farina, B.; Imperatori, C. Online Psychological Counselling during Lockdown Reduces Anxiety Symptoms and Negative Affect: Insights from Italian Framework. *Clin Psychology and Psychoth* **2022**, *29*, 367–372, doi:10.1002/cpp.2608.
58. Alawna, M.; Mohamed, A.A. An Integrated Intervention Combining Cognitive-behavioural Stress Management and Progressive Muscle Relaxation Improves Immune Biomarkers and Reduces COVID-19 Severity and Progression in Patients with COVID-19: A Randomized Control Trial. *Stress and Health* **2022**, *38*, 978–988, doi:10.1002/smi.3151.
59. Latifian, M.; Raheb, G.; Abdi, K.; Alikhani, R.; Shariful Islam, S.M. The Effectiveness of Psychoeducation in Improving Attitudes towards Psychological Disorders and Internalized Stigma in the Family Members of Bipolar Patients: A Quasi-experimental Study. *PsyCh Journal* **2023**, *12*, 272–279, doi:10.1002/pchj.621.
60. Cardi, V.; Meregalli, V.; Di Rosa, E.; Derrigo, R.; Faustini, C.; Keeler, J.L.; Favaro, A.; Treasure, J.; Lawrence, N. A Community-Based Feasibility Randomized Controlled Study to Test Food-Specific Inhibitory Control Training in People with Disinhibited Eating during COVID-19 in Italy. *Eat Weight Disord* **2022**, *27*, 2745–2757, doi:10.1007/s40519-022-01411-9.
61. Juarascio, A.S.; Michael, M.L.; Srivastava, P.; Manasse, S.M.; Drexler, S.; Felonis, C.R. The Reward Re-Training Protocol: A Novel Intervention Approach Designed to Alter the Reward Imbalance Contributing to Binge Eating during COVID -19. *Int J Eat Disord* **2021**, *54*, 1316–1322, doi:10.1002/eat.23528.