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## SHORT REPORTS

### Attentional and Affective Concomitants of Meditation: A Cross-Sectional Study

Richard J. Davidson, Daniel J. Goleman, and Gary E. Schwartz  
*Harvard University*

The purpose of this study was to explore differences in attentional absorption and trait anxiety in 58 subjects divided into four groups: (a) controls who were interested in but did not practice meditation, (b) beginners who meditated for 1 month or less, (c) short-term meditators who regularly practiced for 1-24 months, and (d) long-term meditators who practiced for more than 2 years. Subjects were administered the Shor Personal Experiences Questionnaire (PEQ), the Tellegen Absorption Scale (TAS), and the Spielberger State-Trait Anxiety Inventory (STAI) in trait form. As predicted, significant increases in the PEQ and TAS and significant decrements in the STAI were observed from controls through long-term meditators. This pattern, associated with the practice of meditation (i.e., decrements in trait anxiety and increments in the capacity to attend), is consistent with physiological data indicating that meditation is associated with decrements in autonomic arousal and increments in cortical responsivity.

Recent research has begun to systematically define a personality trait, moderately correlated with hypnotizability, which represents a disposition for having episodes of "total" attention, termed absorption (Roberts, Schuler, Bacon, Zimmerman, & Patterson, 1975; Shor, 1960; Shor, Orne, & O'Connell, 1962; Tellegen & Atkinson, 1974). Although attempts to modify hypnotizability have been only partially successful (see Diamond, 1974), with test-retest reliabilities over a 10-year span found to be .60 (Morgan, Johnson, & Hilgard, 1974), the plasticity of absorption has never been explored.

Recent prospective longitudinal research on certain forms of meditation has indicated that their regular practice is associated with significant enhancement in attentive ability, as assessed by the Embedded Figures and Rod and Frame Tests

(Linden, 1973; Pelletier, 1974), as well as significant decrements in trait anxiety (Linden, 1973). The purpose of the present study was to explore the association between these practices of relatively passive, sitting meditation (see Davidson & Schwartz, in press) and absorption and anxiety using a cross-sectional design.

Although the contributions of self-selection and differential drop-out rates among the three groups of meditators could not be unambiguously assessed with this design, we believed that the present study might provide a foundation for more systematic longitudinal research with these variables in the future. It was hypothesized that a linear increment in measures of absorption concomitant with a linear decrement in a measure of trait anxiety would be observed across four groups of subjects representing nonmeditating controls, beginners, and short-term and long-term meditators, respectively.

#### METHOD

##### *Subjects*

A total of 58 Harvard undergraduates served as subjects. The subjects were divided into four groups on the basis of their responses to questionnaires asking whether they meditate regularly and, if so, for how many months. The groups included (a) controls ( $n = 11$ ) who expressed an interest in meditation although they did not practice; (b) beginners ( $n = 14$ ) who indicated that they meditated for 1 month or less; (c) short-term meditators ( $n = 18$ ) who

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regularly practiced for 1–24 months; and (d) long-term meditators ( $n = 15$ ) who have regularly practiced for greater than 24 months.<sup>1</sup> The mean age for the total sample was 20.81 years ( $SD = 2.77$ ) and did not differ between groups. There were 36 males and 23 females in the total sample and the sex ratio was comparable between groups. All subjects were solicited, unpaid volunteers.

The type of meditation practiced by the subjects was varied and ranged from transcendental meditation (see Kanellakos & Lukas, 1974) to Zen and traditional Buddhist practices such as focusing attention on breathing (see Goleman, 1972). All were relatively passive in nature and performed while sitting quietly (Davidson & Schwartz, in press).

#### Measures

**Shor Personal Experience Questionnaire (PEQ).** The PEQ is a 45-item scale developed by Shor et al. (1962) through cross-validated studies designed to assess personality variables which predict hypnotizability. Subjects are required to indicate whether or not they have experienced the particular event described by each item and to rate the intensity of their experience on a scale from 0 to 2. Two representative items are: "Have you ever become so absorbed in listening to music that you almost forgot where you were?" and "Have you ever remembered events in your past life so vividly that it felt like living it again?" In their validation and cross-validation studies, Shor et al. (1962) found a significant positive association between hypnotizability and intensity (for the validation study, the phi coefficient = .22; for the cross-validation study,  $r = .46$ ) with no significant association observed between the frequency of occurrence of such experiences and hypnotizability. On the basis of these data, it was predicted that greater changes over time would be observed in the intensity versus frequency measures.

**Tellegen Absorption Scale (TAS).** The TAS is a 32-item scale developed by Tellegen and Atkinson (1974) through a series of replicated, cross-validated factor analytic studies. Roberts et al. (1975) report alpha coefficient reliabilities over .80. The TAS has been found to correlate consistently with hypnotizability in the range of .40 (Roberts et al., 1975; Tellegen & Atkinson, 1974). Absorption is interpreted as a disposition for having episodes of total attention "during which the available representational apparatus seems to be entirely dedicated to experiencing and modeling the attentional object, be it a

landscape, a human being, a sound, a remembered incident, or an aspect of one's self" (Tellegen & Atkinson, 1974, p. 274). Importantly, Tellegen and Atkinson show absorption to be fully independent of stability–neuroticism and introversion–extroversion. The following two representative items, if answered true, would be indicative of absorption: "If I wish, I can imagine some things so vividly that they hold my attention in the way a good movie or story does" and "It gives me—or would give me—deep satisfaction to devote myself to someone I care about."

**State-Trait Anxiety Inventory (STAI).** The STAI, in the trait form, was employed (Spielberger, Gorsuch, & Lushene, 1970). This 20-item scale distinguishes among subjects on the basis of the degree to which they respond to perceived threat or stress with different intensities of anxiety and reflects relatively stable differences in anxiety proneness.

#### Procedure

All subjects were administered the scales in the context of other personality and attitude questionnaires. The test battery was given to subjects at the end of a class period. Subjects were told that this was a study on the "medical and physical correlates of behavior" and were requested to answer the questionnaires as honestly as possible. Subjects' social security numbers rather than names were employed for identification. Subjects were requested to return the questionnaires at the next class meeting (in 4 days).

#### RESULTS

One-way analyses of variance with groups (controls, beginners, short- and long-term meditators) as a factor were computed separately for the three dependent measures.

On the PEQ frequency measure, no significant differences were observed between the four groups,  $F(3, 54) = 2.35$ ,  $p < .08$ . As predicted, however, differences did emerge on an intensity measure. The groups were compared on the number of "2" (most intense) ratings given. Analysis of variance revealed a significant main effect for groups,  $F(3, 54) = 3.47$ ,  $p < .03$ . These data are illustrated in the top panel of Figure 1 and indicate a reliable, relatively linear increase in PEQ intensity from controls to long-term meditators. The significant main effect for groups is primarily a function of the significant differ-

<sup>1</sup> Beginners and short-term and long-term meditators were enrolled in a class on the psychology of consciousness while controls were students in a physiological psychology course.

ences between long-term meditating three groups: for long-term controls,  $t(22) = 4.13$ ,  $p < .001$ ;<sup>2</sup> versus beginners,  $t(27) = 3.41$ , long-term versus short-term,  $t(33) = 3.01$ . None of the remaining in comparisons were significant on the PEQ intensity measure.

The group means on the TAS in the middle panel of Figure 1 indicate a significant main effect for groups was  $F(3, 54) = 6.24$ ,  $p < .002$ , indicating a significant increase in TAS score from controls to long-term meditators. Unlike the PEQ intensity data, the TAS data reveal a significant difference between controls and beginners,  $t(23) = 3.01$ , and between controls and short-term meditators,  $t(27) = 5.04$ ,  $p < .001$ . The difference between controls and long-term meditators was also significant,  $t(24) = 5.35$ ,  $p < .001$ . On the basis of the PEQ data, no significant differences were obtained on the TAS between long-term meditators. Finally, the lo-

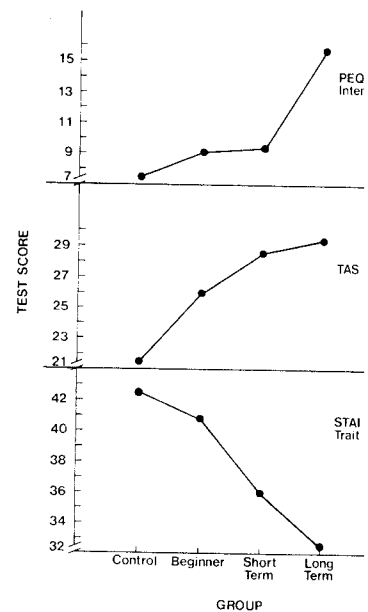


FIGURE 1. Mean test score on each dependent variable by group. [PEQ = Shor Personal Experience Questionnaire; TAS = Tellegen Absorption Scale; STAI Trait = Spielberger State-Trait Anxiety Inventory in trait form. Controls ( $n = 14$ ) were students in a physiological psychology course; meditators ( $n = 18$ ) practiced 1–24 months; long-term meditators ( $n = 15$ ) practiced more than 24 months.]

human being, a sound, a remembered aspect of one's self" (Tellegen & 1974, p. 274). Importantly, Tellegen show absorption to be fully independent of stability-neuroticism and introversion. The following two representative items answered true, would be indicative of absorption: "If I wish, I can imagine some vividly that they hold my attention in a good movie or story does" and "It would give me—deep satisfaction to myself to someone I care about."

**State-Trait Anxiety Inventory (STAI).** The trait form, was employed (Spielberger, & Lushene, 1970). This 20-item instrument distinguishes among subjects on the basis of the degree to which they respond to perceived stress with different intensities of anxiety. It reflects relatively stable differences in anxiety.

Subjects were administered the scales in the other personality and attitude questionnaires. The test battery was given to subjects of a class period. Subjects were told as a study on the "medical and physical aspects of behavior" and were requested to complete the questionnaires as honestly as possible. Subjects' social security numbers rather than names were employed for identification. Subjects were requested to return the questionnaires at a class meeting (in 4 days).

## RESULTS

Analyses of variance with groups (controls, beginners, short- and long-term meditators) as a factor were computed separately for each dependent measure.

**PEQ frequency measure.** No significant differences were observed between the four groups,  $F(3, 54) = 2.35, p < .08$ . As predicted, differences did emerge on an intensity measure. The groups were compared on the number of "2" (most intense) ratings given.

Analyses of variance revealed a significant main effect for groups,  $F(3, 54) = 3.47, p < .03$ . These differences are illustrated in the top panel of Figure 1. There is a reliable, relatively linear increase in PEQ intensity from controls to long-term meditators. The significant main effect for groups was a function of the significant differ-

ences between short-term and long-term meditators. Controls were students in a psychology course while controls were students in a physiology course.

ences between long-term meditators and the remaining three groups: for long-term versus controls,  $t(22) = 4.13, p < .001$ ; for long-term versus beginners,  $t(27) = 3.41, p < .01$ ; for long-term versus short-term,  $t(31) = 3.30, p < .01$ . None of the remaining individual group comparisons were significant on this measure.

The group means on the TAS are illustrated in the middle panel of Figure 1. A highly significant main effect for groups was obtained,  $F(3, 54) = 6.24, p < .002$ , indicating a reliable linear increase in TAS score from controls to long-term meditators. Unlike the PEQ intensity findings, the TAS data reveal a significant difference between controls and beginners,  $t(23) = 3.02, p < .01$ , and between controls and short-term meditators,  $t(27) = 5.04, p < .001$ . The difference between controls and long-term meditators was also highly significant,  $t(24) = 5.35, p < .001$ . In contrast to the PEQ data, no significant difference was obtained on the TAS between long- versus short-term meditators. Finally, the long-term versus

beginners comparison was significant,  $t(27) = 2.40, p < .05$ , while the short-term versus beginner comparison failed to reach significance.

The group means on the STAI trait scale are illustrated in the bottom panel of Figure 1 and reveal a highly significant linear decrement in trait anxiety from controls to long-term meditators,  $F(3, 53) = 5.16, p < .004$ . There were no significant differences between controls and beginners or between long- versus short-term meditators. Significant differences were obtained between controls and short-term meditators,  $t(23) = 4.77, p < .001$ . Finally, beginners had significantly more trait anxiety than both long-term,  $t(27) = 4.25, p < .001$ , and short-term meditators,  $t(30) = 2.61, p < .02$ .

Correlational data across groups revealed a highly significant correlation between the PEQ intensity measure (number of "2" ratings) and TAS score ( $r = .53, p < .001$ ). Moreover, neither the PEQ intensity measure nor the TAS correlated significantly with the STAI trait scale. Correlations between number of months meditating and scores on the three dependent variables revealed, as predicted, positive correlations with the PEQ and TAS and negative correlations with the STAI (for PEQ,  $r = .37, p < .01$ ; for TAS  $r = .27, p = ns$ ; for STAI,  $r = -.35, p < .05$ ).

## DISCUSSION

The data from the present study reveal reliable increases in measures of attentional absorption in conjunction with a reliable decrement in trait anxiety across groups as a function of length of time meditating. Interestingly, these differences (i.e., increases in absorption and decrements in trait anxiety) appear to be independent of one another as shown by the lack of significant correlation between the STAI and the two absorption measures. That these dimensions are orthogonal is consistent with the factor analytic findings of Tellegen and Atkinson (1974).

One limitation of the present study should be noted in interpreting these data. Since this study employed a cross-sectional design, the contributions of predispositional influences could not be assessed (see Smith, 1975). However, the linear changes obtained across groups in conjunction with the correlational data seem to be more parsimoniously consistent with a training effect. This interpretation is further supported by the lack of any differences between control and beginners on two out of the three dependent measures. If predispositional effects were strongly

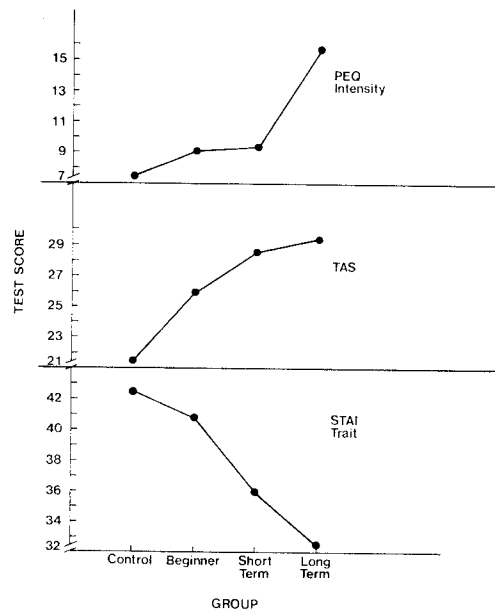


FIGURE 1. Mean test score on each of the three dependent variables by group. [PEQ intensity = number of "2" ratings on the Short Personal Experiences Inventory; TAS = Tellegen Absorption Scale; STAI Trait = Spielberger State-Trait Anxiety Inventory in trait form. Controls ( $n = 11$ ) were non-meditators interested in meditation; beginners ( $n = 14$ ) meditated 1 month or less; short-term meditators ( $n = 18$ ) practiced 1-24 months; and long-term meditators ( $n = 15$ ) practiced more than two years.]

<sup>2</sup> All  $p$  values are based on two-tailed tests.

<sup>3</sup> One control subject failed to complete the STAI.

influencing the data, one would expect differences between controls and subjects who actually began the practice of meditation. However, it should be noted that the contributions of differential drop-out rates among the groups employed could not be assessed with the present design and could conceivably have contributed to the pattern of results obtained. Future studies on this topic might fruitfully employ a longitudinal design where these variables may be unambiguously disentangled. Also, different forms of meditation might be compared so that the generality of these findings could be ascertained (e.g., Schwartz, Davidson, & Goleman, Note 1).

Finally, the pattern found to be associated with the practice of meditation in the present data—decrements in trait anxiety and increments in the capacity to attend—is consistent with a large body of physiological data (e.g., Banquet, 1973; Davidson & Schwartz, in press; Goleman & Schwartz, in press; Hirai, 1974; Orme-Johnson, 1973) indicating that these practices of meditation are associated with decrements in autonomic arousal and increments in cortical responsivity.

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## "Associative Homogeneity Correlations But

Chapman and Chapman categories cannot explain symptoms and test scores influence the persistence of issues of causality rather

Rosen (1975) found that the Rorschach percepts used by Chapman (1969) in their demonstration correlations varied in "associative homogeneity" (Chapman & Chapman, 1975).<sup>2</sup> In his findings, Rosen speculated that control over associative connections of individual percepts could affect the illusory correlations.

The Chapmans (1975) point to specific implications of Rosen's associative homogeneity within categories to explain why particular symptom-sign correlations are perceived when percepts occur with varied symptom types. The associative homogeneity among percepts would not explain why this relationship was perceived as correlated with rather than an alternative symptomatic connections between signs (and not associative homogeneity) is the factor that accounts for the illusory correlations.

The Chapmans (1975) note that associative homogeneity within categories can explain the occurrence of illusory correlations; this factor might accentuate the observed symptom-sign relationships in accord with Rosen's (1975) associative homogeneity may influence the persistence of illusory correlations. perception of an illusory correlation of anal percepts and homosexuality

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