

Effects of Imagery, Critical Thinking, and Asthma Education on Symptoms and Mood State in Adult Asthma Patients: A Pilot Study

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ABSTRACT

Objective: To compare biologically targeted imagery (BTI) and critical thinking asthma management (CTAM) outcomes.

Design: Participants were randomized to BTI (group 1, G1) or CTAM (group 2, G2) in a 2 × 2 × 4 design (BTI/CTAM × pretest/post-test × weeks [3 week averaged intervals of symptoms and peak flows]). Interventions were asthma education plus treatment (BTI or CTAM for two 2-hour sessions per week for 6 weeks). For BTI, data collection (symptoms, lung function) occurred preintervention (3 week baseline), during the intervention (6 weeks), and postintervention (6 weeks). For CTAM, data collection occurred at wait-list control (WLC) (12 weeks extended baseline), preintervention (3 weeks), during the intervention (6 weeks), and postintervention (6 weeks).

Setting: Alaska Regional Hospital, Anchorage.

Subjects: Seventy (70) adults (53 women, 17 men) with asthma.

Interventions: WLC record keeping, BTI, or CTAM.

Outcome measures: Dependent variables included asthma symptoms (wheezing, coughing, sleep, activity, attacks, peak flow) and self-report assessments of Profiles of Mood States (POMS-BI) (anxiety, hostility, depression, uncertainty, fatigue, confusion); Knowledge, Attitude, and Self-Efficacy Asthma Questionnaire (KASE-AQ); Health Attribution Test (HAT) for locus of control (LoC); and the Revised Asthma Problem Behavior Checklist (RAPBC).

Results: Analyses of covariance with repeated measures contrasted BTI pre- to post-tests, time periods, and WLC; CTAM pre- to post-tests, time periods, and extended baseline WLC; and BTI to CTAM outcomes. WLC improved all POMS-BI scores except anxiety, increased internal LoC, and reduced problematic behaviors. Compared to WLC, BTI reduced wheezing, anxiety, and chance LoC, and increased asthma knowledge, attitude, and self-efficacy. Compared to CTAM, BTI reduced wheezing and chance LoC, increased internal LoC, and improved 6 POMS-BI scores. Compared to extended baseline WLC, CTAM increased asthma knowledge, attitude, self-efficacy, internal LoC, and peak flow.

Conclusions: Both interventions significantly improved symptoms and asthma management more than record keeping. Contrary to hypothesis, BTI produced better outcomes than CTAM.

INTRODUCTION

Asthma is a complex disorder involving biochemical, neural, immunological, infectious, endocrine, and psy-

chological factors in varying degrees in different individuals, leading to airway obstruction. Asthma is caused by inflammatory events in the airways and is considered to be the outcome of a cluster of diseases and hyper-reactive im-

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mune responses, rather than a single disease state (Busse, 1989). Asthma symptoms can be elicited by exposure to allergens or exacerbated by infection, stress, or environmental changes. A predisposition to asthma can be inherited, and multiple family members may suffer from the disease. When untreated, asthma can worsen, leading to permanent airway and lung damage. In these cases, emphysema or other chronic obstructive pulmonary diseases (COPD) can result (Lawler et al., 1995).

Prevalence and cost of asthma

It has been estimated that 31.3 million Americans have been diagnosed with asthma by a health professional. In 2001, more than 12 million Americans suffered an actual asthma attack. Between 1997 and 1999, it was reported that the lifetime diagnosis rate for asthma had decreased by 6%. The celebration was short lived, however, with the rates of diagnosis between 1999 and 2001 increasing by 27% for lifetime prevalence, and 12% for asthma attack. Females consistently demonstrate higher rates of asthma diagnosis than men. In 2001, females were 10% more likely to be diagnosed than their male counterparts. Further, 65% of all asthma deaths occurred in women. In 2001, the prevalence rate for asthma in African Americans was 15% higher than in the Caucasian population. Asthma currently ranks within the 10 most prevalent conditions causing limitation of activity (American Lung Association, 2003).

The economic cost of asthma is staggering. Financial loss due to asthma, in 2002 dollars, was estimated at \$9.4 billion in direct medical care costs and \$4.6 billion in lost productivity, totaling more than \$14.0 billion per annum. Inpatient hospital services represented the largest direct medical cost, at over \$4 billion (American Lung Association, 2003).

The successful management of asthma can vary from patient to patient depending on genetic predisposition; allergic susceptibilities; psychological, emotional, and physical status; disease severity; age; and patient compliance. Because asthma is so complex, and patient response so individualized, developing an effective asthma intervention is a challenge.

PURPOSE OF STUDY

The purpose of this study was to determine the most synergistic and efficacious combination of cognitive components known to improve asthma outcomes. Numerous asthma interventions and a variety of treatment approaches have been described in the literature. Those approaches and interventions fall into three categories: medical research and case studies; psychological and physiological research demonstrating the effects of emotional suppression, negative mood state, and stress on physiological conditioning of

immune pathways, leading to asthma exacerbation; and educational interventions purporting to teach patients about their disease, and resulting in improved asthma management behaviors. Below, we consider the components related to this study: asthma education, critical thinking asthma management (CTAM), and the mind-body effects of biologically targeted imagery (BTI).

Asthma education literature

The medical literature available on asthma education included definitions and clinical manifestations of asthma; etiology and course of the disease; immune system responses to allergens and hyper-reactivity; classifications of disease severity; and outcomes of drug treatments (Bardana and Montanaro, 1996; Cluss and Fireman, 1985; Kaliner, 1996; Lawler et al., 1995; Mathison, 1996; McFadden, 1998; Steurer-Stey, 2003).

Asthma management and critical thinking strategies

Asthma education programs have also been studied for their contributions to patient asthma management. Program goals were to provide health education on the nature and treatment of asthma and to increase patient self-regulation of asthma. Health education purists had previously acted on the assumption that providing basic knowledge about asthma management would translate into proactive and consistent patient response (Lewis et al., 1984; Toelle et al., 1993; Yoon et al., 1993).

Other health educators recognized the need to develop programs that incorporated cognitively based problem-solving and strategic thinking plans, often referred to as self-regulation programs. The self-regulation programs were based on the premise that education alone is insufficient to ensure patient management of disease. Self-regulation advocates argued that improved problem-solving abilities bring about behavioral changes and increase self-efficacy. These skills are necessary, they asserted, to ensure efficacious patient-driven asthma management (Bandura, 1977; Barnett et al., 1992; Colland, 1993; Creer, 1987; Zimmerman and Clark, 1990).

In the current study, patient-driven asthma management was encouraged by the use of critical thinking tools, as defined by Paul (1993). Study participants used Paul's elements of reasoning to evaluate all potential problem areas contributing to their asthma. Participants then developed an individualized CTAM plan to mitigate asthma triggers.

Mind-body and imagery literature

The emotional components of asthma and the physiological connections between illness, psychological state, and conditioning of immune function have intrigued researchers for more than 35 years. Psychologists have ex-

plored psychological factors related to asthma exacerbation; sought to influence the number and severity of asthma attacks with stress reduction, relaxation, and imagery interventions; and explored conditioning of physiological and immune responses as they relate to the symptomology of asthma and other illnesses (Achterberg and Lawlis, 1984; Ader and Cohen, 1975, 1993; Glaser et al., 1987; Graham et al., 1967; Kiecolt-Glaser et al., 1986; Kinsman et al., 1973; Lehrer et al., 1986; Levinson, 1979; Lutgendorf and Costanzo, 2003; Lyketsos et al., 1984; Pert, 2002). The research suggested that the practice of relaxation and BTI could contribute a new aspect to the improvement of asthma outcomes.

MATERIALS AND METHODS

Participants

Subjects were recruited through fliers sent to individuals on the American Lung Association mailing list, by pulmonary physician and pharmacist referral, and newspaper ads. Seventy (70) asthma patients over the age of 18, residents of the municipality of Anchorage, with a physician-documented diagnosis of asthma but no confounding lung disorder, were randomized to BTI (asthma education and BTI) or wait-list control (WLC) via a random number table. Participants completing WLC were later assigned to CTAM (asthma education and CTAM).

Program interventions

Before delivery of BTI or CTAM, subjects in both groups received identical asthma education information, consisting of:

1. an overview of asthma and its physiology
2. education and practice on how to use inhalers and spacers

3. information on vaccinations and flu prevention
4. the impact of stress and emotion on asthma exacerbations
5. how stress affects immune function
6. types and proper use of asthma medications
7. identifying and reducing asthma triggers
8. use of simple strategies for reducing stress
9. identifying your style for health management
10. particulate and pollen issues in Alaska and their management
11. how to reduce asthma response to pets
12. strengthening the patient/physician relationship
13. breathing exercises for asthma patients
14. exercise physiology and implementing an exercise plan
15. asthma planning and problem solving.

In addition to asthma education, BTI participants created imagery that represented, biologically and symbolically, healthy lung functioning (i.e., an absence of lung inflammation and bronchospasm).

In addition, the CTAM group created and implemented an individualized CTAM plan that emphasized removal of allergy and asthma triggers from the home and work environment, family support, and stress reduction. The time devoted in the classroom to asthma education, CTAM, and BTI were timed to assure that both groups devoted equal time to the intervention. Subjects in both groups were also asked to devote 30 minutes a day, 5 days a week, to BTI or CTAM outside of class.

Design

The research design was 2 × 2 × 4 (BTI/CTAM × pretest/post-test × weeks 1–3, 4–6, 7–9, 10–12) (Fig. 1; see page 64). Class intervention consisted of two 2-hour sessions per week for 6 weeks. Daily data collection (asthma symptoms, lung function) in the BTI group (*n* = 35: 8 men,

TABLE 1. PATIENT DEMOGRAPHICS

	<i>Group 1 Biologically targeted imagery n = 25</i>	<i>Group 2 as wait list n = 30</i>	<i>Group 2 Critical thinking asthma management n = 20</i>
Mean age ± SD	44.72 ± 9.24	45.33 ± 10.87	48.00 ± 10.82
Mean years with asthma	21.28	20.30	10.82
Gender			
Male	5 (20%)	6 (20%)	5 (25%)
Female	20 (80%)	24 (80%)	15 (75%)
Asthma severity rating			
Mild	8 (32%)	11 (37.7%)	7 (35%)
Moderate	14 (56%)	14 (46.7%)	10 (50%)
Severe	3 (12%)	5 (16.6%)	3 (15%)

SD, standard deviation; some percentages are rounded to the nearest tenth of a percent.

Powerful others	Pre	4	1.39	4	2.18									
	Post	4	2.33	4	2.06	(1,52)	3.32	0.0741	(1,52)	0.04	0.84	(1,52)	0.10	0.76
Chance	Pre	5	2.00	5	1.76									
	Post	4	1.95	5	1.91	(1,52)	2.48	0.122	(1,52)	0.15	0.7	(1,52)	9.36	0.0035
RAPBC	Pre	85	32.63	81	28.80									
	Post	74	33.95	79	30.22	(1,52)	5.17	0.0271	(1,52)	0.01	0.91	(1,52)	2.09	0.154
Peak flows	Time 1	397	120.21	340	118.36									
	Time 2	395	101.94	342	134.54									
	Time 3	403	113.77	344	140.83									
	Time 4	390	119.86	342	143.42	(1,52)	0.9	0.45	(1,45)	2.44	0.125	-3138.00	0.65	0.59
Attacks	Time 1	2	3.47	1	2.33									
	Time 2	1	1.20	2	4.25									
	Time 3	1	2.08	1	4.13									
	Time 4	1	2.40	3	6.54									
Wheeze	Time 1	16	13.73	11	10.65									
	Time 2	10	10.22	10	11.16									
	Time 3	9	9.51	12	14.67									
	Time 4	10	8.76	14	15.55	-3138.00	0.95	0.42	(1,45)	0.50	0.49	-3318.00	2.27	0.084
Cough	Time 1	13	12.90	14	7.70									
	Time 2	8	8.61	12	12.23									
	Time 3	10	10.46	13	13.35									
	Time 4	11	10.15	14	16.63	-3144.00	2.38	0.072	(1,47)	0.04	0.85	-3144.00	4.29	0.0062
Activity	Time 1	18	17.34	14	15.43									
	Time 2	15	10.35	14	16.74									
	Time 3	14	10.13	15	18.75									
	Time 4	16	12.85	14	18.24	(1,47)	0.6	0.62	(1,47)	0.10	0.76	(1,47)	0.96	0.42
Sleep	Time 1	12	10.97	12	14.03									
	Time 2	8	10.35	11	15.37									
	Time 3	8	10.13	11	16.49									
	Time 4	10	12.85	12	14.89	(1,47)	1.27	0.29	(1,47)	0.24	0.63	(1,47)	0.40	0.76

Note: Significant findings referred to in the text are in **bold**. SD, standard deviation.

TABLE 3. IMAGERY VERSUS CRITICAL THINKING PRE- AND POST-TEST COMPARISONS

Dependent variable	Group 1		Group 2		Within-group			Between-group			Interaction effect		
	N = 25 Means	df	N = 20 Means	df	F	P	df	F	P	df	F	P	
POMS-BI													
Composed/anxious													
Pre	21.90		23.30										
Post	27.80	(1,42)	24.50	(1,42)	8.67	0.005	(1,42)	0.27	0.610	(1,42)	3.68	0.062	
Elated/depressed													
Pre	22.90		23.80										
Post	28.00	(1,42)	26.00	(1,42)	7.50	0.009	(1,42)	0.06	0.820	(1,42)	1.14	0.300	
Agreeable/hostile													
Pre	27.20		25.30										
Post	30.10	(1,42)	28.60	(1,42)	8.99	0.005	(1,42)	1.14	0.292	(1,42)	0.05	0.830	
Confident/unsure													
Pre	20.85		23.50										
Post	26.50	(1,42)	24.30	(1,42)	14.02	0.001	(1,42)	0.01	0.910	(1,42)	7.92	0.007	
Clearheaded/confused													
Pre	26.40		27.20										
Post	30.30	(1,42)	26.70	(1,42)	2.37	0.131	(1,42)	0.58	0.460	(1,42)	4.23	0.046	
Energetic/tired													
Pre	18.20		20.60										
Post	23.70	(1,42)	21.40	(1,42)	6.95	0.012	(1,42)	0.01	0.990	(1,42)	3.74	0.060	
KASE-AQ													
Knowledge													
Pre	12.50		13.50										
Post	14.40	(1,43)	15.70	(1,42)	25.42	0.000	(1,42)	2.88	0.097	(1,43)	0.12	0.740	
Attitude													
Pre	80.50		81.00										
Post	90.00	(1,43)	90.90	(1,42)	65.75	0.000	(1,42)	0.11	0.750	(1,43)	0.04	0.850	
Self-efficacy													
Pre	75.60		79.10										
Post	89.00	(1,42)	87.60	(1,42)	68.74	0.000	(1,42)	0.18	0.680	(1,42)	3.27	0.078	
HAT													
Internal													
Pre	6.50		7.00										
Post	7.30	(1,42)	7.70	(1,42)	9.00	0.005	(1,42)	0.98	0.330	(1,42)	0.15	0.710	
Powerful others													
Pre	3.50		3.60										
Post	3.90	(1,42)	3.10	(1,42)	0.02	0.880	(1,42)	0.64	0.430	(1,42)	1.96	0.170	
Chance													
Pre	5.10		4.30										
Post	4.00	(1,42)	3.70	(1,42)	10.55	0.002	(1,42)	1.03	0.320	(1,42)	0.76	0.390	

RAPBC		Problem behaviors										
Peak flows	Pre	85.50	70.60									
	Post	74.70	69.00	(1,42)	3.84	0.057	(1,42)	1.34	0.260	(1,42)	2.12	0.154
Attacks	Time 1	395.00	398.00									
	Time 2	393.00	402.00									
	Time 3	402.00	394.00									
	Time 4	388.00	407.00	-3114.00	0.01	0.990	(1,37)	0.02	0.900	-3114.00	0.77	0.510
Wheeze	Time 1	1.70	0.30									
	Time 2	0.60	1.20									
	Time 3	0.60	0.70									
	Time 4	0.90	0.00	-3120.00	0.40	0.760	(1,39)	0.56	0.470	-3120.00	1.55	0.210
Cough	Time 1	16.20	9.40									
	Time 2	10.00	9.40									
	Time 3	8.60	6.10									
	Time 4	9.80	6.80	-3120.00	3.74	0.013	(1,39)	1.29	0.270	-3120.00	1.14	0.340
Activity	Time 1	13.30	10.50									
	Time 2	8.00	8.90									
	Time 3	9.40	12.40									
	Time 4	10.70	10.50	-3120.00	1.18	0.330	(1,39)	0.01	0.930	-3120.00	0.83	0.490
Sleep	Time 1	18.00	13.10									
	Time 2	15.20	11.20									
	Time 3	13.91	14.90									
	Time 4	15.90	14.10	-3120.00	0.97	0.420	(1,39)	0.44	0.520	-3120.00	1.66	0.180
	Time 1	11.90	8.70									
	Time 2	8.60	9.80									
	Time 3	8.30	8.90									
	Time 4	10.10	5.70	-3120.00	0.87	0.460	(1,39)	0.19	0.670	-3120.00	1.61	0.200

Note: Significant findings referred to the text are in **bold**.

27 women) occurred for 3 weeks prior to intervention, during 6 weeks of classroom intervention, and for 6 additional weeks after the classroom intervention ended. In the CTAM group ($n = 35$ recruited, 30 participating beyond the wait-list period: 5 men, 25 women), daily data collection occurred for 15 weeks before intervention, with the first 12 weeks serving as WLC for comparison with the BTI group. The CTAM group continued to collect daily data during the 6 week intervention and for 6 weeks after completion of classes ($n = 20$ subjects completing full treatment).

During all data collection periods, subjects recorded their asthma symptoms, peak flows, and medication use, twice daily, on a diary form created for that purpose. These data were averaged into 3-week periods (weeks 1–3, 4–6, 7–9, and 10–12) and reported as Time 1, 2, 3, and 4. All other self-report tests—Profiles of Mood States (POMS-BI), Knowledge, Attitude, and Self-Efficacy Asthma Questionnaire (KASE-AQ), Health Attribution Test (HAT), and the Revised Asthma Problem Behavior Checklist (RAPBC)—were administered twice (pre- and postintervention or WLC) (Table 1).

Variables

Dependent variables included asthma symptoms and POMS-BI, KASE-AQ, HAT, and RAPBC scores. Asthma symptoms included wheezing, coughing, sleep interruption, activity levels, asthma attack, and lung function (peak flow meters). The POMS-BI assessed anxiety, hostility, depression, uncertainty, tiredness, and confusion. The KASE-AQ assessed patient knowledge of asthma, patient attitude toward their disease, and patient sense of self-efficacy in relation to disease management. The HAT assessed patient locus of control (LoC).

Statistical analysis

Analyses of covariance (ANCOVAs) with repeated measures contrasted BTI pre- to post-test, and to WLC; CTAM pre- to post-tests and to extended baseline WMC; and BTI to CTAM outcomes.

The within-subjects main effect addressed whether there was a mean difference in each dependent measure between pre- and post-intervention or over Time 1 through 4 for both groups. The between-subjects main effect determined whether there was a mean difference in each dependent measure between BTI and WLC. Finally, the interaction (group \times time) effect determined whether the rate of change in the dependent measure, over timeframes, varies as a function of group status.

RESULTS

WLC group

WLC produced a statistically significant main testing effort on 5 of the POMS-BI scales. WLC significantly improved LoC (HAT), and reduced problem behaviors (RAPBC). This indicated that record keeping improves mood state, internal LoC, and asthma management. WLC did not produce improvements on these scales more effectively than either BTI or CTAM. WLC produced no significant improvements in asthma knowledge, attitude, self-efficacy, asthma symptoms, or anxiety.

Asthma education with BTI

Compared to WLC, BTI demonstrated significant improvement (interaction of time effect) for wheezing; all 3

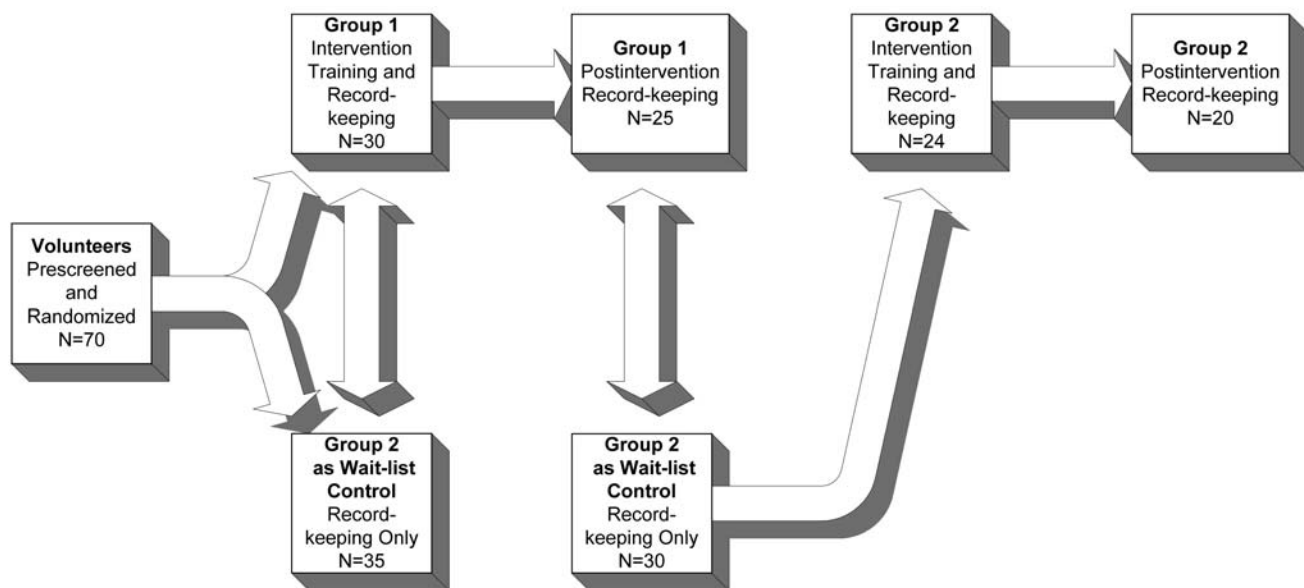


FIG. 1. Design relationships among group 1, group 2 as wait-list/control, and group 2.

TABLE 4. CRITICAL THINKING EXTENDED BASELINE DATA

	<i>Dependant variable</i>	<i>Group 2</i> N = 20	<i>SD</i>	<i>Within-group df</i>	<i>F</i>	<i>P</i>	
POMS-BI	Composed/anxious						
	Pre	23.20	6.88				
	Post	24.50	7.96	(1,18)	0.47	0.51	
	Elated/depressed						
	Pre	23.80	8.62				
	Post	26.00	8.05	(1,18)	1.15	0.3	
	Agreeable/hostile						
	Pre	25.40	5.23				
	Post	28.70	7.15	(1,18)	3.65	0.072	
	Confident/unsure						
	Pre	23.40	8.35				
	Post	24.20	7.11	(1,18)	0.37	0.56	
	Clearheaded/confused						
	Pre	27.20	6.59				
Post	26.60	7.72	(1,18)	0.22	0.65		
Energetic/tired	Pre	20.60	10.11				
	Post	21.40	9.95	(1,18)	0.33	0.58	
	KASE-AQ	Knowledge					
		Pre	13.40	3.1			
Post	15.60	2.19	(1,19)	8.96	0.0075		
Attitude	Pre	80.70	10.95				
	Post	90.60	6.66	(1,18)	23.47	0.0001	
Self-efficacy	Pre	78.80	11.42				
	Post	87.30	7.89	(1,18)	14.83	0.0011	
HAT	Internal						
	Pre	7.00	1.17				
Post	7.65	1.49	(1,18)	4.18	0.0554		
Powerful others	Pre	3.65	1.66				
	Post	3.15	1.81	(1,18)	0.2	0.67	
Chance	Pre	4.40	1.5				
	Post	3.80	1.85	(1,18)	2.92	0.11	
RAPBC	Problem behaviors						
	Pre	71.90	29.68				
Post	70.30	30.85	(1,18)	0.12	0.73		
Peak flows	Time 1	362.00	119.84				
	Time 2	367.00	138.31				
	Time 3	369.00	148.29				
	Time 4	365.00	153.46				
	Time 5	392.00	154.46				
	Time 6	396.00	168.98				
	Time 7	388.00	181.22				
	Time 8	401.00	145.59	-7119.00	2.07	0.0524	
Attacks	Time 1	0.50	2.06				
	Time 2	1.90	4.77				
	Time 3	1.60	4.71				
	Time 4	2.60	6.92				
	Time 5	0.40	1.12				
	Time 6	1.30	5.26				
	Time 7	0.90	3.02				
	Time 8	0.10	0.3153	-7119.00	1.21	0.31	

(continued)

TABLE 4. CRITICAL THINKING EXTENDED BASELINE DATA (CONT'D)

	<i>Dependant variable</i>	<i>Group 2 N = 20</i>	<i>SD</i>	<i>Within-group df</i>	<i>F</i>	<i>P</i>
Wheeze	Time 1	8.10	8.75			
	Time 2	9.40	11.77			
	Time 3	10.80	15.39			
	Time 4	11.70	13.67			
	Time 5	9.60	11.73			
	Time 6	9.60	14.89			
	Time 7	6.30	10.25			
	Time 8	7.00	10.19	-7119.00	0.27	6.2
Cough	Time 1	13.30	7.49			
	Time 2	13.10	11.56			
	Time 3	14.40	13.98			
	Time 4	13.10	11.38			
	Time 5	10.60	9.12			
	Time 6	9.10	10.58			
	Time 7	12.60	16.89			
	Time 8	10.70	12.3	-7119.00	0.56	0.79
Activity	Time 1	10.70	13.56			
	Time 2	10.90	14.84			
	Time 3	12.00	16.99			
	Time 4	11.20	15.27			
	Time 5	13.40	15.67			
	Time 6	11.50	15.42			
	Time 7	15.20	17.62			
	Time 8	14.40	19.4	-7119.00	0.49	0.84
Sleep	Time 1	8.70	5.23			
	Time 2	9.40	12.82			
	Time 3	9.90	15.99			
	Time 4	9.80	16.87			
	Time 5	8.80	13.98			
	Time 6	9.90	11.61			
	Time 7	9.10	16.35			
	Time 8	5.90	9.04	-7119.00	0.51	0.83

Note: significant findings referred to the text are in **bold**. SD, standard deviation.

main effects for anxiety reduction; and a between- and within-group effect for hostility reduction. Improvements were found within-group with BTI for scales of depression, uncertainty, tiredness, and confusion. BTI produced improvements on 6 POMS-BI scales. BTI within-group effects were found for increased patient knowledge of asthma; and all 3 main effects were found for patient attitude and self-efficacy. BTI improved patient-perceived control of disease, as indicated by a reduced belief in chance as a controlling factor for disease outcomes (interaction of time) (Table 2).

BTI versus CTAM outcomes

In contrast to CTAM, BTI produced a more effective within-group and rapid positive change in mood state scores. The POMS-BI scales of anxiety and hostility, scales most often tied to asthma exacerbations, were significantly more

improved by BTI than CTAM. This was supported by BTI to CTAM between-group outcomes and the failure of BTI, as compared to extended baseline WLC, to reach significance. CTAM demonstrated no significant effect on mood states when compared to its extended baseline WLC data. Wheezing, an important symptom of asthma, was significantly reduced by BTI (main effect of testing), and more quickly than by CTAM. Significant improvements shared by BTI and CTAM but not WLC were knowledge, attitude, self-efficacy, and internal belief (Table 3).

CTAM compared to extended baseline WLC

CTAM improved asthma knowledge, attitude, self-efficacy, peak flow, and marginally increased internal LoC, indicating the practice of an asthma management plan based on critical thinking strategies, significantly improved these

measures as compared to WLC alone. CTAM, compared to its extended baseline WLC, failed to significantly increase scores for any of the POMS-BI mood states or the attribution of health to “powerful others.” CTAM failed to decrease problem behaviors or belief in chance (Table 4).

DISCUSSION

Gruzelier and others have called on the scientific community to invest significantly more effort and funding in imagery research (Donaldson, 2000; Freeman, 2001b; Gruzelier, 2002). Scientists have found that imagery protocols and programs grounded in imagery have been demonstrated to improve mood state (i.e., reduce depression and anxiety, improve clarity of focus and a sense of empowerment) and immune function. Changes in immune function brought about by participation in imagery interventions have been demonstrated to reduce pain and improve health outcomes (Freeman, 2001b).

Imagery can significantly reduce stress. Life stressors exacerbate chronic disease symptoms (including pain), drive inflammatory cytokines, play a significant role in poor physical health, negatively impact mood state, and reduce function and quality of life (Leventhal et al., 1998; Miller, 1998). Conditions associated with aging (pain, inflammatory diseases, and changes in mental and physical health status and function) are entangled. Improvement or decline in any one of these conditions drives the other conditions in a similar direction. It has been clearly identified that depression, negative mood state, and the diseases of aging are strongly associated (Leventhal et al., 1998). Because of these findings, the authors of the current study have turned their attention to the potential of imagery as intervention for other chronic diseases, including cardiovascular disease, osteoarthritis, and cancer.

Mind–body interventions based on imagery have demonstrated promising results that may be built upon to improve mental and physical health in aging populations, including targeted alteration of immune function (Gruzelier, 2002). Specifically, the ability of the mind to communicate with the body via the “molecules of emotion” has been elucidated and can now be accessed to modulate health outcomes (Freeman, 2001a; National Institutes of Health, 1996; Pert, 1999). Imagery is the communication tool most readily available between mind and body and is the foundation of all other mind–body interventions (Miller and Cohen, 2001). It is our hope that imagery, an underfunded and little explored mind–body intervention, will be taken more seriously by the medical and scientific community in the future. For that to occur, new evidence-based research will have to be produced.

CONCLUSIONS

Both interventions—BTI and CTAM—significantly improved asthma symptoms and asthma management. Con-

trary to hypothesis, the addition of BTI generally produced better overall outcomes than the CTAM addition. Asthma is a disease driven by allergy triggers, so this outcome was a surprise to the authors. We had anticipated that CTAM, with increased time spent on allergen control, would produce better statistical and clinical outcomes than the BTI imagery intervention, in terms of direct and within-group comparisons. The findings point to the potential power of the mind, via imagery, to significantly affect disease outcomes, even when those diseases are driven by immune dysfunction, as with asthma. We conclude that the practice of imagery makes a statistically significant contribution to an effective asthma management program and that both imagery and critical thinking asthma management, in combination with asthma education, can reduce asthma symptoms.

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