

Laughter is The Best Medicine! Laughing Stock or Worth A Talk?

¹*Harshita Ahuja, corresponding author, ²Dr. Komal Rai

¹Phd Scholar, Department of Psychology, Lovely Professional University, Jalandhar

²Assistant Professor, Department of Psychology, Lovely Professional University, Jalandhar.

Abstract

The use of laughter as medicine is not novel. Norman Cousins' swift recovery from ankylosing spondylitis as attributed to laughter aroused scientific community's curiosity in therapeutic laughter. Laughter Yoga is one way of exploiting the therapeutic value of laughter. Laughter Yoga is a form of exercise that involves prolonged voluntary laughter. Laughter yoga's positive effect lies in its ability to facilitate deep breathing which is highly unlikely under stress wherein we hardly utilize lungs full capacity for oxygen-carbon dioxide exchange. This paper presents a narrative review to discuss the benefaction of laughter yoga in health and well-being if any. Keywords used for literature review were laughter yoga, laughter therapy, impact of laughter on health, positive impact of laughter. Electronic abstract databases and the internet and reference lists of all identified papers were searched and papers from only indexed journals were selected. Review is arranged thematically and chronologically (within a theme) and studies focusing on application of laughter yoga (laughter therapy) both in medical and non-medical setting for health and well-being have been included. Studies reviewed reflect Laughter Yoga's great potential with both physiological and psychological benefits. Most of the studies report promising results in spite of stark differences in time duration of intervention (ranging from single session to multiple sessions). Studies reviewed provide a good concoction by measuring both psychological and physiological markers of health and well-being thus giving a comprehensive account.

Keywords- Laughter Yoga; Health Psychology; Well-being;

Introduction

Interest in laughter and its therapeutic impact increased after the classic case of Norman Cousins. Cousins (1976) emphasized in his account the role of laughter in curing him of his illness (ankylosing spondylitis, a painful degenerative disease of the joint). He experimented to check this by laughing for 10

minutes. This gave him at least two hours of pain free sleep. The relatively new understanding of psychoneuroendocrinoimmunology (PNEI) can be used to explain the effect of laughter on mind and body. Laughter Yoga (LY) is an exercise that incorporates standardized sequence of activities which includes unconditional simulated laughter (without depending on jokes, humour, comedy) yogic breathing, stretching, clapping and childlike playfulness (Laughter yoga International, 2017). Chanting ho ho ha ha helps in diaphragmatic breathing unlike shallow breathing from chest when under stress. Furthermore, laughter facilitates deep breathing and helps optimal utilization of our lung's capacity to provide oxygen which is highly unlikely when under stress.

From medical point of view, oxygen is most important for breath. Stress makes our breath shallow thus decreasing oxygen that reaches the brain which can possibly be rectified by laughter yoga. The following studies are discussed to understand the positive impact of laughter yoga if any.

Inclusion and Exclusion criteria

Studies that used the word laughter therapy but used the classic steps of laughter yoga were included. Papers from only indexed journals were selected. Studies pertaining to laughter yoga and health and well-being were included. Publications covering last fifteen years were included in order to avoid redundant research. All population age groups were considered. Papers were excluded if only the title was available, or we were unable to get the full paper. Papers not published in English were excluded from review. Studies of laughter yoga's impact in workplace were not included.

Laughter Yoga for Cancer patients

In a study in Korea, impact of Laughter yoga on depression, quality of life, resilience and immune responses among thirty seven breast cancer survivors was studied. Experimental group consisted of sixteen participants whereas control group consisted of twenty one participants. Laughter yoga was conducted eight times. It was scheduled twice a week for sixty minutes per session. Questionnaires were administered in order to measure depression, quality of life and resilience before and after laughter yoga session. Furthermore, blood tests were administered to study the changes in Total T cell, T helper, T suppressor, Th/Ts ratio, Total B cell, T cell/B cell ratio and NK cell for immune responses. There was a

significant increase in quality of life and resilience among breast cancer survivors in experimental group after laughter yoga session ($p < .001$). But difference in depression and immune responses (before and after the session) among breast cancer survivors was not significant (Cho & Oh, 2011)

Farifteh, Aria, Kiamanesh and Mofid (2014) studied impact of laughter yoga on stress among cancer patients in Iran. They used randomized independent measures design wherein thirty-seven cancer patients were randomly assigned to either control or experimental group and pre-post test measures of stress using QSC-R23 (Questionnaire On Stress In Cancer Patients). The results revealed a significant decrease ($p < 0.05$) in stress in laughter yoga group. However, it should also be kept in mind that the sampling technique employed was convenience sampling. Nevertheless, this study underpins the positive impact of laughter yoga.

In another study in Korea with breast cancer patients, laughter yoga was seen to reduce radiation dermatitis and pain. Nineteen participants were assigned to control (only radiation therapy) and eighteen to experimental group (laughter yoga during radiation therapy) twice a week until radiation therapy was complete. Both radiation dermatitis and pain reduced in experimental group. Readings of dermatitis was taken by an oncologist who was blinded to the patient's assignment thus made unaware of whether he/she was subject to laughter yoga or not. Thus steps were taken to control bias which could have confounded the results. However the difference in both pain and radiation dermatitis between the radiation therapy only group and laughter yoga with radiation therapy group was not significant. This has been attributed to smaller sample size. (Kong, Shin, Lee & Yun, 2014)

Another study on impact of laughter Yoga on depression, anxiety and stress among breast cancer patient was conducted in Korea. (This study uses the name Therapeutic Laughter Programme instead of laughter yoga but uses the same procedure/steps as in laughter yoga)The study incorporated a randomized control trial wherein thirty-one patients were assigned to experimental and twenty-nine patients to control group. Four sessions of laughter yoga were administered in total. Scores on depression, anxiety and stress was measured using 11 point scale before and after the administration of laughter yoga. A significant decline ($p < 0.05$) in scores was witnessed both after the very first laughter yoga session and after all the four sessions in experimental group unlike the control group (Kim, Kim & Kim, 2015).The significant decrease in points

on depression, stress and anxiety after the very first session supports the positive role of laughter yoga strongly.

Similarly, it was seen that laughter Yoga improves mood state and self-esteem in cancer patients. This study was also carried out in Korea. The study investigated changes in mood disturbance and self-esteem among patients. Three sessions of laughter yoga were administered for sixty minutes each. It included sixty two patients. Thirty three of them were randomly assigned to experimental and twenty nine to control conditions. They were administered Profiles of Mood State and Rosenberg Self-esteem scale before and after their laughter yoga session. Experimental group showed significant reduction in mood disturbance after the session ($p < 0.001$). Furthermore, self-esteem increased for experimental group ($p < 0.044$) (Kim, Kook, Kwon, Son, Ahn & Kim, 2015).

Laughter Yoga and Diabetes

Laughter Yoga is also known to reduce blood glucose in diabetics. In a study in Taiwan two hundred and eleven participants (With Type 2 Diabetes and not taking insulin therapy) were recruited. Out these hundred and ten were assigned to experimental and hundred and one to control group. Baseline measure of blood sugar was recorded at arrival. This was done after all the participants had consumed standard brunch (250 Kcal) thus establishing the same measure as a baseline. The experimental group was administered a single laughter yoga session which included both lecture and laughter session whereas control group was only subject to lecture. After 120 minutes blood glucose levels were measured for both the groups. There was a significant reduction in increase of postprandial blood sugar (blood sugar after meal) in experimental group ($p < 0.001$) unlike control group where postprandial blood glucose increased. Furthermore, a 10-point rating scale was used to understand changes in general wellbeing (including stress, mood, optimism, muscle relaxation etc) in experimental group before and after the session. This was done in pre and post test manner only with laughter yoga group and overall positive impact was witnessed. (Cokolic, Herode & Krebs, 2013). This study incorporated a large sample unlike most of the previously mentioned studies.

Laughter Yoga among organ transplantation patients

Kaspar, Baldwin, Johnson, Edling and Sethi (2012) studied the impact of laughter yoga on heart rate, heart rate variability (HRV), blood pressure (B.P) and immediate and long term mood and anxiety and depression using Beck Anxiety Inventory and Beck Depression Inventory II respectively before and after laughter yoga. They used repeated measures design. The participants were patients awaiting organ transplantation (three patients for heart and three for lung). Due to very small sample size meaningful statistical analysis was not carried out as intended but observations report positive results related to immediate mood and heart rate variability. The study being a pilot study with a very small sample size and lack of quantitative analysis (as intended) warrants caution in drawing inferences.

Laughter Yoga and Haemodialysis patients

In a study in Australia effect of laughter Yoga on psychological variables (like quality of life, subjective well-being, mood, optimism, self-esteem, depression, anxiety and stress) and blood pressure, intradialytic hypotension and lung function among patients under haemodialysis was conducted. The study design was a pre-post intervention design wherein participants were administered laughter yoga once a week for thirty minutes each in a four week programme. There were eighteen subjects in total with one dropout. A non-significant decrease in stress and increase in happiness, mood and optimism was reported. Intradialytic hypotension episodes decreased from nineteen to four post laughter yoga. There was no change in lung function or blood pressure. Additionally, a laughter yoga attitudes and perception scales was also administered on dialysis nurses which yielded positive results. All the nurses either strongly agreed or agreed that laughter yoga had positive impact on patient mood and is a feasible intervention. This highlights the strong role of perception and attitude in laughter yoga's success. Sample size estimates were also calculated which indicated a minimum of two hundred and four participants for future research in order to investigate any meaningful change in psychological variables. Thus a small sample can be considered as a limitation of the study in not yielding conclusive results. (Bennett, Parson, Moshe, Neal, Weinberg, Gilbert, Ockerby, Rawson, Herbu & Hutchison, 2015)

A study similar to one done in Australia in 2015 was done in Korea in 2016. This study aimed to measure impact of laughter yoga on mood, cortisol level and health related quality of life among patients

undergoing haemodialysis for which they used visual analogue, blood sample and The Kidney Disease Quality of Life Instrument respectively. Forty participants were randomly assigned to either control or experimental condition. Group laughter yoga was administered for sixty minutes once every week for four weeks and fifteen minutes every day individually via telephone. Laughter yoga group exhibited a significant betterment in mood and better social interaction quality, role limitations due to physical health, emotional well-being, Mental Component Summary (MCS), and Kidney Disease Component Summary (KDCCS) in health related quality of life. However, there was no significant change in serum level cortisol between two groups. (Heo, Kim, Park & Kil, 2016).

Laughter Yoga among Parkinson's patients and caregivers

A pre experimental pre-test, post-test study measured impact of laughter yoga on well-being among Parkinson's patients and their caregivers in southern California. The sample was a convenience sample of forty seven patients and thirty eight caregivers. "How do you Feel" questionnaire of laughter yoga international that measures enthusiasm, energy, mood, optimism, stress, muscle relaxation mental relaxation, ability to laugh and level of friendship in groups was used. Significant improvements on well-being were seen (using paired t-test) among Parkinson's patients and their caregivers. (Decaro & Brown, 2016) An important limitation of the study is the choice of tool which lacks information on validity and reliability in spite of its frequent use in laughter studies.

In 2017 another study was carried out to evaluate impact of laughter yoga on anxiety and sleep quality among Parkinson's patients in Iran. Study was done on twenty four participants who were divided randomly into control and experimental group. Laughter yoga was administered to experimental group for forty five minutes each twice a week for eight weeks. Anxiety was measured using Beck scale for anxiety and sleep quality was measured using sleep quality inventory of Pitezbourg. A significant difference was found in anxiety and sleep quality between control and experimental group (Memarian, Sanatkaran & Bahari, 2017)

Laughter Yoga, Wellbeing and Quality of life

It is interesting to note in another study done in Australia, how single laughter yoga session affects well-being of those who engage in laughter yoga clubs voluntarily. This exploratory pilot study that

consisted of forty four participants from seven different laughter yoga clubs in Melbourne and forty four participants randomly picked from 23rd longitudinal survey of Australian unity well-being index. Life satisfaction was measured using single item. Subjective well-being was measured using personal wellbeing index (which has strong psychometric properties). Whereas stress, anxiety and depression was measured using The Depression Anxiety Stress Scale, DASS. (Again with strong psychometric properties) A significant improvement in the Life satisfaction and subjective well-being was witnessed among laughter yoga group after laughter yoga. Furthermore there were significant changes in mood, stress, anxiety but not depression in laughter yoga group. Another interesting thing to note is that the participants who attended laughter yoga clubs of their own interest were initially at lower level of functioning than Australian population that formed the other group (Weinberg, Hammond & Cummins, 2014).

Cha and Hong (2015), investigated the role of laughter yoga on serotonin level, quality of life and depression among middle aged women five times a week in a two week program. They used a pre and post test design wherein fourteen women constituted control group and thirty women constituted the experimental group (which was subdivided into three groups on the basis on level of depression). Repeated measures ANOVA, ANCOVA and LISREL were used. Significant increase in serotonin was observed after the 10th session ($p = .006$) with highest rise in severe depression group ($p = .001$). Depression decreased the most in severe depression group after 5th laughter yoga session ($p = .007$). Furthermore, path analysis showed that decrease in depression was not directly affected by laughter yoga but mediated by increase in serotonin. It's interesting to note that in the previous study by Weinberg et.al. no significant change was observed in depression after single laughter yoga session which could imply the relevance of frequency of laughter and the mediating effect of serotonin which was not addressed in that study. Furthermore, in Cha and Hong (2015) study the quality of life score also improved after 10th intervention ($p = .049$) and maximum increase was again seen in severe depression group ($p = .006$) This further strengthens effectiveness of laughter yoga with group that is already at lower functioning. (Similar trend was seen in Weinberg study mentioned before this)

In Turkey, a study was conducted to understand the role of laughter therapy on quality of life among nursing home residents. Thirty two nursing home residents made up the experimental group whereas another thirty three nursing home residents from another nursing home made up the control group. This could be

major limitation since the assignment of subjects to experimental and control group was not random although the study does mention an attempt to ensure equality between two groups in terms of socio-demographic variables. Laughter yoga was carried out for twenty one sessions. Short form health survey (SF-36) was administered before and after the intervention. A significant difference was seen in mean general quality of life ($p < .01$) between control group and experimental group and a significant difference was also observed in mean subscale scores between control group and experimental group ($p < .05$) (Kuru & Kublay, 2016).

Laughter yoga among elderly

Ko and youn (2011) studied what effect laughter therapy had on depression, cognitive function, quality of life and sleep among elderly in community. For this study hundred and nine subjects aged 65+ were divided into two groups- experimental and control. Various measures like Geriatric depression scale GDS, mini-mental state examination MMSE, health related quality of life HRQOL by using short form health Survey 36 SF-36, Insomnia severity Index ISI and Pittsburg sleep quality Index PSQI were measured before and after four sessions of laughter yoga for one month for experimental group and no laughter yoga for control group. There was a significant decrease in mean GDS score in laughter group unlike control group ($p.027$). However there were no significant changes in MMSE in both the groups. Similarly significant changes were witnessed both in terms of improvement in sleep quality and decrease in insomnia ($p.037$) in laughter yoga group. Statistically significant changes were witnessed in bodily pain (BP) aspect of HRQOL in laughter yoga group. In a nutshell laughter yoga has shown positive effects on depression, insomnia and sleep quality among elderly in experimental group. This is yet another study that supports the effectiveness of laughter yoga with depression. It's interesting to note again that it is more than a single session of laughter yoga that yielded any significant result with regard to depression.

Another study investigated impact of laughter yoga with regard to depression and life satisfaction and again yielded positive results supporting the literature. It was seen that laughter yoga is as effective as exercise program in improvement of depression and life. In this study seventy elderly depressed women were randomly divided into exercise group, laughter yoga group and control group. Depression (using Yesavage Geriatric Depression Scale) and life satisfaction (using Diener Life Satisfaction Scale) pre test and post test results for all groups were compared. There was a significant decrease in depression in both

laughter yoga group ($p < .001$) and exercise group ($p < .01$) Furthermore, a significant increase in life satisfaction was observed in laughter yoga group ($p < .001$). (Shahidi, Mojtahed, Modabbernia, Motjahed, Shafiabody, Delavar & Honari, 2011).

In another study in Iran impact of laughter yoga on general health using General Health Questionnaire (which consisted of subscales measuring insomnia, somatic symptoms, anxiety and depression) among seventy two elderly was conducted using pre-test post test method. Subjects were randomly assigned into control or experimental group and a statistically significant difference was witnessed in general health ($p .0001$) anxiety and insomnia ($p .03$), somatic symptoms ($p .04$) and depression ($.07$) between experimental and control group. The session lasted for six weeks (two sessions per week for ninety minutes each) (Ghodsbin, Ahmadi, jahabin& Sharif, 2014).

In South India, study was done to assess stress reduction among elderly in old age home using laughter yoga. This study consisted of sixty subjects (non-probability convenience sampling) and laughter yoga intervention was carried out for four weeks. A structured questionnaire was used to measure levels of stress. Pre-test and post test scores on stress were compared. Significant reduction was found between the two ($.001$). (Elamathi, 2015)

In 2017 more studies of laughter Yoga with older people was conducted. In Australia, laughter yoga was conducted with twenty eight residents using convenience sampling method. A pre-test post-test design was used to measure happiness (Using General Happiness Scale), blood pressure, pulse and positive and negative affect (using PANAS Positive and Negative Affect Scale). The session was conducted for 30 minutes (for 6 weeks) and post test measures were carried out after 1st, 3rd and 6th week. Mean scores on positive mood increased significantly in 1st week itself ($p .001$) whereas mean scores on general happiness increased significantly by 3rd and 6th week ($p .001$ and $p .002$). Also blood pressure decreased significantly between 1st and 6th session ($p .027$) unlike the difference in pulse which was insignificant. Also, negative mood decreased significantly by the last session (Ellis, Ben- Moshe & Teshuva, 2017).

Another study reflects the success of laughter therapy with older adults. This study was done in Turkey. It measured changes in loneliness and death anxiety after laughter therapy using De Jong Gierveld Loneliness scale (DJGLS) and Turkish death anxiety scale(TDAS). A quasi experiment with fifty adults

(non-equivalent control group) using a pre-test post-test design was carried out. Scores on DJGLS total was found to have decreased significantly after laughter therapy ($p < .0001$). Furthermore, scores on social and emotional loneliness subscales decreased significantly in experimental group after the intervention ($p < .0001$). However, significant decrease ($p < .05$) was only witnessed in exposure subscale of TDAS and not in overall TDAS or other subscales (Alici, Bahceli & Emiroglu, 2017).

Recommendations for Future Research

There is enough research to understand how laughter yoga impacts well-being of patients but there is hardly any attempt to research its role in healthy population without any health condition. Thus further research can be carried out with healthy population. Also, more rigorous empirical support is required to further support the claim of laughter yoga against a mere placebo. Also, comparative study with other psychological and physiological modalities will help establish a better understanding of its significance.

Implications for practice

It is clearly reflected that laughter yoga has positive results with respect to depression, anxiety, quality of life, insomnia, emotions, life satisfaction, heart rate, heart rate variability, serotonin, blood pressure, diabetes, pain, stress, intradialytic hypotension and radiation dermatitis. This means it has great scope as far as practical implications are concerned. It can and should be incorporated as an effective complimentary therapy in hospitals, community centres and the like. It can be a good supplement to drug therapy.

Conclusion

Laughter yoga has a promising scope of success in health and well-being. Not only is laughter ubiquitous but is highly economical tool to health and happiness. If a modality like laughter yoga can tap the medicinal value of laughter it can be a useful and economical complimentary therapy. We sometimes underestimate the influence little things can have on health and well-being, we under use and undermine the power of what we are intrinsically and universally equipped with- laughter. It's always the small pieces that make the big picture!

References

- Alici, N.K., Bahceli, P.Z. & Emiroglu, O.N. (2018). The preliminary effects of laughter therapy on loneliness and death anxiety among older adults living in nursing homes: A nonrandomized pilot study, *International Journal of Older People Nursing*, DOI: 10.1111/opn.12206
- Bennett, P.N., Parsons, T., Moshe, R.B., Neil, M., Weinberg, M.K., Gilbert, K., Ockerby, C., Rawson, H., Herb, C. & Hutchinson, A.M. (2015) Intradialytic Laughter Yoga therapy for haemodialysis patients: a pre-post intervention feasibility study, *BMC Complementary and Alternative Medicine*, 15(176), DOI 10.1186/s12906-015-0705-5
- Cha, M.Y. & Hong, H.S. (2015) Effect and Path Analysis of Laughter Therapy on Serotonin, Depression and Quality of Life in Middle-aged Women, *Journal of Korean Academy of Nursing*, 45(2) DOI: 10.4040/jkan.2015.45.2.221
- Cho, E.A. & Oh, H.E. (2011) Effects of Laughter Therapy on Depression, Quality of Life, Resilience and Immune Responses in Breast Cancer Survivors, *Journal of Korean Academy nursing*, 41,(3), 285-293, DOI: 10.4040/jkan.2011.41.3.285
- Cokolic, M., Herodez, S., Sternard, S. & Krebs, S. (2013) The inhibitory effect of laughter yoga on the increase in postprandial blood glucose in type 2 diabetic patients, *Diabetologia Croatica*, 42,(2), 54-58.
- Cousins, N. (1976). An Anatomy of Illness (As perceived by the patient). *The New England Journal of Medicine*, 295(26). <http://dx.doi.org/10.1056/NEJM197612232952605>
- DeCaro, D.S. & Brown, J.L.C. (2016) Laughter yoga, adults living with Parkinson's disease, caregivers A pilot study, *Explore*, <http://dx.doi.org/10.1016/j.explore.2016.02.005>
- Elamathi, E. (2015) A study to assess the effectiveness of Laughter therapy in reduction of stress among the elderly people at selected Old age home at Chennai (Master's Thesis). Retrieved from <http://repository-tnmgrmu.ac.in/id/eprint/2324>
- Ellis, J.M., Moshe, R.B. & Teshuva, K. (2017) Laughter yoga activities for older people living in residential aged care homes: A feasibility study, *Australian journal on aging* DOI: 10.1111/ajag.12447.

- Farifteh, S., Aria, A.M., Kiamanesh, A. & Mofid, B. (2014) The Impact of Laughter Yoga on the Stress of Cancer Patients before Chemotherapy, *Iranian Journal of Cancer Prevention*, 7(4), 179-83 PMID: 25628838; PMCID: PMC4307100
- Ghodsbin, F., Sharif A.Z., Jahanbin, I. & Sharif, F. (2015) The Effects of Laughter Therapy on General Health of Elderly People Referring to Jahandidegan Community Center in Shiraz, Iran :A Randomized Controlled Trial. *IJCBNM*, 3(1), 31-38.
- Heo, E.H., Kim, S., Park, A.J. & Kil, S.Y. (2016) The effects of a simulated laughter programme on mood, cortisol, and health-related quality of life among haemodialysis patients, *Complementary Therapies in Clinical Practice*, 25, 1-7 <https://doi.org/10.1016/j.ctcp.2016.07.001>
- Kaspar, R.D., Baldwin, A., Johnson, M.S., Edling, N. & Sethi, G.K. (2012) Effect of laughter yoga on mood and heart rate variability in patients awaiting organ transplantation: a pilot study, *Alternative therapies*, 18 (4), 53-58.
- Kim, S.H., Kim, Y.H. & Kim, H.J. (2015) Laughter and Stress Relief in Cancer Patients: A Pilot Study, *Evidence-Based Complementary and Alternative Medicine*, doi: [10.1155/2015/864739](https://doi.org/10.1155/2015/864739)
- Kim, S.H., Kook, J.R., Kwon, M., Son, M.H., Ahn, S.D. & Kim, H.Y. (2015) The Effects of Laughter Therapy on Mood State and Self-Esteem in Cancer Patients Undergoing Radiation Therapy: A Randomized Controlled Trial, *the journal of alternative and complementary medicine*, 21(4), 217-222, DOI: 10.1089/acm.2014.0152
- Ko, H.J. & Youn, C.H. Effects of laughter therapy on depression, cognition and sleep among the community-dwelling elderly, *Geriatric and gerontology international*, 267-274, doi: 10.1111/j.1447-0594.2010.00680.x
- Kong, K., Shin, S.H., Lee, E. & Yun, E.K. (2014) The effect of laughter therapy on radiation dermatitis in patients with breast cancer: a single-blind prospective pilot study, *OncoTargets and Therapy*, 7, 2053–2059, doi: [10.2147/OTT.S72973](https://doi.org/10.2147/OTT.S72973)
- Kuru, N. & Kublay, G. (2016) Effect of Laughter therapy on quality of life of Nursing Home residents, *Journal of clinical nursing*, doi: 10.1111/jocn.1368
- Laughter Yoga International, (2017). *Certified Laughter Yoga Leader Training Manual*, Laughter Yoga International, Bangalore.

Memarian, A., Sanatkaran, A. & Bahari, S.M. (2017) The effect of laughter yoga exercises on anxiety and sleep quality in patients suffering from Parkinson's disease, *Biomedical Research and Therapy*, 4(7), 1463-1479, DOI: 10.15419/bmrat.v4i07.200

Shahidi, M., Mojtahed, A., Modabbernia, A., Mojtahed, M., Shafiabady, A., Delavar, A. & Honari, H. (2010) Laughter Yoga versus group exercise program in elderly depressed women: a randomized controlled trial, *International Journal of geriatric psychiatry*, 26, 322-327, DOI: 10.1002/gps.2545

Weinberg, M.K., Hammond, T.J. & Cummins, R.A. (2014) The impact of laughter yoga on subjective well-being : a pilot study, *European journal of humour research*, 1,(4), 25-34. DOI: 10.7592/EJHR2013.1.4.weinberg

