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# The effectiveness of laughter yoga to improve sleep quality in cancer patients during COVID-19 pandemic

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## ABSTRACT

Background and purpose: The COVID-19 pandemic triggered a high-stress situation and disrupted sleep quality in cancer patients. Laughter yoga is a method that suggested to improve sleep quality. The purpose of this study was to assess the effectiveness of laughter yoga to improve sleep quality of cancer patients during the pandemic.

Methods: This was a quasi-experimental design with a non-equivalent control group approach. The study was conducted at the Indonesian Cancer Foundation, East Java Surabaya branch, in June 202, involved 20 people in each intervention and control group. The instrument used was Pittsburg Sleep Quality Index (PSQI), with lower scores reflect better sleep quality. Laughter yoga intervention was given to the intervention group for four weeks, twice a week, and 20 minutes each meeting while the control group performed daily routine activities. Data was analysed with Paired t-test for pre and post intervention, and Independent Sample t-test for comparing both groups.

Results: The intervention group shows a decrease in the global PSQI score (from 10.15+2.18 to 7.55+1.87) with p< 0.001, while in control group, there was an increased score (from 10.05+1.46 to 10.10+1.44) with p=0.841. The intervention group showed a decrease in the average score on the global and all of the components PSQI score, indicating a better sleep quality. Meanwhile, in the control group, the average global sleep quality score almost the same, and no significant decrease in all components. Laughter yoga was effective in improving the sleep quality of cancer patients during the pandemic.

Conclusion: Laughter yoga is effective to improve sleep quality. This technique can be routinely practice to improve relaxation and stimulate improvements in sleep quality in all components.

Keywords: Laughter Yoga, Sleep Quality, Cancer, Pandemic

## INTRODUCTION

Psychological distress and sleep disturbances often occur in cancer patients undergoing therapy.[1] A study also mentioned that stress, anxiety, and depression due to cancer and its treatment cause patients to experience sleep disorders.[2] During the COVID-19 pandemic, a very high level of stress and burden was identified in patients with cancer, more than previously measured in this population.[3] Sleep disturbances vary from mild to severe,[4] even in the situation of COVID-19 causing symptoms of moderate to severe insomnia in patients with heterogeneous cancer diagnoses.[5] A study explains that breast cancer patients experienced severe distress and insomnia at the peak of the COVID pandemic.[6] A study states a high prevalence of sleep disorders and depression in cancer patients accompanied by psychiatric symptoms such as somatization, obsession, sensitivity, anxiety, and phobic anxiety.[7] Sleep disturbances affect the low quality of life of cancer patients.[8]

According to the GLOBOCAN 2020, cancer prevalence in 2020 globally was estimated 19.3 million new cases (18.1 million excluding non-melanoma skin cancer) and nearly 10.0 million cancer deaths (9.9 million excluding non-melanoma skin cancer). This prevalence is expected to increase to 28.4 million cases by 2040.[9] The prevalence of cancer in Indonesia reaches 1.79 per mil, and the highest is in DI Yogyakarta, which reaches 4.86 per mil. In the 55-64 year age group, the highest group of people with cancer was 4.62 per mil, with the female sex dominating at 2.85 per mil. In East Java, the most cancer management was surgery, reaching 65.1%, followed by chemotherapy (24.9%), other therapies (20.7%), and the lowest was radiation at 14.1%.[10]

A study revealed that cancer patients might experience sleep disturbances due to a cancer diagnosis, and the side effects of cancer treatment exacerbate sleep disturbances, which has a long-term effect on patients' quality of life.[11] Cancer patients have poor sleep latency, poor sleep pattern also significantly affects the sleep quality of caregivers of cancer patients.[12] A study explains that cancer patients with poor sleep quality impact impaired physical function, social role function, vitality, emotional roles, and general health problems.[13] Distress conditions cause the release of cortisol and inhibit the hormone melatonin thus causing sleep disturbances during the day and night.[14] Previous research has stated a close relationship between glucocorticoids and the onset of sleep disorders in cancer patients.[15]

A study conducted on 31 breast cancer patients who were given four sessions of laughter yoga therapy found a significant decrease in anxiety and depression scores.[16] The same opinion was conveyed by a study that explained that laughter yoga could reduce stress levels in cancer patients before undergoing chemotherapy.[17] The positive effects of laughter yoga help reduce tension, anxiety, resentment, anger, stress, and depression, aid interpersonal relationships, and reduce insomnia, memory failure, and dementia.[18] Laughter yoga, or laughter, can reduce the production of the hormone cortisol and increase the release of endorphins, thereby strengthening the immune system.[19] Laughter therapy lowers serum cortisol and epinephrine levels and releases endorphins that help increase feelings of well-being and improve depressed mood.[20] Laughter yoga is efficient in positively reducing depression and improving sleep in the elderly living in the community.[21] This study aimed at proving the effectiveness of laughter yoga to improve the sleep quality of cancer patients during the pandemic.

## METHODS

This was a quasi-experiment study with a non-equivalent control group. The population was all cancer patients at the Indonesian Cancer Foundation, East Java Surabaya Branch. They come from various regions in Indonesia, including East Java, Kalimantan, Lombok, East Nusa Tenggara, and Papua. The study was conducted

in June 2021. The samples were selected with purposive sampling with eligibility criteria: sleep quality score >5, patients were not experiencing excessive physical problems (painful, severe fatigue, severe nausea, and vomiting). Then, all respondents met the eligibility criteria, then the group distribution was carried out randomly through drawing lots into two groups consisting of 20 people in intervention group and 20 people in the control group. Exclusion and drop-out criteria: patients who did not follow the intervention completely and the condition worsened during the intervention.

Instrument used to measure the sleep quality was Pittsburgh Sleep Quality Index (PSQI), a validity test with a range of r values of 0.787–0.901, and Cronbach's alpha 0.961, which means the instrument was valid and reliable to measure sleep quality. The first step was the pre-test assessment in the intervention and control groups by filling out the PSQI questionnaire after the participants signed the informed consent. Then, participants in the intervention group were given eight sessions of laughter yoga therapy for four weeks, twice a week, and 20 minutes each meeting. The duration and frequencies are done based on previous studies on effective doses for performing laughter yoga. Respondents in the control group carried out daily routine activities.

The laughter yoga procedure is a combination of laughing and pranayama breathing. Respondents were divided into groups of 5-6 people/group and implemented strict health protocols during the intervention (wearing masks and keeping a distance). This action was carried out in the hall of the Indonesian Cancer Foundation, East Java Branch. Detailed steps of laughing yoga consist of a) warming up the muscles by moving the hands, neck, legs and facial muscles on the cheeks (for 3 minutes), b) rhythmic laughter: respondents laugh in rhythm ha..ha..ha..ho..ho..ho while clapping, stamping feet, and shaking head (5 times each), c) pranayama breathing I: respondent take a deep breath through one nostril and exhale through the other nostril (5 times), d) Snow White's laughter: respondents use their palms like a mirror and say "it's me" then laugh while looking at their palms (5 times), e) cellphone laughter: respondents laugh by moving their hands like holding a cellphone while walking back and forth (5 times), f) pranayama breathing II (5 times), g) one meter laughter: respondents in a row spread their arms while being followed by a laugh with the rhythm of aa...ee...aa ..ee (5 times), h) silent laughter: respondents showed an expression of laughing without a sound (5times), i) pranayama breathing III (5 times), j) laughter of a lion: respondents were asked to express like a lion while laughing roaring (5 times), k) celebrity laughter: the respondent laughs while imitating a celebrity laughing (5 times), l) pranayama breathing IV (5 times), m) laughs and dances: respondent laughs while moving body like dancing (5 times) n) relaxation: respondent is asked to calm down and breathe in through both noses and exhale through the mouth (5 times).

After the intervention was completed, respondents in both groups were given a post-test for filling out PSQI questionnaires. Data were tested for normality by Kolmogorov Smirnov, and all data were normally distributed ($p>0.05$). Furthermore, the data were tested through parametric statistics using the Paired T-Test test with a significance level of $p<0.05$ for comparing mean score pre and post intervention in each group; and Independent t test for comparing the mean score pre and post between groups.

This research has been validated by the Ethics Committee of the Faculty of Medicine, Widya Mandala Catholic University Surabaya, and declared ethically worthy with an ethics certificate no. 136/WM12/KEPK/DOSEN/T/2021.

## RESULT

Based on demographic data, most respondents in both groups were female, with more than one third at 56-65 years old and 80% were married. The cancer stage that dominated the two groups was stage III cancer, with the type of cancer was cervical cancer, and the duration of cancer diagnosed was 1-3 years. The majority of respondents in both groups had undergone therapy surgery, chemotherapy, and radiation, while the control group with the same number of respondents also underwent chemotherapy and radiotherapy (Table 1). Before laughter yoga, cancer patients with sleep disorders did not do any intervention to overcome it, the majority of patients only watched television or sat on the terrace when they could not sleep.

**Table 1. Demographic characteristics of the intervention and control group**

| Demographic Data | Characteristic | Intervention Group (n = 20) | (%) | Control Group (n = 20) | (%) |
|---|---|---|---|---|---|
| Gender | Female | 15 | 75 | 14 | 70 |
| | Male | 5 | 25 | 6 | 30 |
| Age Group (years) | 26 – 35 | 4 | 20 | 2 | 10 |
| | 36 – 45 | 1 | 5 | 4 | 20 |
| | 46 – 55 | 5 | 25 | 5 | 25 |
| | 56 – 65 | 7 | 35 | 6 | 30 |
| | >65 | 3 | 15 | 3 | 15 |
| Marital Status | Single | 2 | 10 | 3 | 15 |
| | Married | 16 | 80 | 16 | 80 |
| | Widowed | 2 | 10 | 1 | 5 |
| Cancer Stage | II | 3 | 15 | 5 | 25 |
| | III | 17 | 85 | 13 | 65 |
| | IV | 0 | 0 | 2 | 10 |
| Cancer Types | Breast | 5 | 25 | 5 | 25 |
| | Cervical | 8 | 40 | 7 | 35 |
| | Lung | 3 | 15 | 3 | 15 |
| | Nasopharynx | 0 | 0 | 3 | 15 |
| | Colon | 3 | 15 | 1 | 5 |
| | Parotid | 1 | 5 | 0 | 0 |
| | Ovary | 0 | 0 | 1 | 5 |
| Duration of Cancer Diagnosis (years) | <1 | 6 | 30 | 8 | 40 |
| | 1 – 3 | 11 | 55 | 10 | 50 |
| | 4 – 6 | 1 | 5 | 1 | 5 |
| | >6 | 2 | 10 | 1 | 5 |
| Cancer therapy | Radiation | 5 | 25 | 0 | 0 |
| | Chemotherapy | 2 | 10 | 2 | 10 |
| | Surgery, Chemotherapy | 0 | 0 | 4 | 20 |
| | Surgery, Chemotherapy, Radiation | 7 | 35 | 7 | 35 |
| | Chemotherapy, radiation | 6 | 30 | 7 | 35 |

Based on the components of sleep quality, there were differences between the intervention and control groups. In the intervention group, all score of components decreased after undergoing a laughter yoga intervention for 4 weeks (8 sessions), which indicated a better sleep quality. The biggest change was in the

components of sleep efficiency (from 2.8±0.52 to 1.85±0.67, p=0.000), followed by sleep medication (from 1.8±1.05 to 1.4±0.75, p=0.004), then daytime sleep dysfunction (from 1.1±0.64 to 0.73±0.56, p=0.008), sleep quality (from 1± 0.85 to 0.65±0.67, p=0.012), sleep disturbance (from 1.25±0.44 to 1±0, p=0.015), sleep latency (from 1.15±0.58 to 0.95±0.39, p=0.021), and the last was sleep duration (from 1.05±0.60 to 1±0.56), p=0.03).

Conversely in the control group, the scores of three components of sleep quality did not change, there were sleep quality (1.1±0.3, p=0.083), sleep latency (1.3±0.57, p=0.428), sleep duration (1.35±0.48, p=0.330), and sleep medication (1.55±0.68, p=0.083). While in the other two components, there were a slight decrease, namely sleep efficiency (from 2.4±0.68 to 2.3±0.73, p=0.163) and day sleep time dysfunction (from 1.1 ± 0.55 to 1.2 ± 0.52, p = 0.428), but there was one component's score that actually increased, namely sleep disturbance (from 1.25±0.44 to 1.3±0.47, p=0.577) (Table 2).

**Table 2. Components of sleep quality of respondents**

| Sleep Quality Components | Intervention Group | | | p | Control Group | | | p |
|---|---|---|---|---|---|---|---|---|
| | Pre-test Mean±SD | Post-test Mean±SD | Δ | | Pre-test Mean±SD | Post-test Mean±SD | Δ | |
| Sleep quality | 1 ± 0.85 | 0.65 ± 0.67 | -0.35 | 0.012 | 1.1 ± 0.30 | 1.1 ± 0.3 | 0 | 0.083 |
| Sleep latency | 1.15 ± 0.58 | 0.95 ± 0.39 | -0.2 | 0.021 | 1.3 ± 0.57 | 1.3 ± 0.57 | 0 | 0.428 |
| Sleep duration | 1.05 ± 0.60 | 1 ± 0.56 | -0.05 | 0.030 | 1.35 ± 0.48 | 1.35 ± 0.48 | 0 | 0.330 |
| Sleep efficiency | 2.8 ± 0.52 | 1.85 ± 0.67 | -0.95 | 0.000 | 2.4 ± 0.68 | 2.3 ± 0.73 | -0.1 | 0.163 |
| Sleep disturbance | 1.25 ± 0.44 | 1 ± 0 | -0.25 | 0.015 | 1.25 ± 0.44 | 1.3 ± 0.47 | +0.05 | 0.577 |
| Sleep medication | 1.8 ± 1.05 | 1.4 ± 0.75 | -0.4 | 0.004 | 1.55 ± 0.68 | 1.55 ± 0.68 | 0 | 0.083 |
| Daytime sleep disfunction | 1.1 ± 0.64 | 0.73 ± 0.56 | -0.37 | 0.008 | 1.1 ± 0.55 | 1.2 ± 0.52 | -0.1 | 0.428 |

Δ = mean difference; SD = standard deviation

**Table 3. Global score of sleep quality and statistical test**

| Group | | Pre-test | Post-test | Paired t test | |
|---|---|---|---|---|---|
| | | | | Δ (95%CI) | p |
| **Intervention** | | 10.15 ± 2.18 | 7.55 ± 1.87 | 2.6 (1.95-3.25) | <0.001 |
| **Control** | | 10.05 ± 1.46 | 10.10 ± 1.44 | -0.05 (-0.56– .46) | 0.841 |
| **Independent t test** | **Δ (95%CI)** | 0.10 (-1.09-1.29) | -2.55 (-3.62 - -1.48) | | |
| | **p value** | 0.866 | <0.001 | | |

Δ=mean difference; 95%CI=95% confidence interval

## DISCUSSION

In this study, the mean score of sleep quality in the two groups before intervention was almost the same, which was above the cut off for good sleep quality of 5 points, signifying the two groups had poor sleep quality (higher score shows poorer sleep quality). Sleep disturbances are occurred in 30%-88% of cancer patients.[22] The majority of cancer patients with various stages of diseases who underwent cancer treatments, experienced a total score of poor sleep quality, and only a small proportion experienced impaired function during the day due to drowsiness.[23] Cancer patients before and after undergoing chemotherapy had poor sleep quality, with the most frequent complaints being daytime sleepiness, waking at night and prolonged sleep latency.[24]

Multifactorial causes of poor sleep quality in cancer patients include decreased physical function, age, cancer recurrence, pain complaints, and depression.[25] Psychological distress, depression, and anxiety are also factors that cause decreased sleep quality.[26]

Another cause of the high sleep quality scores was related to gender. Female cancer patients tend to have poor sleep quality, take longer to fall asleep, wake up more often, only sleep 2 hours less per night and have an impact on lower quality of life, greater pain severity, more concern about health and relapse, and increased vasomotor symptoms.[27] Another study also stated that cancer patients, especially women, had short sleep duration and poor sleep quality.[23]

The findings of this study indicate that the majority of respondents (>75%) in both groups received chemotherapy treatment. Chemotherapy can also be a trigger of sleep disorders. Sleeps problems that often occur during chemotherapy include frequent awakenings at night (49%-56%), inability to fall asleep within 30 minutes (50%-73%), and waking up early (49%-65%).[28]

This study showed a significant effect of laughter yoga on the sleep quality of cancer patients during the pandemic. This study shows that after laughter yoga in the intervention group, there was a decrease in sleep quality scores towards a better direction, which was close to the standard score (<5). Laughter can stimulate the release of endorphins from the central nervous system and pituitary gland.[29] Laughter can simultaneously increase pleasant sensations and trigger the release of endogenous opioids in the thalamus, caudate nucleus, and anterior insula.[30] The humor stimulates various physiological systems that decrease stress hormones, such as cortisol and epinephrine, and increase the mesolimbic dopaminergic system.[31] In other chronic diseases such as Parkinson's, laughter yoga therapy can also improve sleep quality, sleep latency, and sleep duration.[32] Laughter therapy resulted in increased plasma serotonin concentrations and decreased salivary chromogranin concentrations.[33] Cancer survivors after chemotherapy were given laughter therapy to reduce fatigue and increase sleep satisfaction.[34]

Cancer patients tend to feel worried, fear of recurrence, and live with uncertainty.[35] The majority of cancer survivors will experience physical and mental disorders that will reduce their quality of life. A study explained that most cancer patients have significant sleep problems characterized by reduced total sleep time, sleep often disturbed by pain, nocturia, feeling too hot, and coughing or snoring loudly.[36] Emotional stress, uncertainty, and physical symptoms of cancer and treatment side effects contribute to poor sleep quality.[37] Stress causes activation of the hypothalamic-pituitary-adrenal (HPA) axis, resulting in maladaptive changes in the HPA axis, leading to neuroendocrine dysregulation and impacting sleep disturbances.[38]

Based on the findings of this study, the researcher hope that cancer patients with sleep disorders can perform laugher yoga independently in their daily lives, and these results can be a guide for palliative nurses as an alternative to the non-pharmacological therapy that is useful in overcoming sleep disorders in cancer patients.

However, there are limitations to this study which include the number of respondents that was not large enough, this is because the implementation is still in a pandemic period. In addition, laughter yoga is carried out using masks so that individuals cannot see each other in detail when laughing so it is less triggering independent laugh.

## CONCLUSION

Laughter yoga is effective in improving the global sleep quality in cancer patients during a pandemic. Improvements occurred in all components, including sleep quality, sleep latency, sleep duration, sleep

efficiency, sleep disturbance, sleep medication, and day sleep time dysfunction. This technique can be practiced to improve sleep quality of cancer patients

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## AUTHOR CONTRIBUTION

Author conducts preliminary surveys, generates research ideas, constructs and develops theoretical studies, designs research methodologies, collects data, tests statistical analyses, interprets results and writes the manuscripts.

## CONFLICT OF INTEREST

I declare that there is no conflicts of interest

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