



## Effect of Mindfulness Based Stress Reduction on Quality of Life (SF-36) and Spirometry Parameters, in Chemically Pulmonary Injured Veterans

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(Received 11 May 2013; accepted 20 Aug 2013)

### Abstract

**Background:** Studies have shown that Mindfulness Based Stress Reduction (MBSR) has positive effect on physical and psychological dimensions of chronic illnesses. In this study for the first time we examine the effect of this new technique on quality of life and pulmonary function in chemically pulmonary injured veterans who have chronic pulmonary problem, psychological problems and low quality of life.

**Methods:** Forty male pulmonary injured veterans were randomly replaced in two groups with 20 participants (MBSR and control Wait List (WL)). Then MBSR group received 8-weekly sessions intervention. We evaluate quality of life (used SF-36 questionnaire) and Spirometry parameters two times; before and after intervention in two group. We used "mixed factorial analyses of variance" test for analyzing data in each dependent variables. Then if we have significant interactional effect, we used "paired- sample t-test" for comparing before and after intervention data of each group, and "Independent-Sample t-test" for comparing after intervention data of two groups.

**Results:** The MBSR compare to WL group improved SF-36 total score, (F (1, 38) = 12.09, P=0.001), "Role limitations due to physical problems"(F(1,38)= 6.92, P=0.01), "Role limitations due to emotional problems"(F(1,38)= 7.75, P=0.008), "Social functioning"(F(1,38)= 9.89, P=0.003), "Mental health"(F(1,38)= 15.93, P=0), "Vitality"(F(1,38)= 40.03, P≤0.001), and "Pain"(F(1,38)= 27.60, P≤0.001). MBSR had no significant effect on "FEV1" (F (1, 38) = 0.03, P=0.85),"FVC" (F (1, 38) = 0.16, P=0.69) and "FEV1/FVC" (F (1, 38) = 2.21, P=0.14).

**Conclusion:** MBSR can improve individual's quality of life but not lung function in chemically pulmonary injured veterans.

**Keywords:** Mindfulness, Stress, Quality of life, SF-36, Spirometry, Veterans

### Introduction

Mindfulness-Based Stress Reduction (MBSR) originated at the university of Massachusetts medical center in 1979, and developed for relieving stress and better coping with illnesses (1). MBSR is a

program with eight weekly mindfulness training sessions. The sessions have standardized elements, including body-scan exercises, mental exercises focusing on the breath, physical exercises focusing

on bodily sensations and own limits during the exercises, and practice of being fully aware during everyday activities by using the breath (2). The MBSR intervention is usually used for people with chronic physical and psychological illnesses (3). In last three decades, many studies examine the effect of mindfulness-based interventions that showed positive effect on patients' physical and psychological problems in many chronic diseases (4). Studies showed the effect of MBSR in reducing negative mood psychological distress, anxiety and depression in many populations (5-6) and Others showed positive effect of this method on quality of life (4, 6-11). Some studies evaluated the effect of psychological intervention on Spirometry parameters in patients with pulmonary problems. Lahman in asthma diseases showed that "functional relaxation" and "guided imagery" can improve FEV1 and Specific airway Resistance (S<sub>Raw</sub>) (12). Also Pbert et al. (2012) evaluated the efficacy of MBSR in improving asthma-related quality of life and lung function; they concluded that MBSR can improve significantly quality of life but not lung function (13). Chemically pulmonary injured veterans, have many psychological and physical problems since nearly three decades ago (Iran -Iraq war) that effect on their health, and quality of life. Furthermore, most treatments that have been used for them are chemical drugs and palliative therapies. Thus development of new non-drug intervention that can improve health and quality of life is essential in their rehabilitation program.

In our searches in some indexing sites like PubMed, SCOPUS, EMBAS and Google scholar there is not any studies about MBSR and its effects on these patients so we designed this study with the assumption that this intervention will improve their lung function and quality of life.

## Materials & Methods

### Participants

Participants (N=40) were male veterans with pulmonary injury by mustard gas in Iran-Iraq war (age 42-59; Mean=49.40). This study was done from November 2012 to March 2013.

### Inclusion criteria

All of the patients were Caucasian race and inhabitant in Tehran. They had mild to moderate pulmonary problems (based on Gold criteria) without any history of acute psychotic disorder or psychosis, negative history of psychiatric drug consumption, negative history of any chronic medical problem except sequels of chemical injuries.

### Procedure

Participants were asked to complete study measures; SF-36 questionnaire. Then they referred to a respiratory disease specialist office for spirometry test. After this first evaluation, they were randomly replaced in two groups; MBSR group (N=20) and Wait- List (WL) control group (N=20) using computerized number generator. Then MBSR group received 8 sessions. MBSR is a standardized and manualized 8-week intervention that developed by Kabat-Zinn (2) that has been used widely in medical and behavioral researches. The Sessions includes breathing relaxation, Body Scanning, Object meditation, Mindful eating Walking Meditation, Mindful stretching, worry Surfing, Simply Watching. MBSR was administered by a clinician specialist and consisted of 8 weekly 120 min group sessions, and 1 times of daily home practice. After the 8-week period, all participants returned to complete the same measures of first evaluation. During this 8-week period, WL group did not participate in any new intervention or treatment and received MBSR program after second evaluation.

### SF-36 questionnaire

The SF-36 is a multi-purpose, short-form health survey with only 36 questions about health on eight dimensions. It includes functional status, well-being, and overall evaluation of General health perception dimension. Functional status contains of "Physical functioning", "Social functioning", and "Role limitations due to physical problems" and "Role limitations due to emotional problems" dimensions. Wellbeing contains of "Mental health", "Vitality" and "Pain" dimensions. Each of these 8 dimensions has a score between 0 (worst health) to 100 (best health). And there is a total score of 8 dimensions (14).

### Spirometry

Spirometry is a pulmonary function test. In this test an instrument called spirometer is used for measuring the amount of air entering and leaving the lungs. The patient must take a deep breath and then exhales completely in a tube. The machine records and analyzes the results of the test and then these results are interpreted by a pulmonologist (15). Forced Vital Capacity (FVC), Forced Expiratory Volume in One Second (FEV1) and the ratio of your forced expiratory volume in one second to your forced vital capacity (FEV1/FVC) are three common and important Spirometry parameters that we measured in

this study. After taking a deepest breath, the amount of air that forcibly, exhaled from the lungs is FVC (16). The amount of air that forcibly exhales from the lungs in the first second of a forced exhalation is FEV1 (17). FEV1/FVC is a value that measures the percentage of the total FVC that is expelled from lungs in the first second of a forced exhalation (18).

### Data analysis

The MBSR and WL groups did not significantly differ on any dependent variables at baseline (before intervention) (Table 1). This indicates successful randomization.

**Table 1:** Before intervention variables of randomized participants

Variable	MBSR Group	WL Group	Difference Statistic
Age	50.22 (5.25)	48.60 (4.63)	$t=1.02, P=0.31$
SF-36 -TOTAL	30.12 (12.68)	34.71 (9.76)	$t=-1.28, P=0.20$
FEV1	92.53 (17.80)	85.60 (17.09)	$t=1.25, P=0.21$
FVC	86.87 (13.13)	81.90 (2.84)	$t=1.19, P=0.23$
FEV1/ FVC	101.88 (22.61)	104.69 (10.86)	$t=-0.50, P=0.61$

Note: Standard deviation values are presented in parentheses

**Table 2:** Effects of MBSR on all dependent variables

		Pre mean	SE	Post mean	SE	F- value	P- value
<b>SF-36 -TOTAL</b>	MBSR	30.12	2.83	46.33	3.23	12.09	0.001
	WL	34.71	2.18	34.30	3.89		
<b>Physical functioning</b>	MBSR	40	2.51	43.90	2.69	5.60	0.08
	WL	42.35	17.15	38.75	4.32		
<b>Role limitations due to physical problems</b>	MBSR	16.30	3.62	39.20	4.67	6.92	0.01
	WL	26.85	4.97	35.40	4.33		
<b>Role limitations due to emotional problems</b>	MBSR	18.23	4.90	46.56	6.16	7.75	0.008
	WL	23.54	5.92	30.58	6.16		
<b>Social functioning</b>	MBSR	37.22	3.84	54.07	4.25	9.89	0.003
	WL	41.02	2.50	42.35	3.33		
<b>Mental health</b>	MBSR	28.40	2.78	43.05	3.34	15.93	≤0.001
	WL	27.15	2.84	29.25	2.97		
<b>Vitality</b>	MBSR	28.27	3.14	40.25	3.35	40.03	≤0.001
	WL	32.85	3.33	29.10	2.97		
<b>Pain</b>	MBSR	40.12	3.92	58.15	4.15	27.60	≤0.001
	WL	39.87	2.84	37.72	3.15		
<b>General health perception</b>	MBSR	32.37	3.46	31.25	3.29	0.17	0.67
	WL	23.20	3.76	23.38	2.57		
<b>FEV1</b>	MBSR	92.53	3.98	90.60	3.99	0.03	0.85
	WL	85.60	3.82	78.45	2.90		
<b>FVC</b>	MBSR	86.78	2.93	87.85	2.97	0.16	0.69
	WL	81.90	2.84	81.85	2.72		
<b>FEV1/ FVC</b>	MBSR	101.88	5.05	104.10	4.04	2.21	0.14
	WL	104.69	2.43	103.30	1.72		

Note: Means and standard errors at pre and post intervention in the MBSR and WL groups for all variables. F and corresponding P-values refer to the treatment condition × time interaction

This is a mixed factorial  $2 \times (2)$  design, with within subject (two times evaluation) and between subject (with and without intervention) factors. We used "mixed factorial analyses of variance" test for analyzing data in each dependent variables (Table 2). Then if we have significant interactional

effect, we used "paired- sample  $t$ -test" for comparing before and after intervention data of each group (Table 3) and "Independent-Sample  $t$ -test" for comparing after intervention data of two groups (Table 4). These analyses were done for each dependent variable separately.

**Table 3:** Paired- sample  $t$ -test in each group

Variable	Group	Mean Diff (Before and After of each group)	$T$ - value	$P$ - Value
SF-36 -TOTAL	MBSR	-16.21	-8.71	$\leq 0.001$
	WL	-0.41	-0.16	<b>0.58</b>
Physical functioning	MBSR	-3.90	-1.93	<b>0.06</b>
	WL	3.60	1.47	<b>0.15</b>
Role limitations due to physical problems	MBSR	-22.90	-5.31	$\leq 0.001$
	WL	-22.90	-2.63	<b>0.01</b>
Role limitations due to emotional problems	MBSR	-28.33	-4.48	$\leq 0.001$
	WL	-7.03	-1.63	<b>0.12</b>
Social functioning	MBSR	-16.85	-5.60	$\leq 0.001$
	WL	-1.32	-0.33	<b>0.73</b>
Mental health	MBSR	-14.65	-6.49	$\leq 0.001$
	WL	-2.10	-0.96	<b>0.34</b>
Vitality	MBSR	-11.97	-8.02	$\leq 0.001$
	WL	3.75	1.88	<b>0.07</b>
Pain	MBSR	-18.02	-5.48	$\leq 0.001$
	WL	2.15	1.08	<b>0.29</b>
General health perception	MBSR	1.11	0.67	<b>0.50</b>
	WL	-0.17	-0.06	<b>0.94</b>

**Table 4:** "Independent-sample  $t$ -test" between two groups

Variable	Group	Mean Diff	$t$ - value	$P$ - Value
SF-36 -Total	MBSR/ WL	12.02	2.37	<b>0.02</b>
Physical functioning	MBSR/ WL	5.15	1.01	<b>0.31</b>
Role limitations due to physical problems	MBSR/ WL	3.70	0.58	<b>0.56</b>
Role limitations due to emotional problems	MBSR/ WL	15.98	1.83	<b>0.05</b>
Social functioning	MBSR/ WL	11.72	2.16	<b>0.03</b>
Mental health	MBSR/ WL	13.80	3.08	<b>0.004</b>
Vitality	MBSR/ WL	11.15	2.84	<b>0.01</b>
Pain	MBSR/ WL	20.43	3.92	$\leq 0.001$
General health perception	MBSR/ WL	7.87	1.88	<b>0.06</b>

The study was approved by Ethics Committee of Baqiyatallah University of Medical Sciences. First of all we had an explanation session for all cases and gave them information about this method and after that they signed in the informed consent forms.

## Results

### *MBSR training and SF-36*

The MBSR improved SF-36 total score, compare to WL condition, a mixed effect linear model revealed a significant treatment condition $\times$  time interaction in SF-36 total score ( $F(1, 38) = 12.09, P=0.001$ ) (Table 2). Specifically, MBSR participants had significant increases in SF-36 total score from before intervention to after intervention ( $t=-8.71, P\leq 0.001$ ) compared to no significant change from before intervention to after intervention in WL group ( $t=-0.16, P=0.58$ ) (Table 3). AS an additional test of MBSR effects on SF-36 total score, we conducted follow-up independent- sample  $t$ -test in our subsample: MBSR participants had higher SF-36 total score at "after intervention" compared to "WL participants" ( $t=2.37, P=0.02$ ) (Table 4), after controlling for baseline SF-36 total score.

The MBSR improved "Role limitations due to physical problems" score, compare to WL condition, a mixed effect linear model revealed a significant treatment condition $\times$  time interaction in "Role limitations due to physical problems" ( $F(1,38)= 6.92, P=0.01$ ) (Table 2). Specifically, MBSR participants had significant higher increases in "Role limitations due to physical problems" score from before intervention to after intervention ( $t=-5.31, P\leq 0.001$ ) compared to lower significant increases from before intervention to after intervention in WL group ( $t=-2.63, P=0.01$ ). in follow-up independent- sample  $t$ -test in our subsample: MBSR participants had no significant differences in "Role limitations due to physical problems" at after intervention compared to WL participants ( $t=0.58, P=0.56$ ) (Table 4).

The MBSR improved "Role limitations due to emotional problems" score, compare to WL condition, a mixed effect linear model revealed a sig-

nificant treatment condition $\times$  time interaction in SF-36 total score ( $F(1, 38) = 7.75, P=0.008$ ) (Table 2). Specifically, MBSR participants had significant increases in "Role limitations due to emotional problems" score from before intervention to after intervention ( $t=-4.48, P\leq 0.001$ ) compared to no significant change from before intervention to after intervention in WL group ( $t=-1.63, P=0.12$ ) (Table 3). In follow-up independent-sample  $t$ -test in our subsample: MBSR participants had higher "Role limitations due to emotional problems" score at after intervention compared to WL participants ( $t=1.83, P=0.05$ ) (Table 4).

The MBSR improved "Social functioning" score, compare to WL condition, a mixed effect linear model revealed a significant treatment condition $\times$  time interaction in SF-36 total score ( $F(1, 38) = 9.89, P=0.003$ ) (Table 2). Specifically, MBSR participants had significant increases in "Social functioning" score from before intervention to after intervention ( $t=-5.60, P\leq 0.001$ ) compared to no significant change from before intervention to after intervention in WL group ( $t=-0.33, P=0.73$ ) (Table 3). In follow-up independent- sample  $t$ -test in our subsample: MBSR participants had higher "Social functioning" score at after intervention compared to WL participants ( $t=2.16, P=0.03$ ) (Table 4).

The MBSR improved "Mental health" score, compare to WL condition, a mixed effect linear model revealed a significant treatment condition $\times$  time interaction in SF-36 total score ( $F(1,38)= 15.93, P\leq 0.001$ ) (Table 2). Specifically, MBSR participants had significant increases in "Mental health" score from before intervention to after intervention ( $t=-6.49, P\leq 0.001$ ) compared to no significant change from before intervention to after intervention in WL group ( $t=-0.96, P=0.34$ ) (Table 3). In follow-up independent- sample  $t$ -test in our subsample: MBSR participants had higher "Mental health" score at after intervention compared to WL participants ( $t=3.08, P=0.004$ ) (Table 4). The MBSR improved "Vitality" score, compare to WL condition, a mixed effect linear model revealed a significant treatment condition $\times$  time interaction in SF-36 total score ( $F(1,38)= 40.03, P\leq 0.001$ ) (Table 2). Specifically, MBSR participants had sig-

nificant increases in "Vitality" score from before intervention to after intervention ( $t=-8.02$ ,  $P\leq 0.001$ ) compared to no significant change from before intervention to after intervention in WL group ( $t=1.88$ ,  $P=0.07$ ) (Table 3). In follow-up independent- sample  $t$ -test in our subsample: MBSR participants had higher "Vitality" score at after intervention compared to WL participants ( $t=2.84$ ,  $P=0.01$ ) (Table 4).

The MBSR improved "Pain" score, compare to WL condition, a mixed effect linear model revealed a significant treatment condition $\times$  time interaction in "Pain" score ( $F(1,38)=27.60$ ,  $P\leq 0.001$ ) (Table 2). Specifically, MBSR participants had significant increases in "Pain" score from before intervention to after intervention ( $t=-5.48$ ,  $P\leq 0.001$ ) compared to no significant change from before intervention to after intervention in WL group ( $t=1.08$ ,  $P=0.29$ ) (Table 3). In follow-up independent- sample  $t$ -test in our subsample: MBSR participants had higher "Pain" score at after intervention compared to WL participants ( $t=3.92$ ,  $P\leq 0.001$ ) (Table 4).

Two mixed effect linear models revealed no significant treatment condition $\times$  time interactions in "Physical functioning" ( $F(1, 38) = 5.60$ ,  $P=0.08$ ) and in "General health perception" ( $F(1, 38) = 0.17$ ,  $P=0.67$ ).

### ***MBSR training and Spirometry***

Three mixed effect linear models revealed no significant treatment condition $\times$  time interactions in "FEV1" ( $F(1,38)= 0.03$ ,  $P=0.85$ ), in "FVC" ( $F(1,38)= 0.16$ ,  $P=0.69$ ) and in "FEV1/FVC" ( $F(1,38)= 2.21$ ,  $P=0.14$ ).

## **Discussion**

Findings of our study show that MBSR can improve, mental health and quality of life in chemically pulmonary injured veterans, but it cannot change spirometry parameters significantly.

Previous studies in another populations, suggest a role for MBSR in reducing psychological factors for example; Women with Early-Stage Breast Cancer Receiving Radiotherapy (5,19), somatization

disorder and functional somatic syndromes (6), Older Adults (20), patients with heterogeneous anxiety disorders (21), Danish women treated for stage I-III breast cancer (22), population with comorbid anxiety and depression (23), percutaneous coronary intervention (PCI) patients (7), generalized anxiety disorder (24), Iranian HIV/AIDS Patients (25), Healthcare Professionals(26), patients with type 2 diabetes mellitus(8), breast and prostate cancer outpatients(9, 10, 27, 28), Nurses with Stress and Burnout(29), Medical Students (30), and groups with Anxiety Disorders (31). Findings of this study in improving health and quality of life, are paralleled to many studies that have shown MBSR has positive effect on quality of life in woman with breast cancer (5), in patients with prostate and breast cancer (17, 18), in patients with somatization disorder (6), in nurses (11), in veterans (32), in percutaneous coronary intervention (PCI) patients and in type 2 diabetes mellitus patients (7, 8).

About the spirometry, this study shows that MBSR cannot change the spirometry parameters significantly; this result is parallel with result of Pbert et al., 2012 (13).

## **Conclusion**

This study makes two contributions. First, consistent with previous findings, it indicates that MBSR can improve individual's quality of life in chemically pulmonary injured veterans. Second, the present study finds that MBSR cannot improve respiratory function test.

It will be important that, future studies replicate this study in large samples and more control on variables that may have effects on results.

## **Ethical considerations**

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc) have been completely observed by the authors.

## Acknowledgments

This study was done by support from Chemical Injuries Research Center of Baqiyatallah University of Medical Sciences. We should appreciate pulmonary injured veterans who cooperated with us in this study. The authors declare that there is no conflict of interest.

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