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CLINICAL TRIAL STUDY

Laughter in Combination with Yoga Exercises: Changes in Psychological Distress and Quality of Life in Patients with Coronary Heart Disease (CHD)

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Abstract:

Background:

Emotional distress (such as depression, anxiety, and stress) predisposes individuals to the risk of heart disease and impact on patient's prospective recovery period. Targeting those factors through psychological intervention can accelerate the healing process. Simulated laughter as a form of therapy in combination with yoga exercise and diaphragmatic breathing exercise may lead to mental and physical relaxation and elevate the quality of life.

Objectives:

This study aimed to measure any psychological distress changes (anxiety, depression, and stress) and simultaneously determine any alterations in the quality of life after intervening laughter-yoga therapy in CHD patients.

Methods:

We conducted an experimental clinical trial which administered a pretest-posttest questionnaire. Also, collected data at a ten-session therapy while patients were referring to the rehabilitation program for their postoperative Coronary artery bypass grafting (CABG) at Tehran Heart Centre. Experimental Participants (N=150) and the control group (N=150) were selected by the convenient sampling method. Subjects participated in 45-minute Laughter Yoga (LY) sessions conducted by an instructor specialised in laughter yoga. A clinical psychologist administered the anxiety, stress, and depression scale (DASS) and Quality of Life Questionnaire (SF-36). We interpreted its eight subscales separately, such as measuring physical function, physical role, physical pain, general health, vitality, emotional role, mental health social function and quality of life.

Results:

Depression in the pretest group was 17.49, which degraded to 4.02 in the posttest; anxiety in the pretest test group was 17.44, which diminished to 4.20 in posttest; also, the mean of stress in the groups showed that in the trial group, the quantity degraded from 16.09 to 3.89. However, those values remained consistent in pre-posttest in the control group. Furthermore, the mean of the quality of life (QoL) in the experimental group was 227.2 in the pretest, which was 605.33 in the posttest, and significantly increased. Accordingly, the impact of laughter-yoga on physical function, physical role, physical pain, general health, vitality, emotional role, mental health, social performance is reported.

Conclusion:

Current research has shown that coronary heart disease (CHD) patients suffer considerably from emotional disturbances (depression, anxiety and stress) accordingly decreased quality of life. Intervening the laughter-yoga treatment by alleviating psychological distress is positively helpful to heal CHD patients. Ultimately, suggestions for further research are offered.

Keywords: Laughter yoga, Psychological distress, Quality of life, Coronary heart disease, Emotional role, Mental health.

Article History

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1. BACKGROUND

The incidence of coronary heart disease (CHD) rises annually [1] According to global health assessments, CHD is

responsible for 16.6% of all mortality globally [2]. It is assessed that 11.06 million individuals currently are living with CHD [3]. Three principal manifestations of psychological distress are depression, anxiety and perceived stress, which

have a causal relationship with CHD and its adverse effects [4 - 6]. Psychological distress is prevalent among CHD patients; to illustrate, depressive symptoms are concomitant conditions among 40% of CHD patients [7]. In a systematic review, the rate of co-occurring anxiety disorders with CHD on average was as high as 16% [7], and stress perceiving was as high as 50% [8]. Anxiety, depression, and stress can induce abnormal coronary contractions [9]. Also, acute and chronic psychological distress can cause the development of multiple coronary issues [10] and elevate the rate of re admission to the hospital even after the healing time, morbidity, and mortality among CHD patients [11]. There is mounting evidence indicating that psychological distress, exclusively depression, has been acknowledged as a recognised risk factor for its deleterious and prevalence influence on CHD patients [11]. It is also known for its correlation with poor prognosis of CHD patients [12]. A study conducted by Bijing and his colleagues indicated that each psychological distress variable (depression, anxiety, and stress) separately and considerably predicted deterioration in physical functioning, with its impact being consistent at six and twelve months [13]. For instance, perceived stress inversely correlated with physical functioning in coronary heart patients as well. There is emerging evidence indicating that targeting psychological distress is a robust predictor of changes in clinical outcomes. For specific, targeting stress and anxiety through a stress management program [14] or complementary interventions [15, 16] can diminish cardiac risk and enhance well-being. Several studies conducted to determine the impact of changes in psychological distress on CHD patients, exclusively investigating on depression [17 - 19], leaves other common variables such as stress and anxiety under investigation.

Humour and laugh therapy, as a complementary therapy in the cares, *via* boosting the immune system, diminish tension, and increase the quality of life [20] and lessen depression [21]. A study has shown that the effectiveness of laugh-yoga in the healthy elderly population and its notable effect on the quality of life (QoL) [22]. Several compelling studies are investigating the efficiency of laugh-yoga therapy on other medical populations but CHD patients. To illustrate, on vascular function [23, 24], oncology [25], cardiology [26], rehabilitation [27, 28], cardiovascular [29] populations. In one recent study investigated the impact of implementing laughter yoga on CHD patients to determine the effect of laughter therapy on the blood glucose level, cholesterol and lipid profile levels. Which indicated respiratory laughing and relaxation work out can normalise cholesterol and lipid profile levels; therefore, should be set in the form of regular exercise besides CHD pharmacological intervention. However, this study was investigating physical variables rather than psychological distress and QoL [30].

There are several existing gaps this study wants to address on. First, most of the studies exploring the effectiveness of laugh-yoga investigated on one or two psychological distress, specifically most of them considering depression [17 - 19] exclusively and leaves other common manifestations such as

anxiety and stress under investigation. Second, although mounting evidence implemented laugh-yoga on other medical populations [20, 22, 23], on CHD patients, the examination is scant [31]. Psychological interventions mostly employed on the modest sample, whereas this study applied the laugh-yoga on a large population-based to be reliable and facilitate the generalizability of the results to a general population.

To our knowledge, no study has investigated to determine any psychological distress changes such as stress, anxiety, and depression after employing laugh-yoga. We addressed three primary psychological distress manifestations before and after applying respiratory laughing and relaxation activities to pinpoint any changes. Simultaneously by administrating QoL questionnaire, we determined any changes, specifically in eight subscales including physical function, physical role, physical pain, general health, vitality, emotional response, mental health, social activity, and quality of life, and generally in physical function and physical role on CHD patients.

2. OBJECTIVES

This study aimed to measure any psychological distress changes (anxiety, depression, and stress) and simultaneously determine any alterations in the quality of life after intervening laughter-yoga therapy in CHD patients.

3. METHODS

3.1. Participants

Due to the usual rehabilitation program at Tehran Heart Center, after doing Coronary artery bypass grafting (CABG) patients attend to the rehabilitation center to participate in the recovery plan, including doing aerobics and consulting about their healing process.

Initially, we gave consultation about participating in respiratory laughing and relaxation activities (diaphragmatic breathing and *etc.*) We also described the possible beneficiary of the research on their psychological status (stress, anxiety and depression) and, ultimately their QoL. We made an appointment for those who agreed to participate in the study. After consulting with the executor, who was a clinical psychologist about the duration and length of the study, with their medical documentaries, they referred to a specialised in LY and meditation techniques. Both groups (Intervention, and Control) continued receiving routine therapeutic interventions as they attended to the hospital. Just the intervention group received LY intervention and meditation exercises based on mindfulness. It was the primary difference between the two groups. When the study was done, the clinical psychologist offered the treatment for the control group free of charge. The intervention and control groups did not differ significantly in sociodemographic characteristics, education, gender and age. Initially, twelve participants (five in the experiment and seven in the control group) were dropped out of the research due to personal reasons, living far from the centre, and they did not complete the questionnaires correctly. Participants with CHD in each group (control and experiments) were 150.

The criteria for being included was: people who have undergone CABG, volunteer to participate in the rehabilitation

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program, and ages ranged between 43 to 76. Exclusion criteria was based on the patient's medical history people, who had a dramatic personality disorder (categorized in cluster B) such as borderline or histrionic personality disorder or were receiving other psychological synchronous treatments such as anti-anxiety (Benzodiazepine, *etc.*), an antidepressant (SSRIs, *etc.*), which may interfere with the outcome of the study.

Patients had informed of the therapeutic goals before the intervention program was launched. Their satisfaction was drawn to participate in the research. They were assured of the disguise of personal information and told, whenever they want, they could leave the research process. However, no one gave up attending the treatment sessions.

The raters, who administered the psychological scales, and analysed data did not become aware of the purpose of the study and they were not involved in the investigation.

We analyzed data *via* SPSS-version 22 and the Spearman correlation coefficient. The meaningful level in this research is considered $p < 0.05$.

Laugh-yoga (LY) developed by Kataria [32, 33]. Participants engaged in 45-minute therapeutic sessions for ten sessions conducted by an instructor who specialized in LY lasted for six months.

3.2. Intervention Procedure

Laugh-yoga (LY) Intervention: Talk about some enjoyable things like national and religious ceremonies, having a positive attitude about life, and living at the moment. Moving hands up and down and switching from one side to other, following the command of Up and down. Pure vocals are added to clapping, typically HO, HO, HA-HA-HA. These songs accompanying by a massive excitement sent out of the abdomen to pleasure stimulate diaphragmatic breathing. Add harmonic movements to enhance the feelings of joy and Having gibberish with deep breathing exercises and helping you with physical and mental relaxation. These techniques include stimulated laughter and silent laughter with a closed mouth. At the end of each session, every participant shouts: "I am the happiest person in the world", then look at others and laugh [33].

3.3. Quality of Life Questionnaire

We administered the quality of life questionnaire (SF-36) [34]. This test comprises a series of eight subscales, including physical function, physical role, physical pain, general health, vitality, emotional purpose, mental health, social activity, and quality of life. Items are measured by a subjective self-report on a scale from zero to one hundred (Cronbach's $\alpha = 0.85$). In a study conducted by Montazeri and his colleagues to measure reliability and validity of QoL in Iranian population with a random sample of 4163 healthy individuals, all eight SF-36 subscales met the minimum reliability standard, the Cronbach's α coefficients ranging from 0.77 to 0.90 except the vitality scale ($\alpha = 0.65$). This questionnaire has satisfying validity and internal consistency in the Persian language [35].

3.4. Depression, Anxiety, Stress Scale (DASS21)

The questionnaire includes 21 items for each subscale; there are seven items in the short version [36]. The survey is a Likert with a range from zero to three. The Cronbach's alpha value the test for each subscale the depression subscale was 0.81, and anxiety was 0.73 and 0.88 for stress. A study conducted by Asghari and his colleagues examined the internal consistency and validity among the general population the Persian version of the depression, anxiety and stress (DASS) has satisfactory reliability and validity. The results demonstrated that the Persian version of the DASS-21 has satisfying psychometric characteristics and can be employed amongst the Iranian adult population [37].

4. RESULTS

Participants with CHD disease (N=150) was in the range from 43 to 76 years. In the control group, there were 97 women and 53 men, while in the experiment group there were 65 men and 85 women, with the total number of participants in the control group was 150, and experiment group was 150. Table 1 lists the percentage of demographic variables (sex, education, and age). The findings show that the rate of men in the control group is 35% and in the experimental group is 43%, which shows the homogeneity of both groups. Regarding the level of education in the control group, the highest rate (56% and in the control group 39%) refers to patients with high school degrees and the lowest incidence (8% in the experiment and in waiting list 6%) relates to the diploma. In terms of age, the control and experimental group were homogeneous.

Table 2 indicated The approval of the assumption of the normal distribution of variables in the test of ANCOVA. The comparison between the pretest group and all eight subscales of QoL.

Table 3 the results of the MANCOVA test consequently. In Table 3, statistical details are provided for all eight components.

The assumption of the normal distribution is confirmed (elongation values for most variables are in the range 1+ to 1- Or close to this value). We can conclude that all variables and components have a standard or near-normal distribution, and all variables can be considered normal.

The results of the study of the effect of the Wilks's lambda distribution (Multivariate Impact) showed that the value of F is 1112.56, which is significant at 99% confidence level ($P < 0.01$), which indicates that the effect of the intervention in at least one of the dependent variables is substantial.

The intervention had significant effects on all eight components of quality of life $P < 0.01$. The impact of laugh-yoga on physical function, physical role, physical pain, general health, vitality, emotional role, mental health, social performance is supported by statistical significance ($P < 0.01$).

Table 4 indicated The Mean and Standard deviation of the quality of life subscales.

Particularly, LY has had the most significant influence on improving the subscales of physical function and mental health. The mean of QoL in the experimental group was 227.2

in the pretest; after the intervention, the variable has risen to 605.33 in the posttest significantly improved. Still, in the control group, the variable remained approximately unchanged (220.09 to 227.84).

Table 5 describes the mean and standard deviation(SD) of DASS (depression, anxiety, and stress). With a confidence level of 99% (P <0.01), we can ascertain that laugh-yoga therapy can reduce anxiety level notably. The value of T is 84.02. The mean anxiety in the pretest is 17.44, which lowered remarkably in the posttest and reached 4.20, but in the control group, the rate remained intact (16.87 to 17.80 in posttest).

The mean of stress in the pretest is 16.09, in posttest is 3.89, which degraded 13.24 after the intervention. The value of T is 75.60 and P-value less than 0.05, which was meaningful. There is a no table difference between the mean scores of cooperators in the pre and posttest. However, in the control group, no noticeable alterations occurred from 17.94 to 16.22.

Furthermore, the mean of depression in the pretest stage is 17.49 and in posttest is 4.02, which indicated a drop of 13.70. The value of T (122.90) and the P-value is <.05., but in the control group, no significant change was observed (16.70 to 18.14 in posttest).

Table 6 revealed the statistical comparisons between

treatment groups of DASS (Depression, Anxiety, and Stress)

5. DISCUSSION

In the current investigation on CHD patients, patients in the pretest suffered from moderate depression (17.49), after undergoing the laugh-yoga therapy, their depression score comes to the normal range on average. From the clinical standpoint, several depressive manifestations improved mostly such as pessimistic viewpoint about life or enjoying or satisfying from life after participating in stimulating laughing exercises. On average participants showed severe anxiety (17.44), they had difficulty with breathing and pounding of the heart. The laugh-yoga which comprises several meditation workouts such as diaphragmatic breathing can ameliorate anxious symptoms, and participant's anxiety has upgraded to the normal state.

Furthermore, according to the stress subscale scores participants has mild stress (16.09) patients were unable to relax, irritated, and nervous, which laugh-yoga helped the stressed individuals to manage their stress notably. The results of the current study are congruent with the previous research carried out by Dr Lee Berk, whose investigation determined that laughing can reduce stress by managing secreting stress hormones [38].

Table 1. The demographic characteristics of patients with CHD are reported based on gender, age, and education

	Control			Experiment	
	Variables	Frequency Prevalence	Frequency Percentage	Frequency Prevalence	Frequency Percentage
Gender	M	53	35%	65	43%
	F	97	65%	85	57%
Education	L.D	42	28%	47	31%
	D.D	84	56%	58	39%
	A	9	6%	28	19%
	B.D	9	6%	2	8%
Age	43-55	11	7%	18	12%
	56-65	67	45%	76	51%
	66-76	72	48%	56	37%

L.D less than diploma, D.D diploma degree, A associated degree, BD bachelor's degree, M male, F female

Table 2. The approval of the assumption of the normal distribution of variables in the test of ANCOVA. The comparison between pretest group and all eight subscales of QoL

F	(P-Value)	Variables
1.43	232 0.	Physical Function
3.45	064 0.	Physical Role
1780.	6740.	Body Pain
2.47	117.0	General Health
441.0	0.507	Vitality
2.35	0.126	Emotion
454.0	0.501	Mental Health
3.73	0.054	Social Function
516.0	0.423	QoL
756.0	0.385	Depression
462.0	0.497	Anxiety
3.15	0.077	Stress

Table 3. The results of the test (MANCOVA) of quality of life subscales

Variable	P-value	The amount of T	Degree of Freedom	Average Diffrence	Average
Physical Function	0.807	<0.001	2335.59	1	396222
Physical Role	0.802	<0.001	2258.35	1	391554
Physical Pain	0.755	<0.001	1713.93	1	316224
General Health	0.658	<0.001	1070.05	1	237226
Vitality	0.623	<0.001	921.01	1	217496
Emotion	0.729	<0.001	1495.24	1	297233
Mental Health	0.758	<0.001	1746.26	1	294875
Social Function	0.744	<0.001	1618.19	1	373230

Table 4. The Mean and Standard deviation of the quality of life subscales (pretest and posttest)

Variables	Level	Control-Group		Experimental- Group	
		Mean	S.D	Mean	S.D
Physical Function	Pre	23.62	3.98	24.88	4.56
	Post	25.08	4.13	78.12	17.83
Physical Role	Pre	24.65	4.25	23.96	4.77
	Post	24.98	4.63	76.89	17.98
Physical Pain	Pre	26.91	7.49	28.73	6.64
	Post	27.16	7.11	76.30	18.01
General Health	Pre	36.67	9.15	34.77	9.97
	Post	36.82	8.32	75.97	18.54
Vitality	Pre	32.20	8.75	34.91	10.35
	Post	33.49	8.12	74.36	19.10
Emotion	Pre	27.23	5.32	29.86	5.64
	Post	28.11	5.97	75.95	19.11
Mental Health	Pre	29.56	5.14	28.19	5.40
	Post	29.76	4.49	74.13	17.55
Social Function	Pre	20.5	9.32	21.90	8.61
	Post	22.44	9.50	73.58	22.44
Quality of Life	Pre	220.09	14.16	227.20	220.09
	Post	227.84	13.38	605.33	227.84

S.D standard deviation, Pre pretest, Post posttest

Table 5. The Mean and Standard deviation of DASS (Depression, Anxiety, and Stress)

Variables	Level	Control-Group		Experimental-Group	
		Mean	S.D	Mean	S.D
Depression	Pretest	16.70	0.71	17.49	0.52
	posttest	18.14	0.76	4.02	1.44
Anxiety	pretest	16.87	1.10	17.44	1.50
	posttest	17.80	1.27	4.20	1.59
Stress	pretest	17.94	1.67	16.09	2.01
	posttest	16.22	1.46	3.89	1.26

S.D standard deviation

Table 6. Statistical comparisons between treatment groups of DASS (depression, Anxiety, and Stress)

Levels	P-Value	T	Degrees of Freedom	Average Diffrence	Average
Pretest	<0.001	84.02	174	13.39	17.49
Posttest					4.10

The results of the current study align with the previous finding, in depression and anxiety, for specific in a study conducted by Kim in mothers [39] revealed that group laughter therapy could degrade the level of anxiety and depression in comparison to the control group. According to Chang research, the effect of LY on military stress has been shown in military patients. After three sessions of laughter, scores of anxiety, depression, and pressure diastolic blood levels in the experimental group degraded significantly in comparison with the control group [40]. On middle-aged women, laughing had a significant impact on serotonin levels and lessened the severity of depression [41].

Besides significant improved in emotional distress, the result of the current study revealed the efficiency of laughter-yoga on QoL, which is congruent with previous studies. Participants had a lower level of QoL in comparison with the general population, likewise patients with heart failure (HF), obstructive pulmonary disease [28, 42], arthritis, and other patients with a history of diabetic cardiovascular complications [41]. Also, the other corresponding previous research confirmed that a rise in the quality of life of the experimental group after intervening in the LY therapy, however the primary difference with the current research is that in that study the target population was healthy people [22]. The outcomes of the current research build upon the previous findings, confirm that LY promotes physical and psychological health-related issues among the medical population. Therefore, the result of the present study is a step forward in substantiating that simulated laughter leads to enhance the quality of life (specific variations in the physical role) and reduce depression, stress and anxiety.

Limitation of the current research: Although the present study has a large based-population with a control group, it has not any follow-up to determine the efficiency of LY therapy over time. Additionally, most of the participants have diploma or lower than diploma education, which may affect the comprehension of the therapeutic concepts. A more educated population may get better results from duplicating this study.

CONCLUSION

According to the prevalence of the CHD in people even in advanced countries, addressing the psychological issues parallel with coronary disease, is crucial, LY therapy stimulates of doing exercise, which has a healing role not only physically but psychologically. Integrating laughter with Yoga training in the postoperative and even preoperative of CABG surgery may unload patients from emotional distress and ultimately increased the QoL, which is a primary factor in well-being. For future researches, we suggest that to intervene the LY therapy during the preoperative of CABG and other surgery, it may decrease stress-related issues and help patients to have reduced healing time after the surgery. Investigating the effect of LY on healing time, stress-related problems, and coping strategies provides further knowledge in medical populations.

ETHICAL APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by the ethical committee of

Tehran Heart Center, Iran.

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All human research procedures were followed in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013.

CONSENT FOR PUBLICATION

Informed consent was taken from all the participants when they were enrolled.

STANDARDS OF REPORTING

CONSORT guidelines have been followed.

AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this research are available from the corresponding author [S.R] upon request with permission from the Ethics Committee of Tehran Heart Center, Iran.

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None.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article.

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