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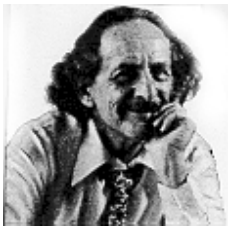

Current Comments®

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Meditation, Learning, and Creativity. Part 2. Can Meditation Increase Learning Power and Creativity?

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In the first part of this essay, I considered various forms of meditation and the ways in which they seem to affect human physiology.[1] This second part will deal with meditation and its effects on learning and creativity.

As noted earlier, proponents claim that the daily practice of meditation provides many benefits, including relief from the harmful consequences of stress and anxiety. Scientists do not agree as to whether these benefits are unique to meditation, or whether other relaxation strategies produce similar results. There is also disagreement over the claim by certain meditation enthusiasts that meditation renders the mind more receptive to learning.

Studies on meditation and learning have produced differing results. William Linden, New York University, performed an experiment in which third-graders from a disadvantaged urban area were taught Transcendental Meditation, or TM. Linden hoped to gauge the effects of TM on reading achievement and also on "field independence," that is, the ability to perceive and think in an articulated fashion. He noted that the students who learned TM performed better than controls on a test measuring the ability to discern a given shape from a distracting background. The meditating students also displayed less test anxiety than did the controls, according to the Test Anxiety Scale for Children (TASC). While no effect on reading achievement was evident, Linden pointed out that meditation did seem to increase field independence and self-mastery.[2]

Another study, by Richard J. Davidson and colleagues, Harvard, tested attention and anxiety in four groups of undergraduates: nonmeditating controls, beginning meditators, short-term meditators, and long-term meditators. The authors noted that there was a definite correlation between experience at meditation and increases in the ability to focus and maintain attention. Decreased levels of anxiety were also more discernible among the experienced meditators.[3]

Other studies on test anxiety have demonstrated no distinct advantage from meditation. Daniel Kindlon, Harvard Medical School, compared a group of students who practiced meditation with control subjects who rested and took naps instead of meditating. After 11 weeks, Kindlon determined that meditation was no more effective than a daily nap in reducing test anxiety. He noted that meditation practiced over a relatively short period of time may not be the psychological panacea that many had hoped it would be.[4]

Michael C. Dillbeck and colleagues, Maharishi International University, Fairfield, Iowa, review the advantages of TM in learning. They discuss the Science of Creative Intelligence, which is the theoretical basis of the TM program. The Science of Creative Intelligence, the authors note, "cultivates the qualities fundamental to learning by directly developing that which is their common basis: consciousness." TM, according to this theory, integrates the activity of the mind, improving the cognitive and emotional characteristics that are essential to

the process of learning. The authors also claim that TM reduces anxiety, and, further, that anxiety is a major impediment to learning.[5]

Arthur Aron, then of Maharishi International University, and colleagues attempted to measure meditation's effects on academic performance. They studied the first graduating class at the university, where TM is an integral part of the curriculum. After testing 15 students at the start of their freshman year (1973) and again after their senior year (1977), the authors noted increases on measures of general intelligence and also positive personality changes, such as increased self-confidence. The authors conceded that their study was flawed by the small sample size and the lack of a control group.[6]

In the opinion of some critics, such flaws are common in studies that present favorable results on the effects of meditation, particularly TM. Kindlon, for one, refers to meditation research as "an area fraught with special interest." In a telephone interview, he expressed the view that, in some studies, researchers commit serious methodological errors, such as failing to assign subjects randomly to treatment or control groups or failing to provide for any kind of methodological control. Another major flaw, according to David S. Holmes, University of Kansas, Lawrence, involves statistical analysis of data. When researchers study such measures as somatic arousal they often fail to take into account the initial differences between meditating and nonmeditating subjects. These initial differences, according to Holmes, can significantly affect subsequent scores and make results unreliable.[7] David C. Zuroff and J. Conrad Schwarz, University of Connecticut, Storrs, point out three "pervasive" flaws in TM studies: failure to obtain initially equivalent treatment and control groups through random assignment of subjects, an excessive reliance on self-report measures, and the failure to use placebo treatments to control for nonspecific treatment effects.[8]

In another study on meditation and learning, Carmen J. Carsello and James W. Creaser, University of Illinois at Chicago Circle, studied 70 students who had undergone TM training but who were not necessarily practicing TM. A control group received no training. Comparing grade point averages for periods before and after meditation instruction, the authors found no significant effects on grades for the meditators. The authors pointed out that their sample may have been slightly different from those in other studies, in which subjects tend to have a positive attitude about meditation. Indeed, Carsello and Creaser noted that many of the students in their study were not particularly enthusiastic about TM. Thus, any placebo or group-expectation effects may have been negated. These authors expressed doubt that TM is a surefire means to higher grades, although they did not dispute the claim that it may help some students.[9]

Martin S. Fiebert and Travis M. Mead, California State University, Long Beach, studied two randomly selected groups of students. One group was taught a form of meditation known as Actualism, consisting of a set of techniques for increasing awareness and controlling and directing energy throughout the mind and body. This group was instructed to practice Actualism before exams. A control group also learned this form of meditation, but its members were asked to practice at other times. Both groups kept careful track of the amount of time spent on studying. Performances on academic tests were measured twice: in a baseline phase prior to meditation training and in an experimental phase after training was completed. The researchers found no difference between the two groups on performance in the baseline period. In the experimental phase, however, they noted that the group that meditated before tests performed better than did the control group. Study time did not account for this difference. The authors concluded that the practice of meditation prior to exams had a positive effect on performance.[10]

During the 1970s, some school systems in the US included TM in their curricula. Francis Driscoll, for example, superintendent of schools in Eastchester, New York, succeeded in having TM instruction made available to all students and faculty members in his school district in 1971. He noted that the program was a great success in improving scholastic performance and social interaction and also in decreasing drug use.[11]

Studies on meditation and drug abuse, however, have produced mixed results. Herbert Benson and Robert K. Wallace, Harvard, whose work on meditation and physiology was discussed in the first part of this essay, also examined TM's effect on drug use. Using a self-report questionnaire, they surveyed more than 1,800 people who had undergone TM training. The subjects ranged in age from 14 to 78 years old, although half were between the ages of 19 and 23. Results suggested that meditation was highly effective in decreasing drug and alcohol abuse.[12] But such results have not been entirely consistent. Zuroff and Schwarz randomly assigned 60 undergraduates to three groups. One group learned TM, while another received instruction in a muscle relaxation technique. The third group received no treatment. The authors determined that while TM seemed to decrease self-reported anxiety, it had no effect on frequency of drug or alcohol use. They concluded that TM had been "oversold" as a psychological cure-all.[8]

The disagreement over TM in schools has spilled into judicial circles as well. David Schimmel, an attorney and professor of education, University of Massachusetts, Amherst, writes of two cases from the mid-1970s involving meditation and the volatile issue of prayer in public schools. In one case, a federal judge upheld a Massachusetts law that allowed for a minute of silence "for meditation or prayer." The judge ruled that the purpose of the law was not strictly religious and that the law did not *require* students to pray or meditate and did not constitute a state endorsement of religion.[13] In another federal case, a New Jersey court ruled that TM instruction in public schools *did* violate the constitutionally mandated separation of church and state. The controversy centered on the *puja*, the brief, traditional ceremony marking the beginning of TM instruction. The ceremony involves the burning of candles and incense and chanting in Sanskrit by the instructors. The puja, according to instructors, serves merely to preserve tradition and is not intended to have religious significance. However, because the chant includes the words "...to the glory of the Lord I bow down again and again..." the judge ruled that the TM program was unconstitutionally religious in character and enjoined the schools from teaching it.[13]

A meditation-like practice that has also found its way into some schools is known as "suggestopedy." Devised by Georgi Lozanov, a Bulgarian physician, suggestopedy is a distillation of psychological and physiological theories designed to increase mental powers.[14] The technique has also been used as an aid in learning, as authors Sheila Ostrander and colleagues point out in *Superlearning*, a popular discussion of Lozanov's theories and methods. To render the mind more receptive to the memorization of new material, suggestopedy depends on rhythm, relaxation, and repetition. In a typical suggestopedic session, music—preferably baroque music at about 60 beats per minute—is played while the subjects attempt to relax as completely as possible. This relaxation involves yoga-like breathing and inner concentration. When the students are relaxed, the instructor speaks the material in time to the music. For variety, the instructor changes voice volume, alternating between hushed, normal, and loud tones. The Lozanov technique, while not suited for all types of educational applications, is said to be ideal for material that requires a great deal of learning by rote, such as language study.[15]

One of the areas from which Lozanov drew his theories is "hypnopedia," better

known as sleep-learning. As Frederick Rubin, Sleep-Learning Association, London, points out in his book *Learning and Sleep*, sleep-learning has been the subject of controversy and misconception throughout its history.[16] (p. 6) Denounced by some as a form of brainwashing, sleep-learning calls to mind an image of a bedside tape recorder from which a voice intones all night, with the sleeper waking the next day able to converse in a foreign language or step into the role of Shakespeare's Hamlet. As Rubin indicates, such a scenario is far from reality. Actually, "learning" can only take place during brief phases of light sleep, when the dominant EEG activity consists of alpha waves.[16] (p. 25)

Rubin reviews several hypnopedic studies, many of which took place in the Soviet Union. In these experiments, sleep-learning was usually combined with conventional daytime instruction. One Russian study determined that technical students who underwent hypnopedic instruction learned Morse code nearly twice as fast as a control group. In addition to hearing a brief tape immediately before retiring, the students, when asleep, were exposed to a recording in which an instructor named a series of Morse symbols as the corresponding sounds were played.[16] (p. 103) In his book, Rubin also reviews studies on hypnopedia in language study. In general, sleep-learning seems to be a useful adjunct to conventional instruction, although it is hardly a miracle method for effortless learning.

Meditation and Creativity

Some researchers claim that, in addition to reducing stress and improving psychological well-being, meditation increases creativity. For example, Elaine N. Aron and Arthur Aron, Institute for Advanced Research in Social Development, Consciousness, and the Science of Creative Intelligence, Atlanta, Georgia, discuss this aspect of TM.[17] They claim that "transcendental consciousness," the state of pure awareness sought by all TM meditators, eventually becomes integrated with the meditator's other waking activities. As a result, "...thinking and behavior are experienced against a background of pure awareness and exhibit optimal levels of creativity and intelligence."[17] According to this theory, once the obstacles to awareness are removed by meditation, the unconscious and its creative powers will emerge.

John C. Gowan, California State University, Northridge, an experienced practitioner of TM, illustrates this theory from his own experience. He claims that often, after a morning meditation session, creative ideas come into focus. He offers the rationale that meditation produces a quasi-hypnagogic state, related to the drowsiness preceding sleep, in which there is increased psychological openness to the preconscious elements in the psyche.[18]

Frederick Travis, Cornell University, Ithaca, New York, performed an experiment to measure the effects of five month's meditation practice on creativity. One group of undergraduates learned TM, while a control group did not. Both groups underwent testing for various forms of creativity with words and abstract figures. Travis found no difference in scores on the tests given prior to meditation practice. After the experimental group had been meditating for five months, however, Travis noted that they performed better than the control group on tests measuring figural flexibility and originality. There were no significant differences between the groups, however, on tests measuring verbal creativity. Travis concluded that his results reflected meditation's effect on the cerebral hemispheres: suppressing the left brain's speech functions and rendering the right brain's spatial capabilities more accessible for problem-solving.[19]

In *Realms of the Unconscious: The Enchanted Frontier*, V.V. Nalimov, Moscow State University, writes that creative scientific activity, even in its everyday manifestation, has features of unconscious meditation.[20] (p. 130) He recounts the story of a researcher who could not

solve a problem. Unable to make any progress, he wandered into a library and looked at books that were not related to his field of study. Although the problem had slipped from his conscious mind, the researcher's unconscious mind continued to weigh the matter, seeking new approaches. Then, without quite knowing why, he was able to view the task from a fresh angle and attack it anew. The unconscious mind had provided the necessary insight to solve the problem.[20] (p. 131)

The history of chemistry also provides an example of this phenomenon. In 1858, the German chemist August Kekulé enunciated key principles that would lead to the structural theory of organic chemistry. In a speech some 30 years later, translated by O.T. Benfey, Kekulé recalled how certain ideas had occurred to him. Riding a bus across London one evening, Kekulé fell into a reverie. He saw atoms "gamboling" before his eyes. It was a familiar vision; he had been pondering the nature of chemical valence and the linking of atoms for many months. On this night, though, he was able to discern a definite order in the grouping and chaining of the atoms as they moved before him. The cry of the conductor "awoke" him from his dream, and he hurried home to spend part of the night sketching these "dream forms." This was the beginning of the structural theory.[21] Years later, dozing by his fire after a day's work in the laboratory, Kekulé had another dream. This time, the gamboling atoms took the shape of a snake biting its own tail. Thus, the well-known structure of the benzene ring was revealed to him.

"Let us learn to dream, gentlemen," says Kekulé in his speech, "then perhaps we shall find the truth." He offers this caution, though: "But let us beware of publishing our dreams till they have been tested by the waking understanding."[21]

It should be pointed out that there is a growing body of literature on the adverse effects of meditation. In one study, Leon S. Otis, Stanford Research Institute, Menlo Park, California, analyzed data from questionnaires given to two groups that had undergone TM training. One group consisted of subjects whose names had been obtained from the mailing list of the Students International Meditation Society (SIMS). The other group was composed of novice and experienced meditators who were in training to become TM instructors. Otis examined subjects who had reported increases in such negative symptoms as anxiety, restlessness, withdrawal, and depression after beginning TM. He determined that long-term meditators were more likely than novices to exhibit these symptoms. Otis speculated that the release of repressed material during meditation may account for the mental disturbances leading to these adverse effects.[22]

Deane H. Shapiro, California College of Medicine, University of California, Irvine, also discusses adverse effects. Meditation, according to Shapiro, often releases images and thoughts that may lead to feelings of dissociation and other unpleasant effects in individuals who previously had not been sensitive to the released material. For this reason, unsupervised meditation may not be appropriate for borderline personalities or for patients suffering from severe depression. Shapiro also points out a danger with solitary, withdrawn people, who might be inclined to use meditation as a means of deepening their isolation. In all cases, notes Shapiro, meditation should be carefully supervised and used with caution.[23]

Research Front Data on Meditation

A search of ISI®'s databases showed that in 1983 there were 53 articles published on meditation and 35 papers in 1984. Our files also show one 1983 research front related to meditation. Table 1 lists the seven core papers identifying front #83-2435, "Biofeedback and meditation in treatment of hypertension and anxiety." The most-cited core publication is *Bodily Changes in Pain, Hunger,*

Table 1: Core papers for the 1983 *SCI®/SSCI®* research front #83-2435, "Biofeedback and meditation in treatment of hypertension and anxiety."

Benson H, Beary J F & Carol M P. The relaxation response. *Psychiatry* 37:37-46, 1974.

Budzynski T H & Stoyva J M. An instrument for producing deep muscle relaxation by means of analog information feedback. *J. Appl. Behav. Anal.* 2:231-7, 1969.

Cannon W B. *Bodily changes in pain, hunger, fear and rage.* New York: D. Appleton, 1927. 311 p.

Miller N E. Learning of visceral and glandular responses. *Science* 163:434-45, 1969.

Shapiro A P, Schwartz G F, Ferguson D C F, Redmond D P & Weiss S M. Behavioral methods in the treatment of hypertension. *Ann. Intern. Med.* 86:626-36, 1977.

Wallace R K, Benson H & Wilson A F. A wakeful hypometabolic physiologic state. *Amer. J. Physiol.* 221:795-9, 1971.

Yates A J. *Biofeedback and the modification of behavior.* New York: Plenum Press, 1980. 512 p.

Fear and Rage, a 1927 book by Walter B. Cannon, Harvard.[24] This 50-year-old classic work was cited by 12 of the 55 papers published on this topic in 1983. According to our data from the 1955-1984 *Science Citation Index®* (*SCI®*) and the 1966-1984 *Social Sciences Citation Index®* (*SSCI®*), Cannon's book has been cited 568 times until now. I think this is an interesting commentary on the importance of classic literature in modern research.

The higher-level map in Figure 1 shows the co-citation links between research front #83-2435 and the other 11 research fronts in the area of "Feedback and motor control of muscle movements." The lengths of the lines are inversely proportional to the co-citation strengths. It is interesting to observe that the study of anxiety's effects on ability and performance is linked to #83-2435 through biofeedback studies involving skin temperature. The number of core and citing documents for each topic (front) is shown.

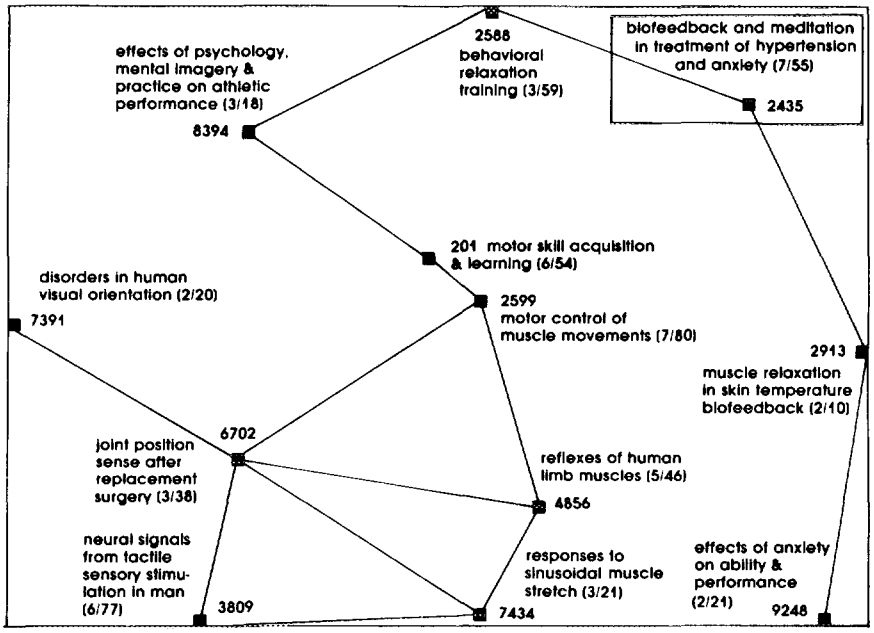
A comparable map for 1984 would show that research on meditation continued into 1984. The front was named "Physiological and psychological effects of Transcendental Meditation," #84-7661, and was identified by two core papers, the most cited of which was by Wallace and colleagues at Harvard, mentioned earlier.[25] This paper, an investigation of the physiologic effects of TM, was cited by 12 of the 15 papers discussing this subject in 1984. The *SCI* and *SSCI* show that this article has been cited over 120 times since its publication in 1971.

The other "core" document for research front #84-7661 is an article by Ron Jevning, University of California, Irvine, and colleagues. Cited by only six papers in 1984, it deals with adrenocortical activity during meditation.[26] It has been cited 17 times since 1978. This example illustrates that the system for identifying research topics is not limited to highly cited papers, but involves variable thresholds based on many characteristics.

As we've seen, research has not yet settled all the disagreement surrounding meditation states. Nalimov touches on the need for further research by posing an interesting question: To what extent might directed meditation increase the creative potential of a scientist? In other words, if scientists consciously and systematically strive to enter the dream-like state that Kekulé spoke of, what might the results be? Nalimov allows that the answer is not easy to give.[20] (p. 135) More research on meditation states and creativity is required before we might know the answer.

As you have seen, the amount of literature on meditation is formidable,[27] but little would qualify as authoritative. Defining creativity is itself a major challenge. Here the literature is probably larger but requires a separate discussion. It is only natural that creativity would have been discussed in *Current Contents®* (*CC®*) under many different guises before. One likes to think that the

Figure 1: Higher-level, multidimensional scaling map for cluster 119, "Feedback and motor control of muscle movements." Number of cited/citing documents for each front are given in parentheses.



awards of science[28] are most often associated with creativity. And in our *Citation Classics®* series authors often observe that serendipitous events (as well as meditation experiences) often play an important role. But somehow I get the feeling that too much preoccupation with these matters on the part of legislators and journalists makes them believe that progress in science and medicine can take place simply by taking a walk in the park or meditating in front of the fireplace. In between these contemplative experiences there is the need for perseverance and hard work. As they now say on Wall Street, in science we make progress the old-fashioned way: we earn it.

* * * * *

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