The Effects of Meditation on Perceived Stress

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ABSTRACT

Participants were 24 (12 men, 12 women) members of fitness clubs. Each completed the Perceived Stress Scale (PSS-14), before and after the meditation-treatment condition. The men and women were randomly assigned to either the treatment or control group. The treatment group participated in a four week meditation program consisting of a minimum of three 20 minute meditation sessions per week. The control group did not. A 2(treatment/no treatment) x 2 (sex) repeat measures analysis of variance was performed. There was a significant between groups effect for sex $F(1, 20) = 7.97$, $p = .01$, with women scoring higher than men. There was a significant within groups effect for time $F(1,20) = 10.11$, $p = .005$, however, there was also a significant time by group effect, $F(1, 20) = 17.40$, $p = .001$, with participants in the control group showing no significant change from Time 1 to Time 2, on the PSS-14 scores, while the treatment group showed a significant decrease in PSS-14 scores.
INTRODUCTION

Over the years there have been many studies that have examined the effect of meditation on human physiology (Anand, Chhina & Singh, 1961; Ando, 1977; Benson, Rosner & Mazretta, 1973; Brown 1977; Kasamatsu & Hirai, 1969; Kamiya, 1966; Orme-Johnson, 1973; Ornstein, 1972; Matsuoto, 1970; Morse, Martin, Furst & Dubin, 1977; Pope & Singer, 1978, Sugi & Akutsu, 1968; Yamaoka, 1977). This research suggests that persons in meditation experiments reveal "...a wakeful, hypometabolic state: reductions in oxygen consumption, carbon dioxide elimination and the rate and volume of respiration; a slight increase in the acidity of the arterial blood; a marked decrease in the blood-lactate level; a slowing of the heartbeat; a considerable increase in skin resistance, and an electroencephalogram pattern of intensification of slow alpha waves with occasional theta-wave activity." (Wallace & Benson, 1972, p. 89), as well as blood pressure reductions (Benson, Rosner & Maryetta; 1974; Kristt & Engel 1975; Patel, 1975).

Wallace and Benson describe this 'hypometabolic state' as the opposite of the "fight or flight' response, a well-known reflex described many years ago by physiologist W. B. Cannon. In this state an aroused sympathetic nervous system mobilizes a set of physiological responses marked by increases in the blood pressure, heart rate, blood flow to the muscles and oxygen consumption. (Wallace & Benson, 1972).

Other meditation studies have revealed behavioural and subjective results in participants. In one meditation study meditation was found to decrease reactivity to external stimuli, specifically noise (Anand, Chhina & Singh, 1961). In another study, meditators demonstrated a quicker response to stressor impact and
experienced less subjective anxiety (Goleman & Schwartz, 1976). In a 12 month longitudinal study research participants characterized themselves as less anxious, more calm and peaceful than those who dropped out (Otis, 1973). Finally, in another study meditators revealed a decrease in muscle tension (Zaichkowsky & Kamen, 1978).

In a review of experimental evidence of meditation reducing somatic arousal Holmes (1984) concludes that meditation does not reduce somatic arousal any more than rest does. However, he does not take into account the role of attention in meditation. "...concentration shares with relaxation an autonomic quiescence, but in addition enhances some attentional skills. A mindfulness technique involving the adoption of a particular attentional stance toward all objects of awareness appears to enhance cortical specificity,..." (Davidson & Goleman, 1977, p. 291). To add, any change in mental events implies a concomitant neural change. (Davidson & Goleman, 1977). Since any change in mental events implies a neural change perhaps through continuous attentional state change through regular meditation practise an individual can induce a permanent neurophysiological change or a trait change. In other words, if an individual develops the skills for entering a particular state on command, the individual with practise can over time induce a predispositional or trait change. One of the most reliable trait effects of meditation is a reduction of anxiety. (Davidson & Goleman, 1977; Zuroff & Schwartz, 1978). However, first the state change or the experiential and biological consequences of a state, in this case the meditational state, needs to be brought under the control of the individual.
Endler and Parker describe state-anxiety as having two components, "...a cognitive-worry component and an emotional arousal component." (1990, p. 244). Not only does meditation practise reduce the 'emotional arousal' component of state anxiety through somatic arousal reduction, but through concentration of attention the 'cognitive-worry' component of state anxiety can also be reduced.

Solley (1984) describes attention as follows: (a) Attention is a stimulus information-processing activity; (b) This activity has a space-time distribution; (c) The centroid of this space-time distribution is the point or area of maximal information processing. "Things look clearer and sharper at the centroid and less clear as you move toward the periphery of this field. ...The particular distribution of attention which obtains at any given slice of time is largely determined by our environment and by our habitual modes of attending." (Solley, 1984, p. 3). Solley (1984) also states that (a) attention is spatially distributed; and (b) its spatial distribution constricts during the stressful course of learning cues which are most relevant to the learning task.

Therefore, one’s ability to attend to any situation is habitual and constricted by stress. Consequently, through meditation practise an individual can change habitual patterns of attention and strengthen attentional abilities to develop an immunity to the attention reducing effects of stress. There have been mixed results in experiments measuring the effect of meditation on anxiety. In one study it was found that "A group mindfulness meditation training program can effectively reduce symptoms of anxiety and panic and can help maintain these reductions in patients with generalized anxiety disorder, panic disorder, or panic disorder with agoraphobia." (Kabat-Zinn et al., 1992, p. 936). Yet in another study it was found
that there was no evidence that meditation reduced anxiety beyond that shown in the control conditions (Boswell & Murray, 1979); in this study however, the treatment only lasted two weeks which may not be long enough to produce a reduction in anxiety measures.

In sum, it is hypothesized that meditation is an effective coping strategy for reducing anxiety and the effects of stress. "Coping is generally seen as a response to stress where this is defined in terms of objective, situational factors which are independent of the individual. Conversely, stress is seen as a possible outcome of coping where subjective, physiological or behavioral responses are the criteria used in defining the former." (Ray, Lindrop & Gibson, 1982, p. 385). Thus, one's ability to cope affects the impact of stress and one's ability to cope is subjective as well as physiological and behavioral. Meditation can enhance one's subjective ability to cope with stress through attentional strength, since one's ability to focus on the centroid of maximal information processing where things look clearer and sharper is improved.

As a coping strategy meditation not only improves one's subjective ability to cope, but also one's behavioral ability to cope through reduced reactivity to external stimuli (Anand, Chhina & Singh, 1961) and quicker response to stressor impact (Goleman & Schwartz, 1976). Also meditation improves one's physiological ability to cope with stress through reduced autonomic arousal (Benson & Wallace, 1972). "Meditation ...produces not a single specific response, but a complex of responses that marks a highly relaxed state." (Benson & Wallace, 1972, p. 90) opposite to that of the "fight or flight" response described earlier.
The purpose of this study is to examine the effect of meditation on perceived stress. It is hypothesized that the meditation group will experience a reduction in perceived stress due to the ability to induce the meditational state on demand which includes improved attentional abilities under stressful and normal conditions, reduced autonomic reactivity, reduced reactivity to external stimuli, quicker responding to stressor impact and reduced state anxiety. Over time, with the continual practise of state change through meditation, a trait change may emerge. "In cognition we can make strategic choices that determine our perception of the stress experience." (Sethi, 1989, p. 12).

METHOD

Participants

Participants were 24 (12 men, 12 women) individuals recruited from fitness clubs in the greater Metropolitan Toronto area. All participants, were volunteers and were treated in accordance with guidelines set forth by the "Ethical Principles of Psychologists and Code of Conduct" (American Psychological Association, 1994). The mean age of this sample was 39.6 years (SD = 10.93); the mean age for men was 39.17 (SD = 11.82) and the mean age for women was 40.08 (SD = 10.46).

Measures

The Perceived Stress Scale, a global measure of perceived stress (Cohen, Kamarack & Mermelstein, 1983) will be used to assess the change in perceived stress over time. "The PSS is suggested for examining
the role of nonspecific stress ...as an outcome measure of experienced levels of stress. (Cohen et al., 1983 p.385). PSS items were designed to measure the degree to which respondents found their lives unpredictable, uncontrollable, and overloading. These three issues have been repeatedly found to be central components of the experience of stress (Averill, 1973; Cohen, 1978, Glass & Singer, 1972, Lazarus, 1966, 1977; Seligman, 1975.) The scale also includes a number of direct questions about present levels of stress. The PSS is an economical scale that can be administered in only a few minutes and is simple to score. (Cohen et al., 1983). This scale shows evidence or concurrent and predictive validity and substantial reliability.

Procedure and Design

The men and women were randomly and separately assigned to either of two conditions -- a meditation -treatment condition or a no meditation-treatment condition (control). Participants assigned to the meditation condition were instructed to practise Vipassna Meditation for 20 minutes for a minimum of 3 times per week for 4 weeks. Participants in the control group did not participate in any form of meditation or other treatment during this 4 week period. The participants in both the meditation and control condition completed the PSS-14 before and after this 4 week period. Participants in the meditation conditions were given the following instructions:

Vipassana meditation simply means breath watching meditation. It is done by sitting quietly with either your
eyes fully closed or half-way closed and all of your mental attention focused on the flow of your breathing. The tape provided will instruct you during the 20 minute meditation practise. The quality of the tape is poor as it is non-professional, so once you are familiar with how to meditate feel free to do your 20 minute meditation on your own and you may want to play music instead. Make sure it is unobtrusive. Also, have a pad of paper and a pen at your side so that if you have any important thoughts such as creative or problem solving ideas etc., you can write them down and then return to the meditation practise.

You will practise the 20 minute meditation a maximum of once daily or a minimum of three times per week depending on your schedule and interest. After four weeks you can continue to practise as little or much as you like. However, after 4 weeks please complete and return the questionnaire that you were administered at the beginning of the study in the addressed envelop provided.

At the end of the four weeks of meditation treatment both the control group and the treatment group responded to the PSS questionnaire. The design of the study was a 2 (meditation/no meditation) x 2 (Sex) within groups (Pre/Post-meditation scores), repeated measures analysis, with the PSS-14 serving as the dependant variable.
Results

Table 1. displays the means and standard deviations on the PSS-14 at Time 1 and Time 2 for the control and treatment research participants by sex.

In order to examine the effects of treatment on perceived stress a 2 (treatment/no treatment) x 2 (sex) repeat measures analysis of variance was performed.

There was a significant between groups effect for sex, $F(1, 20) = 7.97$, $p < .01$, with women scoring higher than men (see table 1). There were no other main or interactive between group effects.

The within groups analysis indicated a significant effect for Time, $F(1, 20) = 10.11$, $p < .005$. However, there was also a significant time by group effect, $F(1, 20) = 17.40$, $p < .001$, with participants in the control group showing no significant change from Time 1 to Time 2, on PSS-14 scales, while participants receiving meditation training showed a significant decrease in PSS-14 scores (see table 1). There was no other significant main or interactive within group effects.
Table 1

Means and Standard Deviations for PSS-14 Scores for the Control
and Treatment Participants at Time 1 and Time 2 by Sex

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Treatment</th>
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<th>Time 2</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Men</td>
<td>22.67</td>
<td>6.95</td>
<td>22.50</td>
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<td>22.67</td>
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<td>7.63</td>
<td>20.00</td>
<td>2.90</td>
</tr>
</tbody>
</table>

DISCUSSION

In this study of the effect of meditation on perceived stress, there was a significant between groups effect (p. .01), with women scoring higher on the PSS-14 than men (see table 1). In studies conducted by Cohen et. al. (1983, p.390), "although the mean PSS score for females was slightly higher than the mean scores for males in all three samples, this difference did not approach significance. Age was unrelated to PSS scores in all three samples." The three samples consisted of two college student groups and one smoking cessation group. Maybe the difference in scores between these samples and the meditation group had to do with the sample. This group consisted of fitness club members who are primarily working women. The question of why women scored higher on the PSS-14 in the first place probably has to due with the fact that the female sex role is socially
devalued, women are socialized to be passive, dependant and to inhibit anger and women tend to lose their sense of self in traditional wife/mother roles (Hurst & Genest, 1995). It is possible that these and other gender differences in relation to "perceived stress", effect working women more than the women in the samples used in Cohen's studies. In any case, in this study women scored significantly higher than men on the PSS-14.

The main effect in this experiment, as it was hypothesized, was a significant time effect for the meditation group and no time effect for the control group. It can be stated that meditation significantly reduces perceived anxiety when practised a minimum of three times per week for 20 minutes over a four-week period of time. Considering the size of the effect (p. .001), perhaps participant expectancy had an impact on the treatment group results. In order to avoid the possibility of participant expectancy in future experiments, the control group could also be given a task to perform and the double-blind method could be implemented.

Assuming meditation does reduce "perceived stress" as measured by the PSS-14, then it does so because meditation; reduces autonomic arousal, improves attentional concentration, reduces reactivity to stress with a quicker response to stressor impact and the "hypometabolic state" that meditation induces can be brought under the control of the individual.

The PSS-14 measures specifically the degree to which respondents find their lives overloading, unpredictable and controllable. Since meditation increases the sense of having control over one's life (Hjelle, 1974; Orme-Johnson & Farrow, 1977), meditation practise probably reduced the PSS-14 measurement of uncontrollability,
in particular. As well, greater attentional ability may reduce one’s sense of overloading and reduced reactivity to stress with a quicker response to stressor impact may improve one’s response to unpredictability factors.

These details could be further examined by evaluating the results of each item in the PSS-14 and what each item measures (overloading, unpredictability or uncontrollability), assuming that the PSS-14 items are in fact this specific in measurement.
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