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RESEARCH

A pilot intervention program that reduces psychological symptomatology in individuals with human immunodeficiency virus

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SUMMARY. Background: Thirty-eight human immunodeficiency virus-seropositive men and women, most with AIDS, enrolled in a psychological intervention, called the HeartMath® program. It is a unique intervention for stress-reduction and mental and emotional self-management that focuses on enhancing positive emotional states, as well as minimizing negative states. *Objective*: This pilot study was conducted to determine the feasibility of this program in managing the psychological status and improving the quality of life of individuals with human immunodeficiency virus. The study was not intended to be a large, double-blind, controlled clinical study. *Methods*: Participants attended three 2-day training sessions and were given home study assignments of approximately one hour per day for the six-month study period. They were assessed on site prior to and at the completion of the six-month period using (i) an Irritability Scale, (ii) a Symptom Questionnaire developed to assess the number and severity of symptoms specifically associated with acquired immune deficiency syndrome, (iii) the State–Trait Anxiety Inventory, (iv) the General Well-Being Scale, and (v) the Essi Systems StressMap® Research Tool. *Results*: The data indicate that the program is highly effective in reducing symptomatology in individuals with human immunodeficiency virus by decreasing state and trait anxiety, improving physical vitality, reducing stress, and improving overall psychological well-being. Some individuals also reported improvements in physical symptomatology. *Conclusions*: The results indicate that the HeartMath program is a non-pharmaceutical intervention that can positively affect the psychological well-being of individuals with acquired immune deficiency syndrome.

INTRODUCTION

Currently, human immunodeficiency virus (HIV) infection and acquired immune deficiency virus (AIDS) constitute a global pandemic, without effective treatment. AIDS itself has gripped the popular mind and engendered what has often been called a 'plague mentality'. Consequently, AIDS is accompanied not only by the extreme personal stress of a chronic, life-threatening infection but also the immense social stress generated by how society perceives HIV-positive individuals.

Management of HIV-related disorders lies on the basic interrelated levels of the physical and the psychological. The psychological approach, involving intervention programs designed to help HIV-positive individuals cope with emotional distress, has focused on more conventional psychiatric therapies with a strong emphasis on grief-management.[1–3] This approach was based on studies which demonstrated an association between the prognosis of AIDS and a variety of psychosocial factors including depression, lack of coping skills, negative emotions and attitudes including anxiety and depression associated with knowledge of HIV seropositivity, and lack of social support.[3–5] Some of these psychosocial factors, notably negative emotions and lack of social support, were further demonstrated to inhibit immune function.[6–8] These immunological effects were also shown to be mediated by changes in sympathovagal balance of the autonomic nervous system, since increased sympathetic activity elevates cortisol and adrenaline,[9–11] which are known to be immunosuppressive.[12,13]

It has been previously demonstrated that a newly developed, specially designed stress-reduction technique called Freeze-Frame® (FF), for increasing self-management of mental and emotional states, produces immunoenhancement[14] and cardiac sympathovagal balance,[15,16] which are associated with improved health.

Our *working hypothesis* is as follows: psychological shifts in attitude associated with increased mental and

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emotional balance produce sympathovagal balance, which manifests as characteristic immunological, endocrinological, cardiovascular, and psychological changes associated with homeostasis, health, and general well-being. To test the effects of mental and emotional balance on psychological changes in HIV-positive individuals, we used a newly developed stress-reduction program referred to as the HeartMath (HM) program which incorporates the FF technique. We were interested in determining whether this program would enhance psychological well-being and quality of life and reduce physical symptomatology in HIV-positive individuals. This pilot study was therefore appropriately named 'AIDS for Hope', providing participants with tools (as in aids) for less stressful and more 'hopeful' lives.

METHODS

Subjects

By telephoning city and county AIDS projects, AIDS clinics, and physicians with high numbers of HIV^+ patients throughout California and in Washington State, prospective participants were identified. Announcements of the study were also placed in several San Francisco periodicals and on the Internet, a global communications network. Packets that included descriptions of the study program and applications for it were distributed to hundreds of clients and patients. The 62 individuals who responded were screened by telephone for inclusion in the program following receipt of their application forms. Applicants were not accepted if they required nursing care at the training sessions, or if they currently reported contagious infections that could be spread easily to other participants. Thirty-eight HIV-1-seropositive volunteers signed consent forms and were enrolled in the program. Thirty-four of the volunteers were male and four were female.

Due to lodging limitations, two sub-groups of 19 were formed from the initial enrollees. All aspects of the HM program and all testing were identical for both sub-groups, the only exception being that sub-group 2 was additionally tested pre- and post-study using the Essi Systems StressMap® Research Tool. Sub-group 1 began in January 1993; sub-group 2 in February 1993. The mean age of the participants was 41 (SD standard deviation: 9; range 28–60). Of the 38 initial enrollees, 14 were not able to provide adequate data for the following reasons: death (3); severe illness (4); job-schedule conflicts (2); loss of contact through moving homes (2); loss of interest in the program (3). Therefore, these 14 were dropped from the study. Thus, complete data were gathered on 14 from sub-group 1 and 10 from sub-group 2 (24 in total). Of these, there were three females, two in sub-group 1, and one in sub-group 2.

Intervention program

The program lasted six months and included attendance at three two-day workshop sessions held at the Institute of HeartMath (IHM). Each workshop was conducted at three-month intervals. Participants were in residence for the two days and three nights of each workshop at the Institute's research and conference center in the Santa Cruz mountains, two hours drive south of San Francisco. Comfortable dormitory-style lodging and healthy meals were provided. Each workshop comprised two full days of classroom training, interspersed with several breaks, a long lunch period, and social gatherings in the evening. These gatherings provided participants with an informal environment in which to interact with Institute associates who have been practising HM self-management techniques for many years. The gatherings included healthy food and live upbeat music.

Participants were taught how to intuitively identify and understand the impact that thoughts, feelings and actions have upon their psychological and physiological well-being, including the effects of mental and emotional stressors on the balance between the sympathetic and the parasympathetic nervous systems and the immune system. Participants were taught techniques for consciously disengaging from unpleasant mental and emotional reactions and transforming stressful feelings of anger, frustration, despair, etc. into more coherent feelings of love, compassion, forgiveness, and appreciation at will. These techniques have been described in detail elsewhere.[17,18]

Freeze-Frame is an example of one of these techniques.[17] The first step of Freeze-Frame is to recognize the stressful feeling. The second step is to intentionally shift one's attention to the area around the heart, where most people subjectively feel positive emotions. The third step is to direct one's feelings toward experiencing or re-experiencing sincere appreciation for someone. Appreciation is defined as the state where the subject has clear perception of the feelings of gratitude and recognition for someone or something. The last step in the technique is to decide on an appropriate course of action using intuition and common sense. The technique focuses on genuinely experiencing the feeling of appreciation, in contrast to other self-management techniques which elicit an emotional response by mentally visualizing or recalling an emotion.

The first weekend seminar taught these basic techniques, while the two subsequent weekends helped participants continue to practise the various techniques for increasing their ratios of mental and emotional self-management.

Each participant committed to practising the assigned HM techniques for one hour each day for a six-month period and listening five times a week to the music *Heart Zones*[19] which was specifically designed to facilitate mental and emotional balance.

Each participant was also assigned an associate of the Institute who served as a counselor regarding practice of the techniques and who contacted the participant by telephone every two weeks throughout the six-month period.

Nine participants selected at random from subgroup 1 received a one-day training in Holoenergetics[20] in addition to the HM program. Although there was no significant difference in the test scores between these nine participants and those who did not receive the training, no conclusions can be drawn about the efficacy of the Holoenergetics training because of the small sample size.

Measures

Psychological measures

Participants were assessed by each of the four measures on two occasions: on site prior to the study and then again at home, one week after completion of the six-month training. The following tests were used: (a) the State–Trait Anxiety Inventory (or 'STAI')[21]; (b) the General Well-Being Scale[22]; (c) the Essi Systems StressMap® Research Tool[23,24] (completed by subgroup 2 only); (d) an Irritability Scale developed at IHM and (e) a Symptom Questionnaire, developed at IHM to assess the number and severity of symptoms specifically associated with AIDS. Tests were scored according to instructions described in the manuals.

The *State–Trait Anxiety Inventory* is designed to differentiate between anxiety as a transitory emotional state (state) and individual differences in anxiety-proneness as a relatively stable personality trait (trait).

The *General Well-Being Scale* was analyzed using the factors defined by Levin; however, the factors were re-named according to standard psychometric practice to reflect more accurately their contents and the direction of coding was changed so the scores were consistent with the new names. Thus, three variables were defined: Positive Affect (happy, satisfied, cheerful), Physical Vitality (energy, pep, vitality), and Hardy Outlook (stress-resistant, hopeful, optimistic), along with a summary variable of these three reflecting the sum of the values for each individual.

The *StressMap® Research Tool* was originally designed to gain a broad overview of stress and its various components. The instrument has been normalized on both American and Canadian populations, showing alpha coefficients above 0.7 for all scales. The *StressMap® Research Tool* has ten major scales, covering the domains of Major Changes (life-event changes), Work Pressures (work stress, job role, and job demand), Home Environment, Self-Care (self-care and social support), Perspective (self-mastery, adaptability, and time management), Hardiness (self-esteem, personal power, expression and compassion), Personal Beliefs (outlook and connection/alienation), Physical Symptoms (many minor illnesses and symptoms such as back-pain, headache, risk of coronary heart disease, and upper respiratory infections), Behavioral Symptoms (work avoidance, substance abuse, and eating disorders), and Emotional Symptoms (depression, anxiety, and obsessive–compulsive behavior). On all but 'Perspective' and 'Self-Care' scales, high scores mean higher stress.

An irritability scale, consisting of seven questions was developed at IHM to determine impatience and irritability. Questions like, 'Would your parents and friends agree that you do most things in a hurry?' or, 'When you have to wait in line, what do you do?' were compiled and scored on a four-point scale. High scores reflect increased irritability.

The symptom questionnaire, developed at IHM, consisted of 29 questions focusing on physical symptomatology, psychological impact, treatment programs and drug use. Self-assessment of physical symptoms and drug-use was scored qualitatively.

The homogeneity of variance in the distribution of test scores indicated the need for non-parametric statistical analysis. Therefore, the Wilcoxon signed-ranks test was used for all analysis. Data from the two

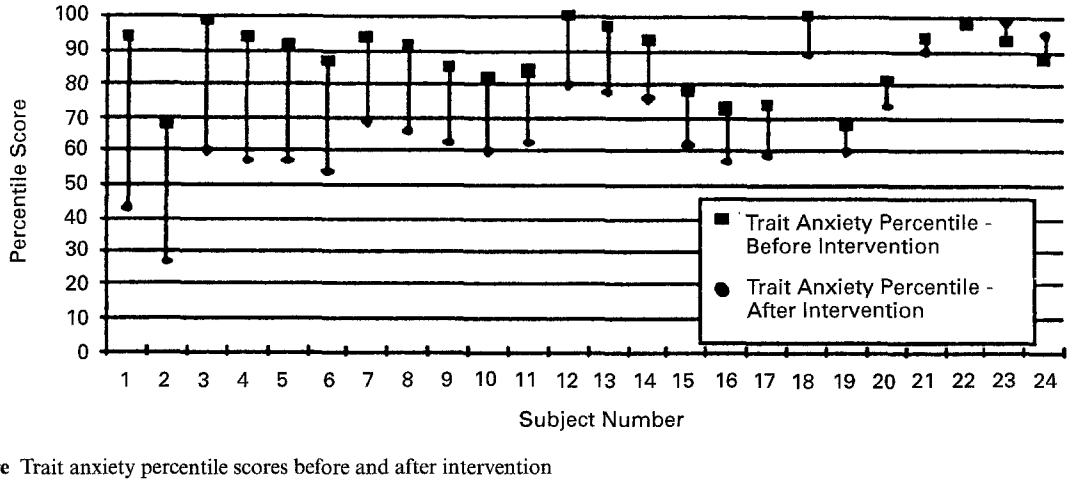

Figure Trait anxiety percentile scores before and after intervention

Table 1 Pre-study laboratory values

Variable	Mean	SD	Range
CD4 cell number	292	263	13–1089
CD8 cell number	974	489	266–2179
CD4:CD8 ratio	0.307	0.253	0.010–0.971
White blood cell number	4.2	1.6	2.6–8.7
Total lymphocyte	1489.5	594.0	576–2700

sub-groups were pooled and analyzed together. Baseline values for the STAI, the General Well-Being, and the Essi Scales were compared and no statistical differences between individuals were found. Therefore, the 24 individuals in the study can be considered a homogenous population.

Verification of serostatus

Participants were requested to provide recent blood-test results from their personal medical records before the start of the program to verify their seropositive status and asses the severity of illness. Specifically, values for CD4 cells, CD8 cells, CD4:CD8 ratios, total lymphocytes, white blood cells, red blood cells, hemoglobin, hematocrit, and platelets were collected.

RESULTS

Briefly, the means, standard deviations, and ranges for the laboratory variables at baseline are as follows:

These data indicate that the subjects varied in terms of disease severity but that, in general, their $CD4^+$ counts indicated that the majority of subjects were in the range of AIDS-related complex or AIDS.

The effect of the HM intervention program on STAI and General Well-Being scores is reported in Table 2. All variables were significantly affected in a clinically positive manner: both State and Trait Anxiety scores were significantly reduced; Positive Affect, Physical Vitality, and Hardy Outlook scores were also all positively affected to a significant degree.

Table 2 Changes in psychological variables following HM intervention. State Anxiety and Trait Anxiety variables were obtained from the State–Trait Anxiety Inventory. The irritability variable was obtained from the IHM irritability questionnaire. The remaining variables were obtained from the General Well-Being Scale

	Mean – before intervention	SD	Mean – after intervention	SD	Wilcoxon's Z	P
State anxiety	46.3	11	30.5	9.8	-4.2	<0.0001
Trait anxiety	49.4	8.5	39.6	8.2	-3.9	<0.0001
Irritability	18.9	4.2	15.5	3	-4.1	<0.0001
Positive affect	10.7	3.5	16.6	3.7	4.2	<0.0001
Physical vitality	9.1	3.1	12.2	3.7	2.8	0.0027
Hardy outlook	13.8	3	17.6	1.8	4.1	<0.0001
General well-being	33.6	7.9	46.4	7.8	4	<0.0001

Table 3 Changes in stress-related variables of sub-group 2 following intervention; assessed by StressMap® Research Tool

Variable	Mean before intervention	SD	Mean after intervention	SD	Wilcoxon's Z	P
Major changes	24.70	4.50	17.00	6.10	-2.30	0.0105
Work pressures	33.70	13.30	24.60	5.50	-2.40	0.0090
Home environment	13.40	3.30	12.60	2.40	-1.70	0.0460
Self-care	39.40	5.80	40.30	7.10	-0.70	0.2419
Perspective	17.20	4.00	21.00	3.10	-2.70	0.0039
Hardiness	31.80	9.40	27.70	9.50	-2.70	0.0035
Personal beliefs	17.00	3.70	13.30	2.40	-2.50	0.0060
Physical symptoms	23.40	9.10	25.10	10.60	-1.20	0.1200
Behavioral symptoms	18.00	4.40	14.90	2.70	-2.10	0.0142
Emotional symptoms	45.50	10.50	37.80	11.80	-2.60	0.0047

The Figure shows pre- and post-trait percentile scores for each individual. There were marked improvements in trait anxiety scores for 20 of the 24 study participants.

The results in Table 3 indicate that, following the HM intervention, there were significant improvements in all but two of the variables from the StressMap® Research Tool. Thus, Major Changes, Work Pressures, Home Environment, Perspective, Hardiness, Personal Beliefs, and both Behavioral and Emotional Symptoms of stress were significantly improved. Self-care and Physical Symptoms of stress did not significantly change.

Results from the IHM questionnaire indicated a wide variety of pathological symptoms including opportunistic infections, hepatitis, herpes, and anemia, as well as more general symptoms like fatigue, depression, and weight-loss. Nine of the 18 participants who reported physical symptoms at the start of the study reported no symptoms after completion of the training program. The remaining nine individuals reported either fewer symptoms, less intense symptoms, or no change after completion of the study. In addition to traditional AIDS medications, individuals reported using a variety of medications including nucleoside analogs, antidepressants and prophylactic anti-infectives, as well as vitamins and herbal formulas. Ten out of 24 of the subjects reported using only vitamins and herbs. Twenty-two of the individuals reported no change in their drug usage after the program, although two subjects reported stopping their medication.

From these results, it may be concluded that the HM intervention produces a statistically significant effect on a wide variety of psychological variables as determined by three independent test measures. For many individuals, self-reported physical symptoms improved as well. These results suggest the clinical efficacy of the HM intervention program in enhancing the well being of HIV-positive individuals.

DISCUSSION

The results from this pilot study support the notion that psychological interventions aimed at increasing an individual's ability to cope with the stress associated with HIV or AIDS and with life in general can have significant effects on psychological well-being. The results are even more significant when compared to other psychological intervention programs intended to change psychological factors in non-HIV$^+$ populations, since many interventions have been without effect.[25]

Most psychologically oriented studies with HIV$^+$ individuals, particularly for long-term survivors, have focused on characterizing the psychosocial factors associated with their clinical status and/or prognosis. Several studies have isolated specific psychological factors associated with more severe symptomatology, e.g. depression, lack of coping skills, negative emotions and attitudes, and lack of social support[4,5]. Other studies, however, failed to observe the expected correlation between depression and the worsening of HIV status[26–28]. These results may be explained by the highly heterogeneous nature of the HIV$^+$ population. Relatively few studies have attempted to improve physiological or psychological variables in HIV$^+$ individuals using psychological intervention programs. The programs that have been used are based on more conventional psychiatric approaches in an attempt to enhance coping strategies, deal with grief and offer an understanding of the nature of the disease.[1,2]

The HM program, which provides simple, easy-to-use tools for stress reduction and mental and emotional self-management, has been previously used successfully in a variety of corporate, 'at-risk' youth, and family programs, and in military applications. The HM program is a unique intervention in that it provides specific tools to enable participants to recognize and minimize negative thoughts and feelings such as anger, resentment, fear, guilt, and anxiety, as well as tools for enhancing positive emotional states, such as love, care, and appreciation. This type of psychological intervention has not been previously applied to the HIV population, although programs emphasizing the immunological benefits of laughter and joy have been used with cancer patients and with normal individuals.[29] Although most studies measuring the immuno-enhancing properties of positive emotions have focused on happiness and laughter,[30,31] McClelland's work[32] is a notable exception. In this work, experimentally induced positive emotions of care and love produced an increase in salivary IgA (S-IgA) secretion rates in healthy individuals.

Individuals who are naturally caring and loving and who readily form social ties score high on an affiliative motive scale.[33] These individuals have increased natural killer cell activity,[34] higher S-IgA secretion rates,[35] decreased stress hormone levels[36] and fewer illnesses.[37] Psychological factors associated with improvement of AIDS symptoms and increased survival include the presence of a positive attitude, emotions or moods and adequate perceived social support.[4] A recent study has shown that HIV$^+$ individuals with improved coping skills and strong social relationships show enhanced immunity.[6] Few studies have considered the impact of social position on the relationship between social support and HIV-seropositive individuals.[38] One may therefore hypothesize that the acquisition of positive attitudes and emotions is likely to improve the longevity and health of HIV$^+$ individuals.

The significant increase in Positive Affect scores on the General Well-Being Scale, and the significant overall decrease in emotional symptoms assessed by the StressMap® Research Tool following the HM program are evidence of increased positive attitudes

and emotions. The psychological changes observed in this study are not likely to be due to increased social support since the participants only met on three occasions during the six-month period and lived in different geographical areas. Furthermore, the study was not designed to distinguish the effects due to social support from those due to increased positive affect.

Physical symptoms as measured by the Essi StressMap® and physical vitality as measured by the General Well-Being test were not changed following the HM intervention program. This may be explained by the fact that these tests are designed to measure stress-related physical symptoms and not the actual symptoms associated with AIDS. These symptoms, however, were addressed in the IHM questionnaire where anecdotal evidence suggests a reduction in self-reported symptoms (53 pre-study to 25 post-study). The relationship between physical symptoms associated with mental and emotional stress and the symptomatology of AIDS bears further and more thorough examination. This would allow a more precise characterization of the value of psychological intervention programs on physical well-being. Self-care as measured by the Essi StressMap® also showed no changes following the HM program. These findings are to be expected, since self-care is likely to be high in a group that volunteers for such an intervention as the one used in the present study.

Because of the remarkable personal benefits experienced by Institute of HeartMath staff members who had practised the techniques in the HM program, it was decided that it would be unethical to subject a control group to a non-treatment program and deprive individuals so in need of a potentially effective therapy. If anything, it could worsen their conditions because of the energy expenditures of travel, practice devoid of substance, and the disappointment of six months spent in a non-effective intervention. The psychological devastation experienced by these individuals is readily apparent in the comment, 'My arrival at HeartMath was accompanied by a hopelessness that had consumed my soul ... (I) felt sentenced to a meaningless death.' A similar attitude was expressed by a majority of the subjects. In addition, in light of the relative ineffectiveness of other therapeutic programs addressing the psychological well-being of HIV^+ individuals, each subject can be considered their own control. The following quote from a participant demonstrates this point: 'As a long-time alcoholic and drug addict, I had been exposed to numerous self-help groups as well as numerous drug treatment facilities and individual, sometimes intense, professional counseling. Years of attempting to alter my behavior and attitude had borne fruit, to be sure, but nothing compared to the benefits of HeartMath as to time- and quality-enhanced changes.'

The purpose of this pilot study was to determine the validity of the HM self-management techniques in a diseased population and not to compare the outcome of the intervention with a non-treatment control group. The validity of using each subject as their own control is indicated by previous studies which demonstrated the relative stability of psychological measures over time in HIV^+ individuals.[39] Therefore, if HIV^+ individuals are depressed, they tend to stay depressed. It has been shown that, in the absence of treatment, no improvements in three psychological measures could be observed in symptomatic HIV^+ patients over an 11-month period.[39] These studies can be considered as comparison studies indicating that, in the absence of a treatment program, the psychological status of HIV^+ individuals does not improve. Nonetheless, future studies testing the efficacy of the HM program or other programs involving enhancement of positive emotional states will need to use appropriate controls. Due to the lack of a control population in the present study the results must be considered preliminary in nature and may be affected by sampling bias associated with a self-selected population. A more comprehensive follow-up study will include age and sex-matched controls from a local HIV clinic and will measure and correlate psychological and immunological parameters.

Nonetheless, the results of the present study clearly indicate a significant effect of the HM intervention program on the psychological well-being of HIV^+ individuals. Improvement in well-being may affect behaviors related to management of the physical disease, including personal health maintenance and access to health care, which might relate directly to the quality of life and perhaps length of survival. In light of the severe impact of this disease on overall health, the HM intervention program appears to have significant potential to help affected individuals.

In view of the encouraging results obtained here, a more comprehensive and systematic study of the effectiveness of this and similar training programs on the psychological well-being of HIV-infected individuals is warranted.

CONCLUSIONS

From the data gathered, it is concluded that a psychological intervention that provides tools enabling participants to recognize and minimize inefficient thoughts and feelings such as anger, resentment, fear, guilt, and anxiety, as well as enhancing positive emotional states, such as love, care, and appreciation, is highly effective in reducing psychological symptomatology in those with HIV infection and AIDS, as evidenced in the decrease in state and trait anxiety, improved mood, reduced stress, enhanced overall psychological well-being, and increased physical vitality.

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