DIFFERENCES IN RELAXATION BY MEANS OF GUIDED IMAGERY IN A HEALTHY COMMUNITY SAMPLE

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Objective • This study investigated differences in relaxation induced by guided imagery in healthy community samples.

Methods • One hundred forty-eight people took part in our investigation. The mean age of the 50 males and 98 females was 39.36 ± 11.86 years. We took saliva samples to measure salivary cortisol (SC) before the first session, after the first session, and after the second session. Subjects were asked to complete the short form of the Multiple Mood Scale (MMS) questionnaire before the first session and after the second session. The shortened form of Betts’ Questionnaire upon Mental Imagery (QMI) was collected once before the first session, and vividness of the imagery was measured using a visual analogue scale once after the second session.

Results • SC levels were significantly decreased after the first session and after the second session in all participants. We found, most significantly, that age and QMI scores were strongly related to changes in SC level throughout the relaxation sessions.

Conclusions • Unpleasant information, a cause of mental stress, is replaced by a comfortable image, and this replacement affects a participant’s SC level. The greater one’s imagery ability is, the more successful the displacement of stress and the shift toward a comfortable mental and emotional state will be. This study provides a basis for explaining the mechanism through which relaxation by means of guided imagery is effective in reducing stress. (Altern Ther Health Med. 2006;12(2):60-66.)

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In this study, we investigated how relaxation by means of guided imagery enables individuals to manage stress. Imagery creates a bridge between mind and body, linking perception; emotion; and psychological, physiological, and behavioral response. Guided imagery, a mind-body relaxation technique, is a behavioral and cognitive technique by which individuals exert active control over the focus of attention. It has been used as a therapeutic process during which participants invoke a comforting image to connect with psychological processes outside conscious awareness for the purpose of achieving specific health goals. Relaxation using guided imagery has been applied to management of the following symptoms (or with specific groups of patients), and has been found to be effective in symptom management and reduction of chronic pain, headache, for use in patients treated with chemotherapy, and for use in cancer patients in general. And some experiments performed after 1980 showed that imagery influences the physiological and immune measure. For example, one study showed that cell-specific mental imagery was associated with decreases in peripheral blood cell counts of lymphocytes and neutrophils. Other studies showed that subjects practicing relaxation alone and with imagery had a higher level of salivary immunoglobulin A (IgA) than the control group. A study in which relationships between absorption, imagery, and immune responses were examined found that more high than low absorbers responded to relaxation with mucosal immune imagery by producing higher mucosal IgA.

The effects of imagery on stress and psychological distress in healthy adults have been explored in several studies, and
preliminary evidence supports the effectiveness of guided imagery for managing stress, anxiety, and depression, as well as for lowering blood pressure and for reducing pain and the side effects of chemotherapy. The influences of negative emotions caused by stressful conditions on mind and body have been studied. One pathway through which stressors are thought to influence physiology is through their effects on emotion. In studies of the effects of acute laboratory stressors, participants responded with both a heightened cardiovascular response and a deepening of negative mood. This effect is attributed to a lessening of the effects of stress via the displacement of its associated unpleasant imagery. Data from a hypnosis study support this explanation, indicating that the emotional valence of unpleasant imagery can overwhelm stress-related relaxation.

Numerous studies have found that relaxation by means of guided imagery is associated with changes in physiological parameters. Previous studies investigating relaxation using guided imagery have measured IgA, cellular immune function, plasma beta-endorphin, heart rate, skin temperature, electrodermal activity, and heart rate and pattern, and end-tidal carbon dioxide (PETCO₂), in addition to using electroencephalography (EEG). As physiological indicators of stress and of the relaxation response. We were most interested in the physiological measurement of salivary cortisol, which has been labeled a stress-related hormone.

When a stressor is received in the cerebral cortex, a stress reaction occurs, and adrenocorticotrophic hormone (ACTH) is released from the hypothalamus. As this promotes secretion of ACTH by adrenohypophysis, secretion of cortisol from the adrenal cortex increases. There is consistent evidence that many forms of psychological stress increase the synthesis and release of cortisol. Glucocorticoids can increase the effects of corticotropin-releasing hormone (CRH) on conditioned fear responses and facilitate the encoding of emotion-related memories.

A number of investigations have examined the effects of brief psychological interventions on cortisol level. There are many reports that cortisol levels, as physiological parameters, are variously related to mood levels, which, in turn, are affected by imagery; these reports include information on the effects of psychotherapy on depression and plasma cortisol levels, of cognitive therapy on mood and cortisol levels, of acute relaxation training on salivary cortisol levels, and of a longer training program on moods and salivary cortisol levels in healthy adults.

There have been a few reports on individual differences with respect to relaxation that makes use of guided imagery. For example, changes in cardiac rate and skin temperature during the use of imagery are not related to the age or gender of children, and the relationship between physiological parameters and an individual’s unique imaging ability with respect to using guided imagery in relaxation has not been investigated.

To investigate the effects of relaxation using guided imagery, we evaluated the ability of each participant (as a function of their different abilities to image, their age, and their gender) to generate realistic mental images. In a previous study of imaging abilities that examined individual differences, subjects participated in a guided-imagery exercise to relieve anxiety associated with an upcoming stressful task; the participants who were relatively successful at imaging were compared with unsuccessful participants after the intervention. Scores on Tellegen’s absorption scale, one measure of absorption in mental imagery, were significantly higher for people in the successful group. This was identified as a potential predictor of success with guided imagery. The findings may be helpful in developing a useful instrument to predict likelihood of success with guided imagery.

Another study suggested that imaging ability is related to an individual’s subjective responses to both stress and relaxation. We assumed that participants with limited imaging ability would feel uncomfortable with the guided imagery content and would achieve very low levels of subsequent relaxation, so we measured and examined the relationships among cortisol, mood, and individual imaging ability.

To summarize, the purpose of this study was to examine the relationship of salivary cortisol levels to individual differences with respect to imaging ability, age, and gender in healthy adults who participated in relaxation and guided-imagery sessions. A recent study determined that there were changes in the pattern of plasma cortisol levels measured under stressful conditions and that these changes emerged as a function of age and gender. There have also been reports of individual differences in EEG as a function of susceptibility to hypnosis or with respect to blood-pressure response studies that examined the relationship of physiological parameters to individual differences with regard to relaxation or to hypnosis.

In addition, it is necessary to validate—in a laboratory setting—the type of guided-imagery relaxation method that can be used effectively by healthy adults. It is important to note that this was investigated without changing the method; the relaxation method used with the participants was that usually used with a general group.

METHODS

For several years, public relaxation sessions using guided imagery have taken place each month in Tokyo, Japan. We investigated the sessions for 1 year (Figure 1). The content of each session was similar, and there were approximately 30 participants in each session. Participants had commonly read pamphlets or books that described relaxation by means of guided imagery and that promoted participation in relaxation sessions. The participants differed for each session.

We explained our study to the participants individually, and
176 of the session participants were asked to participate in our study. Twenty-eight people refused, so 148 of 176 people (84%) took part in our investigation. The mean age of the 50 males and 98 females was 39.36 ± 11.86 years (mean ± SD, minimum 18, maximum 72). In addition, several participants took part in many sessions over the course of our investigation. Data were collected only once per participant during the investigation, however. All participants provided informed written consent; we used identification numbers rather than names to protect personal information when compiling statistics.

The program session lasted 3.5 hours. After completing questionnaires, participants volunteered to provide saliva samples. The data from 2 individuals taking antidepressants were excluded from the statistics; an additional 8 individuals were excluded because of technical difficulties in measuring their cortisol levels.

**Relaxation Program**

The relaxation program was carried out from 1 PM to 4:30 PM. Data collection was performed once a month, and the relaxation program was executed at exactly the same time, in the same room, in which the temperature was kept at about 20°C; the only illumination was that provided by fluorescent lamps.

In the first session (ie, from 1 PM to 2:30 PM), subjects were instructed to stretch slowly. Participants repeatedly tensed and relaxed each skeletal muscle of the body in conjunction with abdominal breathing, in a manner similar to a yoga exercise. During skeletal muscle relaxation, participants were instructed to invoke mental images such as, "My muscles were stretched comfortably." While tensing muscles, subjects were asked to recall images such as, "My body becomes warm and then gently relaxed," and, "My body's cells become younger and are activated."

In the second session, from 2:45 PM to 4:30 PM, the participants meditated with abdominal breathing, according to the guided-imagery instruction, with a locus or facing upward. A compact disk entitled "Water," consisting of slow-tempo, mixed nature sounds (eg, the sound of water flowing or birds singing) was played as background music. The instructor told the participants to close their eyes, breathe deeply, and relax. The guided imagery included the following: and (1) a rising sun—the subjects are on a large, sandy beach lit by the rising sun and feel deeply relaxed; (2) comfortable landscapes—forests or individually selected favorite places; (3) harmony with people and expressions of gratitude toward them; and (4) a warm and peaceful light expanding and surrounding the person, the earth, and space. Participants become light and can see the entire world. After telling participants, "You feel relaxed, refreshed, and at ease," the instructor allowed them to open their eyes.

**Study Design**

We collected saliva samples using a Salivette (Sarstedt, Rommelsdorf, Germany), a special plastic tube that contains cotton. Participants chewed accessory cotton in their mouths for 90 seconds before sample collection. Samples were centrifuged for 5 minutes at 3,000 rpm at 4°C and were stored immediately after
collection at -20° C until assays were performed. Salivary cortisol levels were measured by radioimmunoassay methods using a DiaSorin Inc/GammaCoat cortisol kit (Mitsubishi Kagaku BCL Inc, Japan).

Psychological Measures

Short Form of the Multiple Mood Scale

Mood states were measured using a mood adjective checklist constructed in Japan; its reliability and validity have been confirmed in studies of Japanese undergraduate students. It has been used widely in Japan and can be used for a general adult population from its contents. The 40-statement list was designed to measure current multiple mood states. The scale has 8 subscales with 5 items each, representing depression (anxiety), hostility, and boredom as negative moods; liveliness, well-being, and friendliness as positive moods; and concentration and startle as relatively neutral moods. Participants were asked to rate how well the statements reflected the way they felt "right now" using a 4-point scale. Items such as "calm" or "fair" were rated from 1 (I feel not at all) to 4 (I feel very much so), based on the participant’s mood at the time of the test.

Shortened Form of Betts’ Questionaire on Mental Imagery

The shortened form of Betts’ Questionaire on Mental Imagery (QMI) is a 35-item questionnaire designed to measure the ability to generate images using 7 modalities: visual, auditory, cutaneous, kinesthetic, gustatory, olfactory, and organic. In this study, participants were instructed to rate how clearly each suggested image appeared to them on a scale of 1 (no image at all) to 7 (perfectly clear). Higher scores indicate a greater ability to generate mental images. The correlation between the short form and the original long form of the QMI is .92. The validity of the long form has been demonstrated by high correlations between QMI scores and actual ability to generate images in experimental settings. A Japanese version of the QMI was constructed, and Tabane’s version was used in our study. Reliability and validity of this version have been demonstrated in populations of university students. The vividness of the imagery was measured using a visual analogue scale (VAS, 0-100 mm) to assess whether participants were able to remember imagery clearly, according to the instructions, during a session; participants rated image vividness along a 100-mm measuring stick, anchored at the left by a description of “no image at all,” and at the right by a description of “perfectly clearly.” Such VAS questions of vividness imagery were used on the Tobacco Craving Questionnaire (TCQ), and the reliability and validity of the TCQ and VAS have been verified. The questionnaire also asked about the subject’s age, gender, stress level, physical condition, exercise habits, alcohol and smoking status, and behavioral style.

Procedure

We took saliva samples to measure SC before the first session (SC-A, 1 PM), after the first session (rest period; SC-B, 2:30 PM), and after the second session (SC-C, 4:30 PM). Subjects were also asked to complete the Multiple Mood Scale (MMS) questionnaire before the first session and after the second session. The QMI was collected once before the first session, and VAS vividness of imagery (VI) scores were collected once after the second session. The experimental procedure is summarized in Figure 1.

Statistical Analysis

Differences in pre- and post-session scores were measured using a paired t-test. Repeated measures analysis of variance (ANOVA) analyses were performed to test for changes in SC levels and to examine potential covariance factors related to changing SC levels. Pearson correlation and a 1-way ANOVA examined the relationships between age and SC levels, QMI scores, and VI scores. These analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 10j (Chicago, Ill).

RESULTS

Psychological

Pre- and post-session MMS scores are shown in Figure 2. Initial scores indicating negative moods (depression, hostility, boredom; t = -10.04, P < .001; t = -6.793, P < .001; t = -8.504, P < .001, respectively) and neutral moods (startle and concentration: t = -7.19, P < .001; t = -2.18, P = .031, respectively) decreased significantly throughout the session. Conversely, initial scores indicating positive moods (PO) (liveliness, well-being, friendliness; t = 6.807, P < .001; t = 5.816, P < .001; t = 4.627, P < .001, respectively), increased significantly throughout the session. Average QMI score measured before the first session was 183.13 ± 3.08.

![Graph showing comparison of Multiple Mood Scale Scores From Before and After Sessions](image-url)
Salivary Cortisol

Repeated measures ANOVA analyses revealed significant decreases in levels of SC-A, SC-B, and SC-C (F = 12.378, P < .001). A repeated measures analysis of covariance (ANCOVA) with 3-point SC levels as a covariate was conducted to examine relationships among individual difference factors.

Age, gender, height, weight, smoking, drinking, hunger time, health status, stress status, changes in MMS positive scores, changes in negative scores, VI scores, and QMI scores were examined as covariates in the repeated measures analysis. In a repeated measures ANCOVA, age and QMI scores as covariates were associated with changes in 3-point SC levels (age: F = 5.828, P = .003, QMI: F = 3.632, P = .028, respectively).

The results showed that age was strongly related to changes in SC levels. Because previous studies have shown that SC levels differ according to both age and gender, we examined the effect of the relaxation program as a function of both age and gender.

Participants were sorted by age, and a 1-way ANOVA was performed for SC levels and changes. The SC-level changes by age are displayed in Figure 3; SC levels measured at 1 PM (SC-A), 2:30 PM (SC-B), and 4:30 PM (SC-C) differed significantly according to age (F = 4.853, P < .001; F = 8.007, P < .001; F = 4.132, P = .003, respectively). The mean levels of SC-A, SC-B, and SC-C were highest in the over-60 age group. The mean level of SC-A was higher in participants under 30 years of age than in participants in the 3 age groups between 30 and 59 years of age. In the under-30, 30-39, and 40-49 age groups, SC levels decreased through the first and second sessions, in the 50-59 age group, SC levels increased during the first session, which consisted of stretching, but decreased during the second session, which consisted of guided imagery. SC 3-point levels in the 60s age group were extremely high compared to those in the younger age groups, in which SC levels dropped more sharply and continually in the first and second sessions; and among subjects older than 50, SC levels increased in the first session and decreased in the second session. The comparison of SC levels and imagery measures by age are presented in Table 1. QMI scores and VI scores tended to increase as age increased.

In the 30-49 age group, QMI and SC changes in the first session and throughout both sessions were negatively correlated (r = -0.228, P = .043; r = -0.233, P = .041, respectively). There was no correlation between QMI and CMS in the under-30 and the over-50 age groups.

Discussion

This study investigated individual differences with respect to relaxation induced by guided imagery in healthy community samples. Relaxation sessions were found to significantly increase positive mood scores and to decrease negative mood scores as measured by the MMS. SC levels were significantly decreased after the first session and after the second session in all participants. McKinney et al. reported that guided imagery might positively affect mood and reduce SC levels in healthy adults, and the present study supports those results. We found, most significantly, that age and QMI scores were strongly related to changes in SC level throughout the relaxation sessions.

We noted first the factor of age, as reflected in the SC 3-point change pattern. Figure 3 indicates the following as a function of change in the pattern of SC. From the age group of the 20s and up, the SC level was lower before the sessions, but the SC baseline was initially high and increased rapidly in participants who were aged 60 years and older. In the 20s, 30s, and 40s age groups, SC levels dropped continually during the first and second sessions, as compared to the younger age groups, in which SC levels dropped more rapidly through the sessions. Conversely, in the 50s and 60s age groups, SC levels increased during the first session, which consisted of stretching, but decreased during the second session, which consisted of guided imagery. SC 3-point levels in the 60s age group were extremely high compared to those in the younger age groups, and the SC level change from session to session was more abrupt.

Previous data indicated that baseline SC levels in healthy men

Relationship of Salivary Cortisol and Betts' Questionnaire on Mental Imagery

QMI scores of the group in which SC levels increased were compared with those of the group in which SC levels decreased, using the independent t-test procedure. The QMI scores of the "SC increased group" were significantly lower than those of the "SC decreased group" (t = -2.218, P = .028).

SC levels and imagery measures for males and females were examined using independent t-tests. SC levels and changes showed no significant differences between genders. VI scores were significantly higher among females than among males (t = -2.392, P = .019).

Participants were divided into 3 age groups based on differences in the SC change pattern. In the under-30 age group (n = 26), CS levels decreased sharply and continually in the first and second sessions; in the 30-49 age group (n = 80), SC levels decreased slowly and continually in the first and second sessions; and among subjects older than 50 (n = 29), SC levels increased in the first session and decreased in the second session. The comparison of SC levels and imagery measures by age are presented in Table 1. QMI scores and VI scores tended to increase as age increased.

In the 30-49 age group, QMI and SC changes in the first session and throughout both sessions were negatively correlated (r = -0.228, P = .043; r = -0.233, P = .041, respectively). There was no correlation between QMI and CMS in the under-30 and the over-50 age groups.
in the over-40 age group are significantly lower than those in the under-40 age group.8 Our data support that trend; our study, however, is the first to investigate specific cortisol responses to relaxation training in different age and gender groups. We suspect that SC levels decreased more rapidly throughout the sessions as a function of decreasing age because SC secretion sensitivity may decrease with age.6 In our study, however, SC levels decreased less in the 50-59 age group in the first session, which consisted of stretching; in fact, SC levels increased. It is likely that the stretching performed in the first sessions led to exercise effects in the 50s- and 60s-age groups, which appear to have been temporarily greater than the relaxation effects. An earlier study of the impact of progressive muscle relaxation as a result of brief exercise found that SC levels decreased significantly in young subjects between pre- and post-intervention.8 In contrast, a study examining the effects of heavy resistance training indicated that exercise elevated SC levels in the younger (under-30) and older (over-60) age groups and that SC levels after training were significantly higher in the older group than in the younger group.57

In the 60s age group in the present study, the SC baseline level was extremely high, and SC levels changed more rapidly than they did in the 20s age group.

The study of the impact of age and gender on hypothalamic-pituitary-adrenal (HPA) axis responses to an acute stress task found that the SC baseline was high and that SC levels increased greatly, but that they decreased after stress in a group of older men (mean age 70), as compared to younger men (mean age 20), closely resembling the pattern of SC change of the 60-year-olds in the present study.

The fundamental cause of this change in SC levels according to age is probably an endocrine feedback mechanism. In the present experiments, we hypothesized that healthy aging disrupts the adaptive SC response; we identified several strongly age-specific contrasts in cortisol dynamics and inferred that healthy aging probably disrupts neuroendocrine mechanisms that coordinate the HPA axis. The majority of investigations suggest that negative glucocorticoid feedback is attenuated in human aging.28 Although they are likely to produce equivalent psychological effects in all age groups, the physiological reactions of stress hormones may differ by age.

Based on age-related differences in SC levels, we examined moods and imagery measures in 3 age groups: under 30, 30-49, and over 50. The older, the participant, the higher the MMS scores for positive mood and imagery, and the lower the MMS scores for negative mood (Table 1). This is consistent with previous reports that age is related to positive effects in women,8 that negative effects are greater among younger adults,39 and that positive and negative effects exhibit different patterns of change in different age groups.39

When age—the factor that most strongly influenced SC level change—was examined, the relationship between QMI as an individual difference factor and SC became clear. For the 30-49 age group, the QMI and SC changes in the first session and during both sessions were negatively correlated. In other words, the greater a participant's imaging ability, the more the SC level decreased through guided-imagery relaxation. For all participants, the QMI scores of the group in which cortisol levels increased were significantly lower than those of the group in which cortisol levels decreased throughout the sessions.

We suggest that the comforting imagery remembered by participants throughout the sessions influenced the decrease in SC levels. Unpleasant information, a cause of mental stress, is replaced by a comforting image, and this replacement affects a participant's SC level. The greater the individual's imaging ability, the more successful the displacement of stress and the shift toward a comfortable mental and emotional state. The present study provides a basis upon which to explain the mechanism through which relaxation by means of guided imagery is effective in reducing stress.

Future studies are needed to evaluate the influence of individual differences more precisely, including the ability to form images, such as age, gender, lifestyle, and stress sensitivity, on the long-term effects of relaxation. It is necessary to elucidate the mechanism by which imagery connects with physiological and psychological parameters and influences the mind and body. This technique could have important implications for improving well-being and preventing illness in healthy but vulnerable individuals, such as the elderly. Application of the practice of relaxation using guided imagery may prove useful.

References

changes associated with clinical improvement of asthmatic children subjected to psychotherapeutic intervention. *Braun Behav Hum. 1999; 5:3-13.*


