Employee support and enrichment by Transcendental Meditation

Corporate success depends on innovative ideas and job performance. Important skills needed are growth in creativity and a continuing ability for learning and teamwork, despite aging. Physical health and mental well-being should be actively supported. Stress, however, is in modern societies a major threat to all this, even without serious occurrences such as the Covid-19 pandemic.

Transcendental Meditation (TM) is a simple practice, twice a day 20 minutes, that significantly changes how we respond to stress and life's challenges. It also fosters further brain development towards creativity and intelligence. It is an easy technique to automatically transcend, which means allowing the mind to settle beyond the active thinking level.
A concise, straightforward book about TM is "Strength in Stillness" (1).

Many scientific and peer-reviewed publications on TM have been published in the last 50 years. They found that during the TM practice a physiologic state is present described as restfully alert (2-5). Importantly, with regular practice a wealth of long-term beneficial effects were noted. A relevant selection will be succinctly presented below.

Increased resilience to stress and its harmful sequelae.

A recent meta-analysis (5) underlines that meditation techniques are effective in treating Post-Traumatic Stress Disorder (PTSD), while TM is significantly more effective in this respect than Mindfulness or other types of meditation (figure 1). An effect-size of 1 is considered as large.

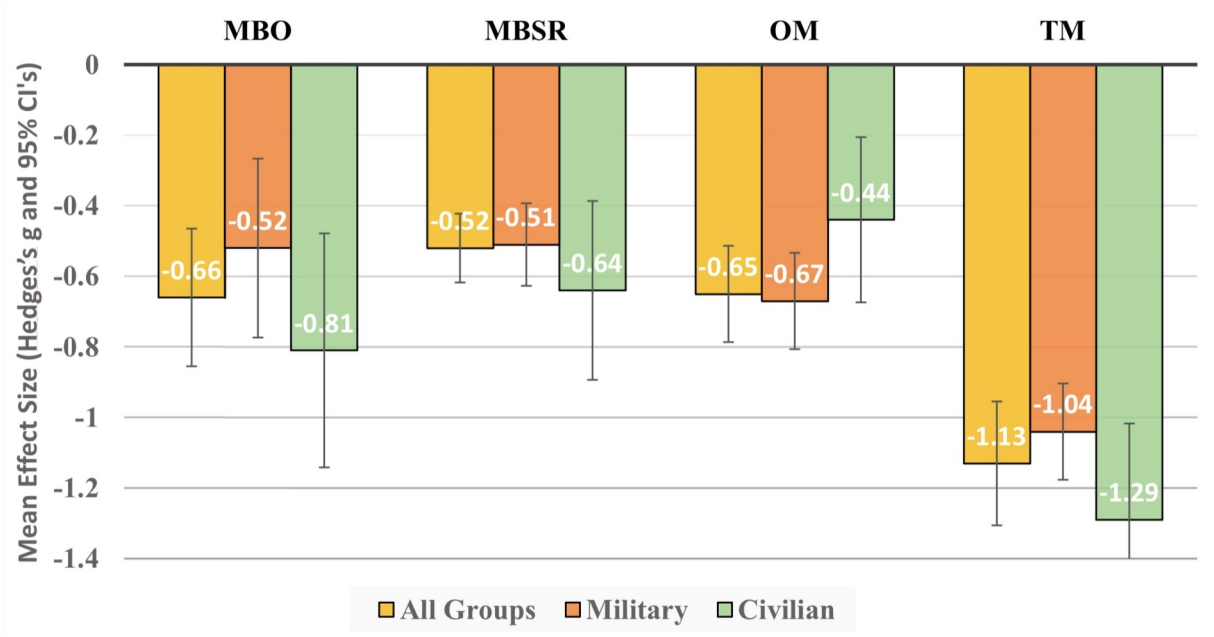


Figure 1. Effects on Post-Traumatic Stress Disorder (PTSD) of Mindfulness-Based (MB) meditation types (O = other, SR = stress reduction), Transcendental Meditation (TM) and Other Meditation techniques (OM). Mean effect sizes with 95%-Confidence Intervals (CI's).
Gold bars for all 61 studies (MBO, n=16; MBSR, n=13; OM, n=14; TM, n=18; in total 3440 subjects); Red and Green bars denote the military and civilian subgroups, respectively. Of those offered, 86 % were willing to try meditation. No serious side effects were reported (5).

TM: differences with other meditations

Meditation practices differ in underlying brain patterns. Indeed, electroencephalography (EEG) studies show that, among others, the brain wave-patterns produced are not the same (6, 7). TM is especially marked by frontal Alpha-1 (8-10 Hz) EEG-waves, indicating internalized attention, alertness and liveliness of the "screen of consciousness".

The other meditation-types of figure 1, show either high-frequency EEG-waves, called Gamma (30-50 Hz) and Beta-2 (20-30 Hz), indicating concentration of one's attention (e.g. on a specific thought or on the breath), or they show frontal midline Theta (4-8 Hz) and posterior Alpha-2 (10-12 Hz) waves, associated with open observation (i.e. without judgement) of the thoughts and feelings as they come and go.

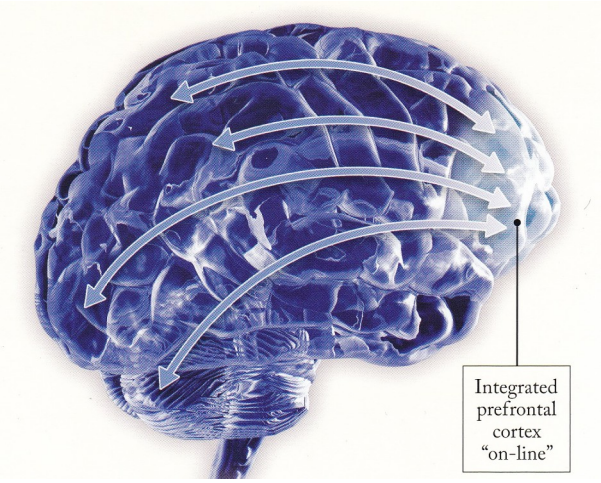


Figure 2. The prefrontal cortex is the latest evolutionary addition to the human brain. It connects to nearly all other brain parts, generating and guiding goal-directed behaviour, i.e. functioning as brain "CEO".

Coherence between frontal and other brain areas

An important characteristic of the brain-state cultured during TM-practice is coherence frontally, and increasingly also with other areas (8). Coherence is a measure of functional connectivity. With regular practice it also grows outside of meditation (figure 2).

Figure 3 shows an example in kids with Attention-Deficit/Hyperactivity Disorder (ADHD), meditating in school (daily 2x 10 minutes). In addition, letter fluency and theta/beta power-ratio (a marker of ADHD-symptoms) significantly improved, as well as parent reports on focussing abilities and happiness (9). An earlier study also found significant reductions in stress and anxiety (10).

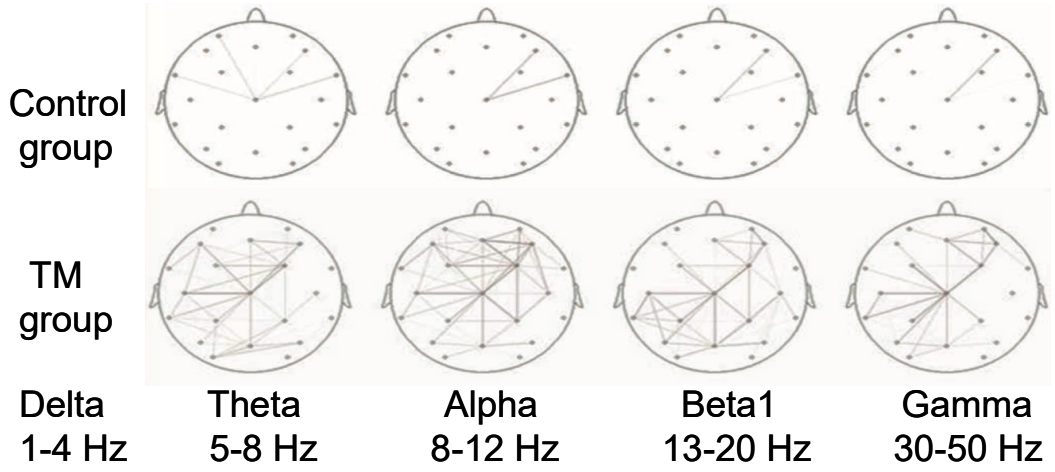


Figure 3. EEG-Coherence difference maps in ADHD school-students (age 11-14 years) during a demanding visual-motor task. Three months after learning TM, coherence between many pairs of electrodes (lines between dots) was higher than in pretest (threshold 0.2), but hardly so in controls. Coherence values (scale 0-1) averaged around 0.6 (9).

Brain Integration and Success

During TM-practice, when EEG-coherence is high, experiences occur of 'unboundedness' and 'awareness without sense of time, space and body' (11). With ongoing regular practice the brain acquires -also outside meditation- the capability to maintain a restful continuum of inner awareness, alongside the 'flurry' of daily activity. Three EEG-components significantly associated with this ability have been combined in a Brain Integration Scale (11, 12).

Cognitive brain function scored by this brain integration scale indeed relates to success in business, sport and arts (table 1; 13-15).

Table 1. Brain Integration scores in highly successful Norwegian top-level managers (n=20), world-class athletes (n=33) and professional classical musicians (n=25), and matched controls (n=20-33-25).

	Managers ~ 56,5 years	Athletes ~ 34,5 years	Musicians ~ 40 years
Top-level	2.48*	2.5*	2.48
Controls**	1.54	1.3	2.45

* $p < 0.01$; group- (& age-) averages presented (score Standard Deviations (SD's) ranged 0.68-1.33);
** managers: mostly low-level; athletes: < 50-percentile in national championships; musicians: next to their regular job playing in amateur symphony orchestras (13-15).

Interestingly, the amateur-musicians had scores similar to the top-level groups and higher than the other controls. An explanation might be that both musician-groups had played their instrument since childhood, i.e. practising classical music during a period of massive cortical reorganization and formation of brain connections.

In Swedish aircraft-engine development engineers, brain integration correlated with creative performance (16).

Practising TM quickly increases brain integration scores

In college students (Washington DC; age ~24 years), 2,5 months after TM-instruction:

TM-group 1.76 → 2.79 *Controls: 1.46 → 0.9*

The decrease in controls reflects study stress around the post-test time due to upcoming exams. Their study stress was reflected in the electrodermal habituation to an imperative stimulus. This habituation deteriorated in Controls, but had improved in the TM-group (12).

Note the relatively large effect of acute stress on integrated brain function; variance within groups (i.e., SD's) remained similar.

In school-district employees (San Francisco; age ~46 years), 4 months after TM-instruction:

TM-group 1.3 → 1.74 *Controls: 1.5 → 1.43*

Moreover, in the TM-group mood-disturbance, anxiety, anger, depression, confusion and fatigue significantly decreased, while vigor increased (17).

Innovation and Creativity

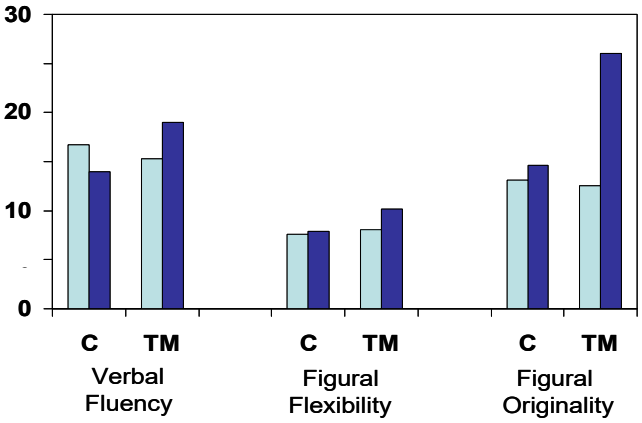


Figure 4. Mean scores on 3 items of Creativity. Undergraduates (Cornell University) were Controls (C) or learned TM; light- & dark-blue bars = pre- & post-test (5 months apart). Post-test p-values: 0.02, 0.006 and 0.0005 (2-tailed; left-to-right); for two striking SD changes due to TM: see text. Torrance-test; 3 other items had p > 0.15 (20).

Generation of novel ideas, as well as their implementation, requires creative thinking.

Innovation begins and ends with logical analytical thinking (preparation and verification stages), but in-between an undirected free flow of ideas is essential (incubation phase).

Transcending the boundaries of "in the box thinking" and letting the attention wander at the feeling level, and even deeper towards experiencing an awake still state of inner awareness, is highly conducive for the incubation phase (16).

Fruitful mind-wandering also requires activity in the brain Default Mode Network (DMN). Cognitive tasks and goal-oriented attentional control (concentration meditations) deactivate DMN (18).

By contrast, during TM-practice DMN-activity remains high (similar to eyes-closed rest; 18, 19). In addition, TM trains the inner skill to function from a deep level of restful alertness.

Hence, one expects TM to foster the incubation phase of creative thinking.

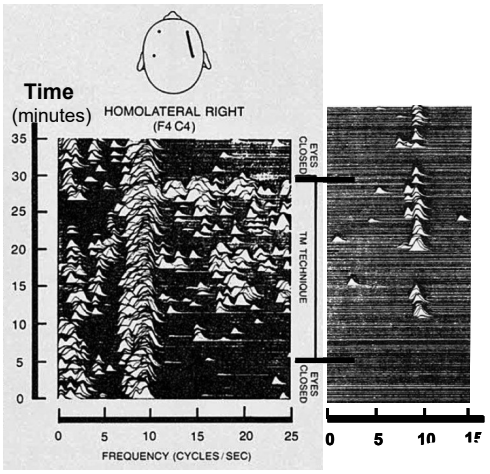
Figure 4 shows significant effects of TM on certain measures of creativity. A large effect was found for figural originality (20), while its variance (SD) doubled. Strong SD-increase likely indicates that some students grew (much) more than others in their ability to produce unique responses. Verbal fluency variance also increased.

A factor involved might be that people widely differ in their EEG-coherence distribution.

Figure 5 shows an example (right panel) of alpha-1 coherence in the right hemisphere starting during TM-meditation and continuing thereafter, as well as (left panel) very strong continuous alpha-1 coherence, and coherence in other frequency bands.

Verbal fluency of creative thinking correlates with alpha-coherence, mostly frontal bilateral (r = 0.65) and within the right hemisphere (r = 0.5). The left panel person (fig. 5) had a verbal fluency score 3.5 standard deviations over the mean for graduate students, and 4 SD's over the mean for verbal originality (21, 22).

Improved tonal functioning of the right hemisphere by TM has also been shown (23).



Figuur 5. EEG-Coherence Spectral Arrays of 2 male meditators (same age (~ 27 years; both F4C4). "White mountain peaks" = only coherence > 0.95 is displayed, as a function of frequency (x-axis) and time (eyes closed, TM-meditation, eyes closed; 21, 22).

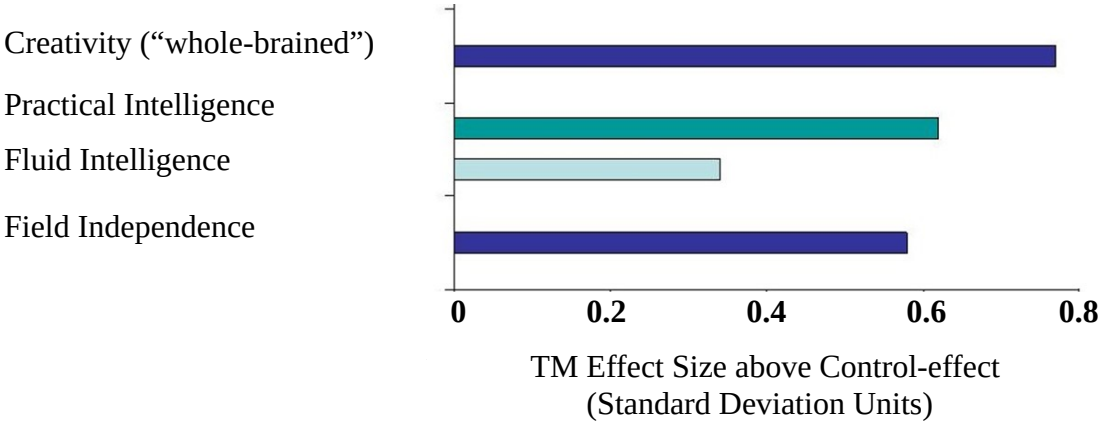


Figure 6. Improvement of cognitive capability by TM-practice (1/2–1 year) in Taiwanese high-school and vocational students (age 14-18 years; total 362). Control-groups in the 3 different schools: napping (1x) & no-treatment (2x); group-SD’s remained similar. The Tests (T) used were: Creative Thinking-Drawing production T, Constructive Thinking Inventory T, Culture Fair Intelligence T & Group Embedded Figures T (24).

TM also increases another measure of creativity, designated as “whole brained” (figure 6). This creativity test reflects comprehension, analysis, curiosity, unconventionality, synthesis and risk-avoidance (24).

Intelligence and Mental Stability

Figure 6 shows, in addition, improvement by TM in measures of intelligence (24).

Practical intelligence relates to success in work, love, social relationships and well-being. Fluid intelligence allows an individual to respond to novel situations, perceive complex relationships and learn. Field independence marks an improved ability to focus attention and refrain from becoming distracted by the environment of an item; it indicates a more stable internal frame of reference.

Concomitantly, inspection time shortened (TM effect size 0.39) and anxiety decreased (TM effect size 0.53). Shorter inspection time indicates an increase in mental speed.

In one Taiwanese high-school (fig. 6), an extra group practised contemplation on the TAO (i.e. the Absolute/Wholeness “on the move”). In contrast to TM, this contemplation only improved inspection time and field independence, but none of the other parameters, nor creativity (24).

Figure 7 presents the remarkable finding of a growth in fluid intelligence after adolescence, when it usually does not improve anymore (tested non-verbally; 25).

The regular meditators were more than 70% regular over the 16-month period. In those, also neuroticism and somatic neurotic instability dropped sharply ($p < 0.01$; Amsterdamse Biografische Vragenlijst; 25).

Increase in Fluid Intelligence test score over 16 months

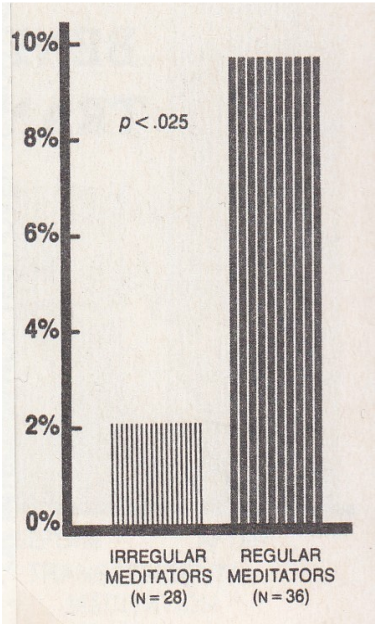


Figure 7. TM meditators with a mean age of about 31 years.

Burnout and coping strategies

Mental stress perceived as high, low resilience and an inability to cope is implicated in the development of burnout. Its key aspect is emotional exhaustion, typically present in those under constant pressure.

Coping mechanisms protective against burnout, as observed in 273 palliative care practitioners in Singapore, were: realistic expectations, passion for one's work, transcendental (meditation and quiet reflection), spirituality, clinical variety, having organisational activities and/or hobbies, and physical well-being (26).

TM proved to be effective against burnout and to enhance resilience in health-care workers (27-30), teachers (31,32) and medical students (33).

Figure 8 shows that TM rapidly intervenes with burnout symptoms. Already after 2 weeks signs of somatization, depression and anxiety (Distress) showed near 45% reductions (27).

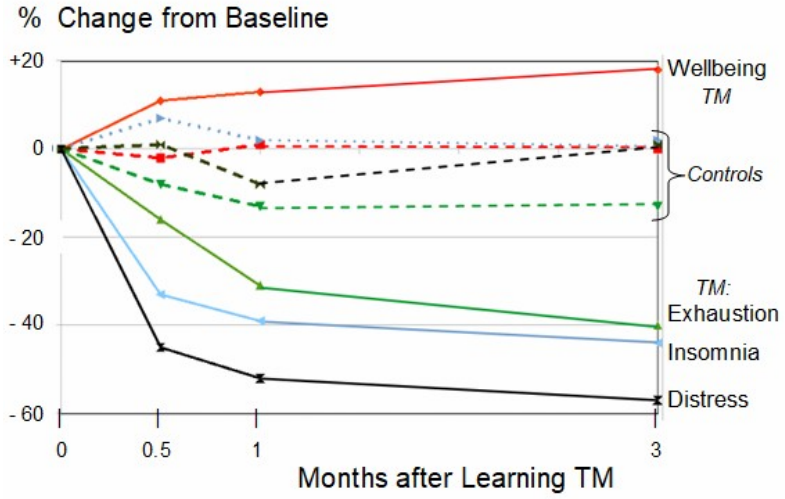


Figure 8. Impact of TM on frontline health care providers from 3 south-Florida hospitals during COVID-19. Lifestyle as usual Controls (n=65) were one-to-one matched to 65 TM subjects. Tests were: Warwick Edinburgh Mental Wellbeing Scale, Maslach Burnout Inventory (for medical professionals), Insomnia Severity Index, Brief Symptom Inventory 18. Significance (within group) present for all 4 TM-curves (and time points, $p < 0.001$), while in Controls only for Exhaustion (at 1 & 3-month, $p<0.002$ & <0.04; lowest dashed curve (27).

At 3-months Distress had reduced by 59% (Effect size over controls (ES) -0.46), Insomnia severity by 44% (ES -0.77), emotional Exhaustion by 40% (ES -0.60), while Wellbeing had increased by 18% (ES +0.71).

Clinical nurses working 12-hour shifts during Covid-19 also significantly improved in flourishing (28), feeling enriched in their authentic presence and caring for self and others (34).

Adherence to home meditation rose from 86 to 98% at 3 months, but it appeared difficult to find time on working-days (28). Hence, organizations are advised to provide professional support and space/time (box-1).

Box-1: *Organizational Mitigation Strategies.*

"… consider offering processes and subsidies to workers who choose to address their burnout with neurobehavioral tools" (29).

"… facilitate TM-practice within a work-shift period … and/or … plan group meditations immediately prior to or after a shift" (35).

Women, Violence and PTSD

In female workforce burnout is disproportionately high (29). On the other hand, their willingness to take action against it is greater.

Sadly, women can become traumatized, even in civilian situation, through crime, domestic violence and sexual assault. Nurses may encounter violence from patients and

visitors. Fortunately, the effect-size of TM on PTSD is similar in women and men, and does not depend on a person's baseline PTSD-level. Moreover, significant and clinically meaningful reductions in PTSD are present already after no more than 2 weeks of TM-practice (35).

Health and survival rates

Chronic psychosocial stress is now recognized as a significant threat to CardioVascular (CV) health. It nearly doubles the risk of major CV-events (i.e. myocardial infarction and stroke). In the 2025-guidelines (AHA/American College of Cardiology) to prevent and modify high blood pressure, stress reduction and TM are recommended under lifestyle modifications (36; figure 9).

TM reduces various risk factors for CV-disease, such as hypertension, obesity, diabetes, insulin-resistance, blood levels of cholesterol and lipids, smoking, alcohol and drug abuse, as well as anxiety (37-39).

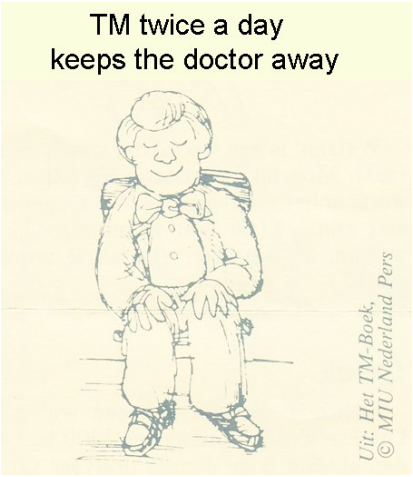


Figure 9. Evidence-based recipe.

TM may increase survival rate in older patients (40). In 182 hypertensive subjects (mean age 72 years ± 10.6 SD; 67% women) a survival curve (Kaplan-Meyer) showed a clear difference between TM and Controls during the first 8-10 years after randomization. From start the Control-curve decreased linearly till about 8 years. By contrast, the TM-curve remained almost horizontal till 3-3.5 years and thereafter decreased parallel to that of the controls.

Mortality decreased in the TM-group by 23% (relative risk 0.77, $p<0.04$), as compared to controls. Of those who died, percentages death due to CardioVascular disease & Cancer were: in the TM-groep 43 & 18 %, and in Controls 49 & 25 % (40).

Considerable reduction in medical care utilization by regular TM-practice is illustrated in figure 10 and table 2 (41).

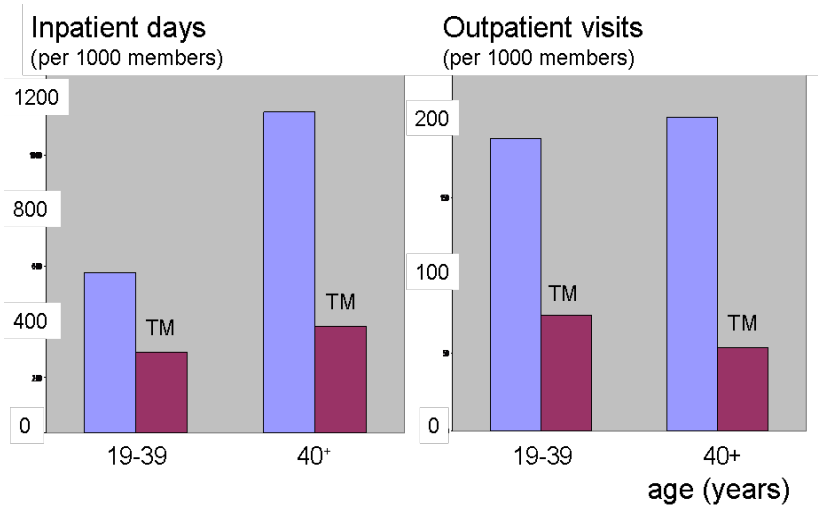


Table 2. Difference in Admission between TM & ICM* for often consulted diseases (41).

Intestinal	-49 %
Nose/Lung	-73 %
Heart	-87 %
Genital/Urinary	-37 %
Injuries	-63 %
Tumors	-55 %
Bone/Muscle	-68 %
Ill-defined	-76 %
All Mental	-31 %

*see legend figure 10.

Figure 10. Insurance-Carrier Members (ICM; 600,000) compared to 2000 insured TM-participants.

The beneficial health effects of TM are likely related to improved physiological homeostatic control, by the brain, autonomic nervous systems, hormonal and paracrine regulations and inflammatory reactions (37), all part of the wisdom and healing power of the body.

Indications exist for involvement of alterations in gene expressions, for example regarding energy-efficiency, immune function and aging and stress (42, 43).

TM trains the innate mental trait to transcend

Transcendental experiences do happen spontaneously in humans, as reports throughout the ages certify, irrespective of culture, religion or philosophy. They may also happen during mindfulness or focussed-attention based meditations. However, TM is specifically devised to purposely and systematically elicit automatic self-transcending (6, 7). This process allows the mind's eye to turn inwards and sink beyond (circumscribed) thought-contents. The deep innermost levels that open up can only be painted poëtically and symbolically (box-2).

Box-2: *Paintings of Transcendence*

"a widening of self-awareness"
"a silent, serene, pure stillness"
"a simple, alert unboundedness"
"a blissful, unified wholeness"

Transcendent experiences occur many times in each TM-session and differ physiologically from "other" experiences therein (44, 45). Transcending is marked, among others, by increased alpha amplitude and coherence, notably frontal alpha-1 coherence, and by refined breathing characterized by periodic slow and prolonged inhalation with -at its onset- changes in the autonomic nervous system.

Transcending improves brain responses to psychosocial stress

One of those autonomic nervous system changes that distinguish transcending is an increase in the heart rate variability caused by breathing (named Respiratory Sinus Arrhythmia, RSA). Resting-RSA is considered an index of emotion regulation and of physical and mental health (46-48).

Lower resting-RSA is frequently found in diseases as diabetes, obesity and hypertension, and in psychological distress, anxiety, depression and PTSD.

Higher resting-RSA is associated with greater flexibility and more active engagement in emotional responses to the social environment, and in better adaptation to and recovery from stress (see also the size and speed of TM-effect in figures 1 and 8, respectively).

Regular Transcending drives self-actualization

Table 3. TM effect on Maslow's self-actualization

Duration (months)	Effect size (SD units)
1.3 – 2.5	0.68
3.0 – 5.2	0.94
12 – 48	1.13
TM* average:	0.88
Other meditations**	0.22

(*18 and **16 studies; 49)

Experiences of "transcendent ecstacy" were recognized by Maslow as associated with a special form of cognition, which he called "cognition of Being". He conjectured that these spontaneous "peak experiences" are important for psychosocial health and self-actualization (49).

Table 3 shows the large effect of TM on self-actualization, and its growth with longer duration of practice (age: mainly college students; high-school to 30-32 years).

Most studies (78 %) used the Personal Orientation Inventory (POI). Factor-analysis on its 12 scales yielded three factors which accounted for 67 % of their variance,

named: 1) “Affective Maturity”, 2) “Integrative Perspective on Self and World” and 3) “Resilient Sense of Self” (49). In all three, only the original POI-scale of Inner-Directedness had in each new factor considerable loading (i.e. ≥ 0.48). This underlines the importance of transcending as a driver of development beyond the level of adult abstract thinking (50).

The third factor, “Resilient Sense of Self”, reflects Maslow’s insight that self-transcended people are autonomous. They are independent from their own culture and environment, but not alienated from it (“resistance to cultural encapsulation”).

Some final remarks

Figure 11: TM fosters good life-style choises

Learning TM takes, after an introductory lecture, a core course of 4 meetings (75 minutes each): a personal one-to-one instruction, and 3 verification sessions on the consecutive days.

Supportive/maintenance sessions are available in the weeks/months thereafter, often web-based (smartphone, Zoom); see also sections ‘intervention’ in (27, 30).

From then on one practises independently, for example at home. This can be on one’s own, with a partner or in a group. Practise is easy, and can be done also in a train or a car.

TM is not a focussed-attention-(mantra)-meditation. Its category is automatic self-transcending (6), and the suitable mantra received facilitates sinking inwards and transcending.

TM-sidhi is an extension of the TM-program. It can be learned in a separate course. It is practised directly following the 15-20 minutes employment of the TM-technique.

Transcending is the engine of the variety of beneficial effects possible. Which of these somebody will notice depends on the wisdom of one’s body and its healing power, although one’s own (free) choices may help (figure 11).

In addition to personal benefits, TM-practice also contributes to stress reduction and increase of harmony in collective life (51, 52).

As a PDF this manuscript is available on www (53).

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