Effectiveness of short-term belly breathing training in individuals who work-from-home during the COVID-19 lockdown in India

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ABSTRACT

COVID-19 impacted many lives around the globe, leading to a nationwide lockdown in India from the 25th of March 2020. Home confinement, physical and social isolation, the spread of false news through social media, fear of contracting the disease, lack of physical activity, and work-from-home situations have affected the mental status and sleep quality of individuals during the lockdown. We intended to identify the effect of belly breathing exercise in reducing the depression, anxiety and stress levels in individuals who work-from-home during the lockdown. A hundred participants were identified through snowball sampling and were divided into two equal groups. Group A received a health education program and belly breathing techniques, whereas group B was provided with a health education program alone. DASS 21 and single item Sleep Quality Scale was assessed before recruitment and after three weeks of intervention in both groups. Significant reduction in depression, anxiety, and stress levels were observed in group A (p<0.001) than that of group B. Participants who underwent belly breathing also reported significant improvement in sleep quality after three weeks of intervention. Belly breathing has found to be an effective and simple technique to instruct and perform, which significantly reduces depression, anxiety and stress levels in individuals who work from home and are in need of medical advice for their mental health status. We suggest the use of belly breathing in improving the mental status in any black swan events such as home quarantine or strict physical isolation measures, and even during any stressful situations.

INTRODUCTION

The impact of COVID-19 among the world population was a black swan event (Kochhar et al., 2020), disturbing the normal lifestyle of the human race in all aspects of his life. It was first reported at Wuhan province of China in December 2019, and the first confirmed case in India was reported on the 30th of January 2020 (John et al., 2020). World Health Organization (WHO) declared COVID-19 as a pandemic on the 11th of March, 2020 (Grover et al., 2020). Quarantine, social isolation, use of masks, and frequent hand washing are the major strategies advocated by WHO to prevent the spread of infection. In
The employment gradually shifted to a work-from-home scenario, mostly the desktop and computer jobs (Jaiswal and Arun, 2020; Kumar and Dwivedi, 2020). Lack of social and emotional interactions, physical inactivity, fear of COVID, and increased workload have created major changes in the lifestyle of these individuals. Basu et al. (2020) identified a 15% increase in those who sleep after 3 am. There was an increase in depression, anxiety and stress levels during the lockdown, with about 70% of participants reporting moderate levels of stress (Grover et al., 2020). High levels of work-related stress were reported due to increased use of technology for being connected to work, virtual team meetings and discussions, and a reduction in workplace interactions among employees (Barkur et al., 2020).

It was imperative to identify those who are in distress and are in need of medical advice to tackle these difficult times. We identified “Belly breathing” to be an effective technique to improve mental health by reducing the levels of depression, anxiety and stress. This technique was also easy to teach and administer through a virtual session with the individuals. This study was intended to identify the short term effect of belly breathing in reducing the depression, anxiety and stress levels in individuals who work from home during the lockdown period.

MATERIALS AND METHODS

The study was conducted in the Coimbatore district of South India, from the 8th to the 28th of April, 2020. This was two weeks after the declaration of nationwide lockdown. Individuals employed in the private sector, performing long hours of desktop and computer works, and those who are currently working from home were recruited for the study. Participants who are under any medications or with diagnosed mental health issues or those who are performing regular yoga or other physical or mental training at home were excluded from the study. Participants were identified through snowball sampling through social media messaging, requesting to contact the investigators if they are in need of medical advice to improve their mental health during the lockdown period. Participants who showed interest in the study were contacted using a video call. Informed consent was collected verbally before recruiting for the study.

Participants were divided into two groups based on random numbers generated through computer software. Group A was provided with a health education program, which included raising awareness about COVID-19, the need of implementing preventive measures such as social isolation, masks and hand hygiene, how to stay safe from not getting infected, and ergonomic advice for their work-from-home situation regarding proper maintenance of posture, frequent changes from long hours of sitting, maintaining hydration, and the need of good sleep. They were also instructed on performing belly breathing techniques effectively. Group B was provided with the health education program only.

Subjects were trained to perform belly breathing techniques through demonstration by the primary investigator during the video call. Individuals were asked to lie down on their back with their knees up as in a crook-lying position. A square-shaped book was placed over the stomach in order to achieve visual feedback of the performance. Subjects were then asked to breathe in through their nose to the count of three seconds so as to lift the book upwards without moving the shoulders or chest. The breath was held for one second, after which a slow expiration is performed through the mouth to the count of six seconds, bringing the book back to the earlier position. This technique, if performed correctly, will provide a respiratory rate of six breaths per minute. Individuals were asked to repeat belly breathing 20 times in a single session, with three sessions per day, for three weeks. Sessions were planned 45 minutes to one hour before or after any meal.

Zaccaro et al. (2018), in their study, have suggested nine descriptions in a breathing technique to increase the methodological quality of the intervention, which are being answered as follows;

1. Breathing was consciously attended with attention focussed on the activity.
2. Subjects were asked to focus on lifting the book placed over their stomach during inspiration to a height of three to six centimetres.

3. The breathing frequency was set to six breaths per minute.

4. Inspiration was performed through the nose and expiration through the mouth.

5. Three seconds of inspiration, one second hold, and six seconds of expiration in one cycle of belly breathing.

6. I: E=1:2, with 1-second inspiratory hold.

7. Abdominal breathing is emphasized.

8. Visual feedback was utilised for effective performance and not auditory feedback.

9. The book used during the technique was a 200-page square notebook, weighs between 100-200 grams, which is readily available in their house.

Outcome measures were collected from participants before the recruitment to the study and after three weeks of the study. Depression, Anxiety and Stress Scale (DASS 21) was used to analyse the mental status of participants before and after the study. DASS 21 questionnaire helps identify the level of depression, anxiety and stress in individuals of the previous week (Lovibond and Lovibond, 1995). The scoring for the 21 questions was self-reported using graded numbers, with '0' for did not apply to me at all, ‘1’ for 1 Applied to me to some degree, or some of the time – SOMETIMES, ‘2’ for applied to me to a considerable degree, or a good part of the time – OFTEN, and ‘3’ for applied to me very much, or most of the time - ALMOST ALWAYS. The scores are multiplied by two and analysed for the levels of symptoms, as illustrated in table 1. The quality of sleep of the participants during the previous week was also assessed using Single-Item Sleep Quality Scale (SQS) (Cappelleri et al., 2020). Subjects were asked to rate their sleep in the morning upon awakening on an 11 point scale, ‘0’ for best possible sleep and ‘10’ for worst possible sleep, and document in a diary. An average of seven days was taken as the quantitative measure of their sleep quality in the past week. The data were analysed statistically using a T-test to derive conclusions.

RESULTS AND DISCUSSION

A total of 100 subjects participated in the study, with 50 in each group. Group A consisted of 24 males and 26 females, whereas group B consisted of 22 males and 28 females. The mean age of the participants in Group A and B were 29.82±4.70 and 30.68±4.99 years, respectively. Homogeneity was maintained between the two groups with respect to age (p=0.377). The mean values of the outcome measures between the two groups are illustrated in Table 2.

Before the study, participants found moderate depression levels, mild anxiety, and mild to moderate stress levels, which was homogenous between the groups (p>0.05). Significant changes were demonstrated with the intervention in group A, whereas group B did not demonstrate any significant change after three weeks. The quality of sleep found to be improved in group A with the changes in depression, anxiety and stress, with a mean difference of 2.82±1.02 in SQS scores after the intervention. Participants objectively reported an increased quality of sleep and achieved the usual pattern of sleep as they had performed prior to lockdown.

Respiration is efficient and good when the diaphragm is being used, such as in belly breathing. The term ‘belly breathing’ is easier for the layman to understand the technique being used than using terms such as ‘diaphragmatic’ or ‘thoracic’. Physiologic responses following efficient diaphragmatic breathing include a reduced oxygen consumption, decreased blood pressure and heart rate, increased theta wave amplitude, and increased parasympathetic activity, which makes an individual alert and invigorating (Varvogli and Darviri, 2011). The intake of oxygen is more in belly breathing when compared to shallow breathing. This technique is currently considered an integral part of different yoga and relaxation programs (Gulzhaina et al., 2018). Belly breathing is one of the simplest and easiest techniques to instruct, administer and perform, which has an impact on the mental status...
Table 1: Scoring for DASS-21 questionnaire

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Extremely Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>0-9</td>
<td>10-13</td>
<td>14-20</td>
<td>21-27</td>
<td>28+</td>
</tr>
<tr>
<td>Anxiety</td>
<td>0-7</td>
<td>8-9</td>
<td>10-14</td>
<td>15-19</td>
<td>20+</td>
</tr>
<tr>
<td>Stress</td>
<td>0-14</td>
<td>15-18</td>
<td>19-25</td>
<td>26-33</td>
<td>34+</td>
</tr>
</tbody>
</table>

Table 2: Mean values of the outcome measures between group A and group B

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Group</th>
<th>Pre Test Mean ± Std. Dev.</th>
<th>Post Test Mean ± Std. Dev.</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>A</td>
<td>14.36±5.31</td>
<td>8.78±3.44</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14.76±6.27</td>
<td>14.38±6.37</td>
<td>0.068</td>
</tr>
<tr>
<td>Anxiety</td>
<td>A</td>
<td>8.60±3.88</td>
<td>5.38±3.36</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8.50±4.02</td>
<td>7.92±3.93</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Stress</td>
<td>A</td>
<td>17.94±5.93</td>
<td>11.68±5.25</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19.46±7.12</td>
<td>19.20±7.25</td>
<td>0.102</td>
</tr>
<tr>
<td>SQS</td>
<td>A</td>
<td>5.78±1.29</td>
<td>2.96±1.44</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.48±1.28</td>
<td>5.34±1.21</td>
<td>0.197</td>
</tr>
</tbody>
</table>

(*significant at the level p<0.05)

of the individual, as identified by our study.

COVID-19 pandemic and its after-effects have hampered the lives of many all over the world. The lockdown imposed by the government restricted the movement of individuals out of their homes, making them deprived of social and emotional interactions and outdoor activities. The misinformation spread through social media has stimulated fear, anxiety and stigma within the community (The Lancet, 2020). People were also scared of getting infected by the disease easily if they go outside, which intensified their level of stress and anxiety. A vicious cycle of sleep disturbance, increased levels of anxiety and stress, and the fear of contracting the disease was common among individuals during lockdown (Kajander and Peper, 1998), as illustrated in Figure 1. Lack of workplace interaction due to the work-from-home scenario increased the responsibility and workload over employers (Jaiswal and Arun, 2020). This has induced depression in them, which may also have influenced the sleeping habits of subjects. Participants have reported having late night sleeps, approximately after 2 am daily during the lockdown, which was very rare before lockdown. Increased use of digital devices along with home confinement, have also influenced the sleeping pattern during the lockdown, which may impact their physical and mental well-being (Majumdar et al., 2020).

The mechanism of the stress response is a continuation of the fight-or-flight situation faced by the human body. Catecholamines are released by the autonomic nervous system during a fight-or-flight situation. If the situation still persists, the hypothalamus-pituitary-adrenal (HPA) axis releases corticotropin releasing hormone, which in turn releases cortisol from the adrenal cortex to the blood (Xiao et al., 2017). Peak cortisol levels are found after 20 to 30 minutes of the onset of stress, affecting the cognitive, behavioural and physical status of the individuals. It can also lead to depression, anxiety, lower morale, and can decrease the productivity of the individual. Prolonged activation of the HPA axis may lead to diseases of heart, gut and sexual problems, weaken the immune system, and may also lead to neurodegenerative disorders and other illnesses (Gulzhaina et al., 2018). Rapid breathing during stressful situations may also contribute to and exacerbates panic attacks (Andre, 2020).

Belly breathing focuses on the effective contraction of the diaphragm whereby reducing the frequency of respiration, maximises the intake of gases, and enhancing alveolar ventilation (Xiao et al., 2017; Nurcahyani et al., 2020). The reduced frequency of breathing will increase the tidal volume and decrease minute volume, which assists in the return of normal respiratory sinus arrhythmia (Kajander and Peper, 1998). Belly breathing has a stabilising effect on the autonomic nervous system (Chen et al., 2017). Conscious deep breathing activates stretch-induced inhibitory signals in both neural and non-neural tissues, which will be in phase with neural elements of the heart, lungs, and cortex (Gulzhaina et al., 2018). It helps in stabilizing heart rate and...
blood pressure by strengthening the parasympathetic system (Chen et al., 2017).

We identified a significant effect of belly breathing in reducing depression, anxiety and stress in individuals who work from home during the lockdown. The higher levels of depression, anxiety and stress have returned to normal with three weeks of interventions, along with an improved quality of sleep. Studies have identified the effectiveness of breathing practice to improve mental health status and emotions (Xiao et al., 2017; Stromberg et al., 2015). A single session of breathing practice has found to be beneficial in minimising post-job burnout to relieve exhaustion, reducing blood pressure, improve oxygenation, and improves cardiorespiratory status and pulmonary functions (Salyers et al., 2011; Wang et al., 2010; Shaw et al., 2010).

Studies have identified the effectiveness of breathing exercises in the treatment of depression, anxiety and stress (Chen et al., 2017). The belly breathing technique stimulates the vagus nerve endings in the nostrils lowering the sympathetic response and activating the parasympathetic nervous system. Diminished hyperventilation with nasal breathing and a mild increase in CO2 levels with the reduced breathing frequency helps in the slowing of heart rate, vasodilatation, enhanced production of gastric juices, and lowered cortical activity, which ultimately helps in relaxation. Cognitive diversion achieved through focusing on the visual feedback of belly breathing helps in reducing negative thoughts and brings about a sense of self-control by the activation of the dorsomedial prefrontal cortex and reducing the activity of the amygdala (Kajander and Peper, 1998; Doll et al., 2016).

The strength of this study is methodological rigour, strict sampling to eliminate bias, and the selection of a simple interventional technique that is easy to administer without direct physical contact with the participants. The study duration was kept shorter to analyse the immediate effects of belly breathing on work-from-home individuals. Long duration studies can be considered in the future to analyse the prolonged impact of the intervention.

CONCLUSIONS

COVID-19 have impacted many lives around the globe. Social isolation and physical inactivity, primarily due to lockdown, had triggered sleep disturbances and higher levels of depression, anxiety and stress. A major share of the population is still confined to their homes because of quarantine measures, government restrictions, unemployment, and work-from-home situations. Belly breathing has found to be an effective and simple technique to instruct and perform, which significantly reduces depression, anxiety and stress levels in individuals who work from home and are in need of medical advice for their mental health status. We suggest belly breathing in improving the mental status in any black swan events such as home quarantine or strict physical isolation measures, even during stressful situations.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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