

SWEDISH JOURNAL OF SPORTS RESEARCH

Volume 1. 2013

SVEBI
SWEDISH ASSOCIATION
FOR BEHAVIOURAL
AND SOCIAL
RESEARCH IN SPORTS



Author Presentation

Lars-Eric Uneståhl, Ph.D, Scandinavian International
University

50 years with Integrated Mental Training

Lars-Eric Uneståhl

Abstract: Integrated Mental Training (IMT) was developed during the 1960's, based on research findings from three areas: Alternative states of consciousness, Mind-Body relations and the possibility of obtaining sustainable changes in both Mind and Body through systematic training. The practical training programs were constructed for- and evaluated in- the Sport area, but spread during the years to most areas of Society. This article gives some examples of Mental Training contents and effects and finish with some recent investigations about "biological ageing" in relation to elite sport and in relation to Mental Training.

Keywords: Mental Training, Elite Sport, Self-Hypnosis, Mind-Body, Sport and Ageing.

Definitions

Integrated Mental Training (IMT): A systematic, long-term, developmental and evaluated training of mental skills, attitudes and processes aiming to Excellence (Peak Performance & Wellbeing).

Integrated Mental Preparation (IMP). Pre-trained Mental Skills and Procedures, which are released at certain pre-decided occasions. One example of this is the creation of a trigger (a conditioning procedure between a self-selected stimulus and a desired response), which will release the response automatically if the trigger is a part of an athlete's precompetitive preparation. The trigger can also be used voluntarily (if needed trigger).

Mental Strategies (MS). Mental strategies, techniques and procedures used purposely in a situation (competition etc.) to influence Body and Mind.

IMT and IMP are based on an Alternative Mind State (AMS), a Controlled and Positive Self-Hypnotic State mainly used for Recovery and Goal-directed Programming. To avoid common misconceptions about the term hypnosis I have chosen to make an operational definition of this self-hypnotic state, calling it the Inner Mental Room (IMR)

IMT consists of a future-oriented, goal-focussed, action-based and experiential training directed to everyone who wants to improve in Sport and Life. The training is based on research about Success factors (external and internal) and about methods for providing effective and sustainable developmental changes towards Excellence.

Short overview

Being an athlete starting Psychology with the goal of a Ph.D. it was natural to have an interest of finding out more about how the mind affected performance and how an alternative state of consciousness like "flow" could create a "relaxed effectiveness".

A third interest was to investigate the effect of systematic and long term training on Mental Processes important for Peak Performance but also for areas like Personality, Life competence (social, emotional etc.), Body systems like the Immune defence, etc.

A decade of research led not only to a Ph.D. but also to the creation of "Integrated Mental Training" (IMT) which now 50 years later has been used in

Sport, School, Work and Leadership, Health and Clinical areas and not least for Personal development.

The development of IMT programs and methods and the application of Mental Training in various areas of society has been combined with theories and models like the developmental model, the training model, the feedback model and the psycho-neuro cybernetic model (Schill, G. & Uneståhl, L-E., 2013).

IMT was introduced in Sports and in the School system during the 1970's, in work, Health and Clinical areas during the 80's and in Personal- and Leadership development during the 90's. During the 21st century there has been an integration of Mental Training with Coaching, Positive Psychology, CBT and Mindfulness. IMT, the Swedish model of Mental Training, had earlier been used in English speaking countries and Russia (Sovjet Union) but during the last 10 years it has been translated and used in many other countries like India, Kosovo and Irak. One example there is a project going on since 2010 together with the government in north Irak with the title: Mental Training for Peace - From Inner Peace to External Peace.

Background Research

One of the research areas in the 1960's which led to IMT was "Alternative states of consciousness" in combination with Ideal States (like IPS - Ideal Performance state). It has not been possible up to day to define consciousness in a way which experts and researchers have agreed upon. It has on the other hand been much easier to establish definitions and criteria for ASC.

ASC is usually expressed as "Altered States of Consciousness". However, a common question will be: "Altered from what?". Common answer: "From our *normal* state". Comment: "Thus, the altered state is an abnormal,

pathological state". I therefore decided to decipher ASC as "Alternative States of Consciousness" different from the "Dominant State of Consciousness" (DSC). Then sleep, dream, hypnosis, flow, etc. will be natural and normal alternatives to DSC. As ASC like Hypnosis also provides ASC 2 - "Alternative Systems of Control" and gives changes which are both quicker, stronger and more sustainable, it was natural to make Hypnosis (in the form of self-hypnosis) to an important part of IMT.

In order to investigate Hypnosis I started the Institute for clinical and experimental Hypnosis at Uppsala University 1965 leading to 32 research reports (Department of Psychology). The series of research reports continued in the 70's and 80's at Örebro College of Sport (GIH) and Örebro University and after 1990 through Scandinavian International University. Most of this research had to do with the Mental Training either to investigate background variables or to measure application effects. Here are some examples:

A. Hypnosis and Hypnotic phenomena - Investigations concerning:

1. The nature of hypnosis and Self-hypnosis (Uneståhl, 1968; Uneståhl, 1973a; Uneståhl, 1973b; Uneståhl, Appelgren, 1974; Uneståhl, 1975; Uneståhl, 1976; Uneståhl, 1982)
2. Spontaneous trance. (Uneståhl, 1969; Uneståhl, 1971 b; Uneståhl, 1973; Uneståhl, 1982.)
3. Posthypnotic suggestions. (Uneståhl, 1970; Uneståhl, 1971 a, Uneståhl, 1972)
4. Posthypnotic emotions as reinforcers. (Uneståhl, Berglund, & Gaunitz, 1971; Uneståhl, & Peterson, 1976; Uneståhl, Andersson, & Joelsson, 1978)

B. The Effects of Integrated Mental Training

1. In the Olympics. (Uneståhl & Buuts, 1977)
2. In Sport in general (Uneståhl, Johansson, & Nygård, 1971; Uneståhl, 1973a; Uneståhl, Hultin & Sundgren, 1975; Uneståhl, 1979 a, b.)
3. In special Sports like:
 - Swimming (Uneståhl, Andersson & Joelsson, 1978; Uneståhl, & Strandh, 1981)
 - Crosscountry skiing (Uneståhl, Apelqvist & Gustafsson, 1981)
 - Alpine skiing (Uneståhl, Aspelin & Hermansson, 1979)
 - Shooting (Uneståhl & Gustavsson, 1975; Uneståhl, 1977)
 - Figureskating (Uneståhl, Bodin & Poulsen, 1981)
 - Soccer (Uneståhl & Ingvarsson, 1981)
 - Bowling (Uneståhl & Breife, 1981)
 - Running (Uneståhl & Thor, 1981).

Some examples from the findings in the reports mentioned above will be summarized below:

1. PE-students "shooting" 30 mental basket free shots a day (in IMR) made a significant improvement (compared with a control group) and improved as much as those making 30 physical training shots a day.
2. An experimental group of 100 bowlers showed clear personal but small performance improvements compared with the hundred in the control group after 3 months of IMT-training, but after that the difference also in performance became continuous bigger during the investigation period of 3 years. A follow up 10 years later showed that one bowler in the experimental group had become the world number one, a position he held during 3 years.
3. Objective measures and subjective ratings from alpine ski races showed that the worst results were related to active thoughts of various technique details while the best results came after a. hypnotic race programming, b. handing

- over the race to the body and c. supporting the body with a "positive emotional rhythm production".
4. After reaching the finish line in the national downhill championships the skiers were asked to ski the race again, now mentally. The best skiers had more similar time in the physical and mental skiing.
 5. Physical training (swimming a.o.) became more effective by replacing the traditional negative and delayed feedback with a positive and immediate feedback by earphones using operant techniques, where the "right performance" was reinforced through signal released posthypnotic positive emotions.
 6. Posthypnotic induced variations of mental states and attitudes produced a performance variation, measured through isometric strength. The "normal" maximum strength in the subject could be increased with 18% when the subjects had the best attitude to themselves (self-image) and an optimal attitude to the task (goal-image)
 7. A jet-lag study with the Swedish National Swimming Team in connection with the preparation for the Sydney Olympics showed better effects on sleep and performance with IMT compared with Melatonin, Placebo and Control.

The Mental Training Mind State (Inner Mental Room)

The base of IMT-training is the "Inner Mental Room"(IMR), which is an operational definition of an altered or alternative state of consciousness (Self-Hypnosis).

Hypnosis, which is a state of focused attention, will enhance mental processes like thoughts, images, emotions, behaviours and performances. An athlete in flow show the same alterations as in hypnosis: Perceptual changes (slow motion, bigger targets, etc.), Concentration/dissociation, Effortless effectiveness and efficiency, Control by images and triggers, etc. (Uneståhl, 1982; Uneståhl, 1996)

As Mental Training is based on an hypnotic like ASC, called the Inner Mental Room, it was important to find the criteria of IMR. As most behavioral and physiological measurements reflects the contents of IMR and not the IMR in itself (Uneståhl, 1971; Uneståhl, 1982) we decided to look for neuro physiological criteria (most of this research was made in the Swedish-Russian IMT Research project 1991 - 2002 and with professor Pavel Bundzen from the Institute of Physical Culture in St Petersburg as the main leader of the project) The patterns of EEG neuro-mapping and the spectral analysis of EEG point to the fact that the mental training state ("Inner Mental Room") is characterized by the following neuro-dynamic correlates (Unestahl, & Bundzen, 1996; Bundzen, Leissner, Malinin, & Unestahl, 1996)

1. An intensification of theta-activity in ante central sections of the brain and smoothing of alpha-activity in the frontal-occipital direction.
2. A decrease of alpha activity in frequency 10-13 and an increase of frequency 7-9.
3. A disappearing of hemispheric asymmetry and a synchronisation of total hemispheric activity (The "holistic brain").
4. The subsequent analysis showed that the EEG frequency spectrum in the retrocentral sections of the cortex represents a set of subdominant and harmonic bound frequencies in the range of delta, theta, alpha 1 and 2 and beta-rhythms. Thus, the polimodal frequency harmonization of cortical bioelectrical activity whose basis may be considered as so-called "golden ratio" or "section divine" (1,618) has been shown to be one of the specific neuro-dynamic correlates of the "IMT-state".
5. The quantitative and the qualitative changes of brain activity during and after IMT-training (the "holistic" and the "harmonic" brain) seems to change the informational system in such a way that the body through decreased "reality testing" interpreters internal images as "real". The differences between a

”physical event” and the image of such an event seem to diminish or disappear in the ”Inner Mental Room”. This may be the main explanation for the significant impact which the IMT-training has on Sport and on various psychosomatic and body-related problems.

6. The neuro physiological differences between top-athletes and athletes on lower level was most clear during competitions. We measured for instance EEG (Omega potential) for two archery shooters during competition, one average and one world record holder. Ten seconds before the shots it was a similar picture for the two competitors with the left brain more active than the right one. At the time of the shots the average shooter had still the same difference while the world champion had integrated the left/right so that the activity was on the same level and inside the "optimal zone". When the world champion was asked: "How do you know when you are going to shoot"?, she answered: "I do not know but my body knows. The shots come by itself when my body is ready. I do not have to think". This "flow state" will also trigger an ideo motor release of the shot.
7. In an analysis of this flow and IMR state we happened to take the ratio between the various EEG frequencies and detected to our surprise that four of the ratios was very close to the golden number or section divine - 1.6, the symbol for harmony. (Figure 1)

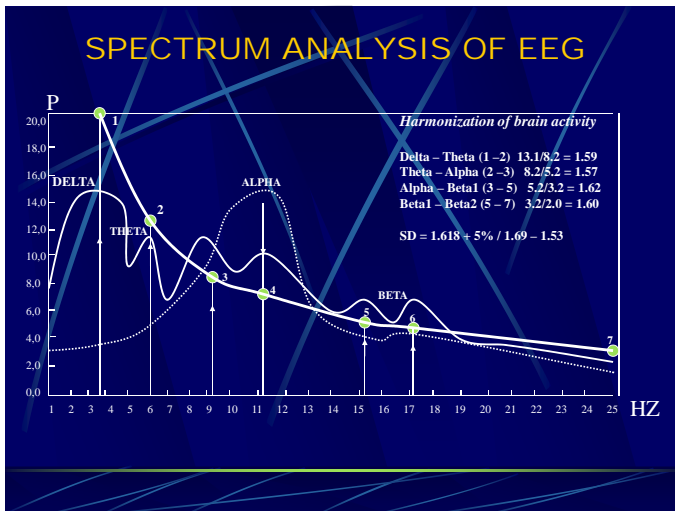


Figure 1: Spectrum analysis of EEG.

1.618.... has been the ratio for harmony, balance and beauty since the beginning of mankind (the Pyramids, Greek temples, Buildings, Art, Animals, Human body, Face, DNA, Solar systems and NASA:s measurements of the radiation indicates that the whole universe is based on this ratio). So besides the "leveling out" of EEG activity (Fig. 1b), making the brain work a unit ("holistic brain") we have added the "harmonic brain" concept for the ideal Mind-Body relation (Uneståhl, & Bundzen, 1996).

PEAK Performance Muscular State (PPS)

- Investigations of the effects of posthypnotic induced variations of Mental states on Performance, measured with maximum isometric strength showed a performance increase of 18% when the athletes had an optimal self-image and optimal goal-images. The biggest decrease of performance was during relaxation. (Uneståhl, Henriksson, & Högström, 1981) This is

understandable as relaxation means "absence of tension" and as muscular tension is demanded for all movements.

2. Based on Leif Janssons investigations of the optimal muscular state in the Swedish Olympic and National Teams in different Sports (Jansson, 1995) it was possible to show that the crucial thing differing national athletes from lower class athletes was the ability to relax the antagonist muscles. The same was true when we compared national elite (the violinists in the Swedish Radio Symphony orchestra) with lower level violinists. There was also a difference between National elite and world class musicians (Chicago Symphony orchestra) in the ability to relax the antagonist muscles. (Jansson 1995; Uneståhl, 1998) I therefore introduced the new English term *relaxense* for the ideal Performance state, and defined it as optimal tension in relevant muscles (synergists) and relaxation in irrelevant and antagonistic muscles. (Uneståhl, 2013)

Training: Learning *relaxense* starts with 5 weeks of systematic and progressive relaxation training in order to establish, learn and automate a complete relaxed state in every muscle. Step 2 is to create images of ideal movements, which will create an optimal tension and activation of the synergist muscles, while the antagonist muscles remain relaxed (Relaxense). Step 3: "Letting it happen". (Uneståhl, 1979; Uneståhl 1998)

Recovery

Mental Training is most known for enhancing change in areas of personal growth, sport performances, etc. However, an area which has received much attention the last years is "Recovery". Today there are many indicators that exhaustion and chronic fatigue are more related to lack of recovery than with hard work or training.

There are several parts of the mental training which increase recovery skills, starting with the basic mental training, which both provide the base for personal growth but also play an important role to learn effective rest and recovery skills. The first part of the basic mental training, the systematic and progressive muscular relaxation, has two main purposes. One is to decrease or remove the basic tension level, which leads to a 'relaxed effectiveness' model, which promotes health (improved rest and recovery) as well as high performance (relaxense). In learning relaxation the spontaneous relaxation effects of exhalation are used by developing triggers, at the same time as the thought is captured by the relaxation's physiological meaning for an emotional experience of unison and total muscular relaxation. The systematic trained connection between desired goals and relaxation results in a well-trained person in immediate and total systemic muscular relaxation, irrespective of the situation the person is in. In this manner, trigger-mediated relaxation according to the IMT-model, offers increased personal control over situations which during other conditions trigger stress related reactions. (Uneståhl, 1979, Uneståhl 1998, Unestahl, Bundzen, & Gavrilova, 2004)

Another application, important for recovery, is the use of triggers to mentally leave or dissociate from energy demanding situations. (Uneståhl 2000; Uneståhl 2001)

The third important application has to do with recovery during sleep. However, Recovery during sleep is related to the quality of sleep and not the quantity. Good sleep quality means a cyclic pattern, for grown-ups consisting of 40- 50% light sleep, i.e. stage 1-2, 25-35% deep sleep or delta sleep, stage 3-4 and 25% REM sleep. The different stages should succeed smoothly into one another without too many shifts or arousals caused by specific sleep disturbances such as for instance snoring, apneas, pain, worries or mental stress. During light sleep

we are very sensitive to such factors which might cause a deficiency of the important deep sleep leading to a lack of spontaneous recovery. This means that 4 hours of deep sleep gives significant more recovery than 8 or 12 hours of light sleep. The first 3-4 hours of sleep (deep sleep level with EEG delta waves - stage 3-4) results in a spontaneous recovery of important bodily functions (growth hormone etc.) (Wallskär & Åkerstedt, 2008). However, the deep sleep is one of the first functions to be disturbed by stress.

The tragic thing here is that when someone gets sick (burnout) due to stress and has to leave work, the recommendation is to stay home, resting and recovering. However, the ability for that has diminished or disappeared. The person can sleep 10-12 hours and wake up as tired as before sleep. When the deep sleep disappear the number of sleep hours doesn't matter.

As no medical drug can bring the deep sleep back there is a risk that the problems will remain for months or even years. Thus, mental training becomes very important to bring back the ability to rest and recover. Stress increases the basic tension, which seems to disturb the deep sleep. Our recommendation is to start the basic mental training immediately after the sick leave to prevent the problem to be chronic and long lasting.

We are just now making a 3 year study to investigate the recovery effect from a combination of Mental Training and a special massage chair, called the "recovery chair". The release of oxytocin is one of the measures (Skövde högskola & KK-foundation).

Ideomotor training

Mental images of movements creates subliminal activation of the muscles which are involved in the execution of the movement. The muscle reactions can be

measured with EMG and makes it possible to study the "muscle work" during "mental performances" (Uneståhl & Peterson, 1976). There are also practical applications of the ideo-motor relations.

One application concerns individuals with movement restrictions (Sport injuries, spinal cord injuries, etc.) who are instructed to make imagery exercises. Even small muscle activation can slow down muscle deterioration. Besides, mental exercises often create a mood elevation which may speed up the recovery. A pilot study - so far not published together with the head orthopedian at Örebro university hospital (Bo Althoff) showed positive postoperative effects after a number of orthopedic surgeries. An article from Luleå Tekniska högskola indicates improved muscular functions also in stroke patients (Askljung & Regnell, 2011)

Another application concerns the possibility of learning sport without physical training. A pilot and still not published study in Gothenburg with control group (10 Ss) and three experimental groups (with 10 Ss in each group).

1. Traditional Training with a golfpro. 1.5 hour/week for 3 months)
2. Learning by mental modeling in IMR 1.5 hour/week - 3 months
(In IMR the Ss experienced playing golf through special recordings of one top world golfer.) The Ss were instructed to avoid any analysis and just imagine that there were the ones playing on the screen.
3. Combination 1 and 2, half of each for 3 months.

The 40 Ss were tested at the same occasion and in the same way after 3 months. All of the 3 experimental groups showed significant improvement compared with the control with group 1 best followed by group 2 and 3. However, the differences between the 3 groups were small and not

significant. The best result of the 40 participants had a 40-year women belonging to exp. group 2.

Examples of Peak Performance results in Sport

IMT was introduced in Sweden 1969 and the training programs were developed and evaluated during the 1970`s. The first major test was the Olympics in Montreal where Sweden was the only country who had a mental trainer as a part of the team. Here is some figures from the next Olympics, 1980.

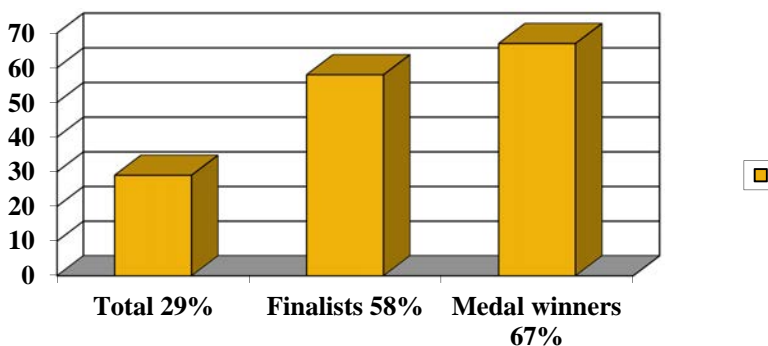


Figure 2. The Olympics 1980. Percent of athletes who had used systematic Mental Training

From 1980 the Mental Training was handed over to the athletes and trainers without the need of having a mental trainer present during training and competition. This made it possible to integrate physical and mental training, which on the other hand made it difficult to know how much of the results that had to do with the mental training. However, in many books (Unestahl, 1979a, 1981, 1985b, 1989) and in many newspaper articles a large number of olympic and world best athletes are claiming that the mental training was of significant importance for the results. Recently, both of the two main candidates for the 2013 feat gold (Svenska Dagbladets bragdguld) Johan Olsson (skiing) and Henrik Stensson (golf) described the Mental Training as a main factor behind

the results. Some athletes and trainers have also become interested to become mental trainers themselves (like Johny Modigh with countless Swedish championships in Shooting or Nanne Bergstrand, twice the soccer trainer of the year)

Integrated Mental Training and Psychosomatic Medicine

Much research and many articles and books has been written about the effect of IMT in Performances (Sport and Performing Arts). Less known is the psychoneuro-physiological and immunological effects of systematic mental training.

Here are some of our findings

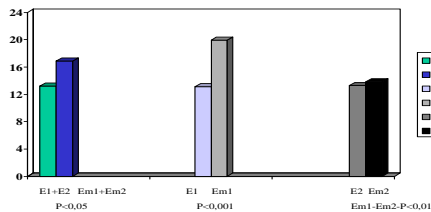
Among the changes that happen during and after IMT-training will be mentioned:

- A significant reduction of the level of cortisol and free fat acids in the blood plasma
- Decrease of sympathetic-adrenal system activity by a simultaneous and significant increase of the level of endogenic-opiatic neuro-peptides and age-dependent hormone-dehydroepiandrosterone.
- Immuno modulating effects expressed in the normalization of cellular and humoral activity
- Optimization of the interaction of ergo- and tropho-tropic subsystems of the cortico-visceral self-regulation. (Uneståhl, Bundzen, Gavrilova, & Isakov, 2004; Johansson & Uneståhl, 2006).

Three different studies have all showed an improvement of the immune system (measured with T4/T8 cells) after Mental Training. It was also shown that the Immune deficiency, often associated which with hard training and overtraining, could be prevented by Mental Training. It was also shown that mental training could not only prevent a decrease of the immune efficiency but also raise the

level above the normal level. This effect seemed to be related to one part of IMT – the Life Quality and Emotional Training with elevated moods, humor, joy, happiness. (Bundzen, Gavrilova, Isakov, & Unestahl, 1998; Johansson, & Unestahl, 2006).

Integrated Mental Training



Changes of beta-endorphin levels in 20 Russian (E1+E2) athletes after 6 weeks of IMT-training. However, no difference was found in E2, where the 10 athletes had Mental Strength training. The whole effect was in group E1. This group had "Emotional Training" or "Lifequality Training".

Figure 2: Integrated Mental Training.

It has been known for decades that both Stress and depression has an impact on the Immune system. Subjective reports of stress are generally not associated with immune changes while brief naturalistic stressors (exams, competitions etc.) tend to suppress cellular immunity and while chronic stress are associated with suppression of both cellular and humoral measures. (Segerstrom & Miller, 2004).

The findings that elevated moods and positive feelings could prevent the Immune deficiency syndrome and even raise immune efficiency above normal has been used in practical clinical work, for instance when Mental Training is used as a complement to medical treatment of cancer. As the common reaction to cancer is stress and low mood levels (depression), which decrease the activities of the "killer cells" it has been important to help the patients to focus

on things, which strengthen the immune system (joy, happiness) together with mental programs of a healthy future. (Unestahl, 1992; Unestahl, 1998; Unestahl 2000; Unestahl, 2001.

Integrated Mental Training for Psychosomatic Problems

Mental Training has been applied to most behavioral and Psychosomatic problems. Here are some examples:

Sleep problems: A Mental Sleeping telephone line was established at one hospital (Motala). People received a mental sleep induction program and after some months there was a significant decrease of the pharmacies sale of sleeping pills compared with another town (Kalmar) as control. However, so many people started to phone that connections started to be blocked, after which the same program became available through the pharmacies instead (Uneståhl, 2010)

Cancer: 300 cancer patients were matched into control and experimental group with the same medical treatment but with mental training added to the E-group. However, the ethical committee at the hospital demanded us to give the control group the same treatment. We therefore had to change the design and have the C-group wait 3 months for the mental training. We could see a trend of lower mortality in the E-group however not significant differences probably due to the short investigation time (Uneståhl, 2010)

A doctoral dissertation in Örebro using Mental Training programs (IMT-tapes) during general anaesthesia showed significant better postoperative improvement and recovery of hysterectomy patients. (Nilsson, Rawal, Uneståhl, Zetterberg, & Unosson, 2001). 70 patients with tinnitus from Sahlgrenska University hospital in Gothenburg did the regular Mental Training during 3 months. Very few of the

patients got rid of the disturbing sounds but many of them got rid of the problems by learning to move the sound away from the awareness. By placing the sound outside DMT (Dominant State of Consciousness) they learned to be unaware of the sound. However, if they were asked to bring the sound into the awareness area they could do that. (Uneståhl, 2010)

The same method has been used for patients with chronic pain. Studies made at the hospital in Helsingborg show that even if the chronic pain was still there ("somewhere") the patients had learned to dissociate and detach from the pain and refocus on more positive things in Life. (Olsson, 2002; Olsson, 2003)

A number of studies by those who are licensed Mental Trainers have been made in regard to areas like weight, smoking, asthma, phobias, delivery, etc but will not be mentioned here. In summary, however, it is possible to say that the use of Mental Training in clinical areas is very Cost-effective as the training is made by the patients themselves after a short instruction. Besides, so far we have not seen any negative side effects (Uneståhl, 2010)

Elite Sport and Biological Age

Based on common comments that elite players in soccer and ice-hockey often looked "older" than non-players of the same age, we examined the research literature but found that very few studies had been conducted in the area of elite sport and biological age. We therefore decided to conduct a pilot study comparing professional elite ice hockey players (EP) (22 males, M = 24.7 years) with a cohort of amateur players (AP) similar in age but from a lower competitive level (17 males, M = 25.4 years). Subjective ratings of motivational, attitude and emotional factors were combined with measurements of blood concentrations of DHEA-S, cortisol and the DHEA-S/cortisol ratio. DHEA-S and the DHEA-S/cortisol ratio were significantly higher ($p < 0.01$)

while cortisol was unaffected in the AP compared with the EP group. Interpretation of the differences in adrenal hormones level indicated a biological age difference of around 10 years, with the EP group being older. Also, significant differences in the subjective ratings were noted with a more positive self-image, goal-image, attitude and emotions noted in the AP-group. As we have earlier demonstrated a decrease in biological age with mental training of these factors, further studies have to determine how much the higher biological age among the EP-group is due to

1. Exercise factors, where too little and too much may be one reason. All subjects in the EP group were on daily scheduled individual and team-based extensive training program except on match days and remained unchanged during the study. The training program during non-match days, comprised of two daily sessions of two hours each. Long-distance and exhausting continental bus transfers provided the transportation of the professional team players away from home competitions. Two competition games were performed on regular weekly basis during the season.

The players in the AP group followed a low or moderate training and competition program. Scheduled training was performed twice weekly for two hours and a competition game only once a week. Due to the local character and short-distance of transportation at competitions, co-transportation of team players was done by car.

2. Experiential/personal factors. Subjective self-reported measurements were made with the Swedish “SMAK” test, measuring the dimension: Self-image (S), Goal-images and Motivation (M), Attitudes (A) and Emotions (K) and showed more positive levels in all variables among the team from a lower level.

3. A combination of these and other factors.

In addition: Both groups were lead by professional coaches. The study was done during the second part of the winter season. None of the participants were taking medication.

Further research: As this is the first study comparing biological ageing in Sport it will be interesting to compare different sports in this respect. It will also be interesting to make more studies about longevity among athletes on different performance levels, especially among team sports.

Mental Training and Ageing

The anti-ageing industry has exploded the last decade and the biggest part of that has been the pharmacological part. However, there are many indicators that mental factors also play a big role in the ageing process. Examples of such factors are Stress levels, Life motivation, Identity, Expectations, Goal-programming, etc. As all of these factors are parts of Mental Training it should be rather natural to investigate if and how much mental training could influence the speed of ageing.

We therefore decided to look at the aging process in a mental training group in comparison with a control group. We examined the influence in healthy subjects of self-hypnosis and mental training taught in group sessions, with individual training in between according to a standard protocol, and integrated in daily life and work for six months.

The measurements were alteration in plasma concentration of the stress hormone cortisol and the ‘anti ageing’ hormone dehydroepiandrosterone sulfate (DHEA-S). Previous studies have shown that stress and serious disease are associated

with increased ACTH secretion. Increased production of ACTH stimulates a shift from androgens towards glucocorticoidal secretion in the adrenal glands. This can mainly be seen as a pronounced increased level of cortisol and lower DHEA-S. Also, a decrease in the cortisol/DHEA ratio and low DHEA-S has been correlated with the suppression of cellular immunity and the severity of disease.

DHEA-S and cortisol were analysed in twelve healthy men and women, with six individuals randomly divided equally between experimental and control groups.

The contents of the training for the experimental group was as follows:

1. Muscular progressive relaxation and Tension regulation
2. Self-hypnosis (IMR)
3. Mental technique training (self-suggestions and imagery)
4. Self-image training (Self-esteem and Self-confidence);
5. Goal-image training (goal settings translated into images);
6. Motivation (goal programming, mission, meaning and energy);
7. Creativity (spontaneous problem solving and cybernetic solution processes);
8. Optimism and attitude training (positive interpretation of 'reality');
9. Mental toughness training (decrease of fear, increase of courage);
10. Emotional training (identification, selection and 'trigger' control of joy, happiness)

In the experimental group DHEA-S was significantly increased by 16% ($P < 0.05$), whereas plasma DHEA-S in controls followed an expected age-related decline. Cortisol was reduced by 12.3% ($P < 0.05$) in the experimental group, but remained unchanged in the control group. The ratio between plasma concentrations of DHEA-S and cortisol that reflects stress-related alteration in

the adrenal secretion between androgens and glucocorticoids, increased significantly by 27.8% ($P < 0.05$) in the experimental group with a reduction of 8,2% in controls. The increase in plasma DHEA-S under experimental conditions was equivalent to a range normally found in individuals 5 to 10 years younger. (Johansson, Uneståhl, 2006)

A reduction of 5-10 biological years in 6 months may seem too good to be true and as this was a pilot study it has to be repeated with a larger sample. However, as we have seen in previous studies that the stress hormone cortisol will decrease rather quickly with mental training and as stress and ageing are related we believe that mental training can be regarded as an anti ageing intervention in the future.

Future studies will show if Mental Training also has a longevity effect. Regardless if this will be the case, increased Life motivation, Life joy and Life quality should be enough reasons for everyone to start a Life long journey together with Mental Training.

References

- Askjung, M., & Regnell, A. (2011) *The effects of Mental Training for Stroke patients*. Research review from Inst. f. hälsovetenskap, Luleå Tekniska högskola.
- Bobbert, T., Mai, K., Brechtel, L., Schult, H.M., Weger, B., Pfeiffer, A.F., Spranger, J. & Diederich, S. (2012). Leptin and endocrine parameters in marathon runners. *Int J Sports Med*, 33, 244-248.
- Bundzen, P., Leissner, P., Malinin, A., & Unestahl, L. E. (1996). Mental relaxation: Neuro-dynamic markers and psychophysiological mechanisms. In: R. Rodano, & D. Hill (Eds.), *Current research in Sport Sciences: An*

- International Perspective* (pp. 91-101). New York and London: Plenum Press.
- Bundzen, P., Gavrilova, E., Isakov, V., & Unestahl, L.E. (1998). Stresslimiting and immunomodulating effect of mental training. *J Pathophysiol*, 5(1), 148.
- Ericsson, Anders K., Charness, N., Feltovich, P., & Hoffman, Robert R. (2006). *Cambridge handbook on expertise and expert performance*. Cambridge, UK: Cambridge University Press.
- Jansson, Leif. (1995) *Avspänd teknik* (Relaxed technique). SISU Idrottsböcker.
- Johansson, B., & Uneståhl, L-E. (2013). Elite Sport and Biological Age. Influence of Extensive or Regular Low to Moderate Exercise on Plasma DHEA-S and Cortisol in Ice-hockey Players. *Psychology* 2013. Vol.4., No 7, 613-618. Published Online July 2013 in SciRes (<http://www.scirp.org/journal/psych>) DOI:10.4236/psych.2013.47087
- Johansson, B., & Uneståhl, L.-E. (2006). Stress reducing regulative effects of integrated mental training with self-hypnosis on the secretion of dehydroepiandrosterone sulfate (DHEA-S) and cortisol in plasma. A pilot study. *Contemporary Hypnosis*, 23, DO 1, 10, 1002/ch.314
- Kujala, U.M., Tikkanen, H.O., Sarna, S., Pukkala, E., Kaprio, J., & Koskenvuo, M. (2001). Disease-specific mortality among elite athletes. *JAMA*, 285, 44-45.
- Nilsson U, Rawal N., Uneståhl L-E., Zetterberg R., & Unosson M., (2001) *Improved recovery after music and therapeutic suggestions during general anaesthesia. A double blind randomized controlled trial*. Doctoral dissertation, Örebro University, and Acta Anaesthesiologica Scandinavia, 2001 (45), 7, 812-817
- Olsson, H. (2002) Mental Training for Pain Patients. *Journal of Excellence*, No 6, 63-70
- Olsson, H. (2003) Mental Training and exhaustion syndrome *Hypnos*, 3, 161-168

- Paffenbarger, R.S. Jr., Hyde, R.T., Wing, A.L., & Hsieh, C.C. (1986). Physical activity, all-cause mortality, and longevity of college alumni. *N Engl J Med*, 314, 605-613.
- Ruiz, Jr., Moran, M., Arenas, J., & Lucia, A. (2010). Strenuous endurance exercise improves life expectancy: it's in our genes. *Br J Sports Med*, doi.1136/bjism.2010.075085.
- Segerstrom, S., & Miller, G.: (2004) Psychological Stress and the Human Immune System: A Meta analytic Study of 30 years of Inquiry. *Psychological Bulletin*, July 130(4), 601-630
- Schill, G., & Uneståhl, L-E. (2013) Coaching with Mental Training. B4 Press, Gothenburg.
- Uneståhl, L-E. (1968). *Hypnosis and hypnotic susceptibility*. Dept. of Psych., Uppsala Univ.
- Uneståhl, L-E. (1969). *The nature of posthypnotic trance*. Dept. of Psych., Uppsala Univ.
- Uneståhl, L-E. (1970). *Signal released posthypnotic suggestions*. Dept. of Psych., Uppsala Univ.
- Uneståhl, L-E. (1971a). *Generalization & discrimination of posthypnotic suggestions*. Dept. Psy, Uppsala Univ.
- Uneståhl, L-E. (1971b). *Investigations concerning spontaneous trance and posthypnotic suggestion*. Dept. of Psych., Uppsala Univ.
- Uneståhl, L-E., Johansson, A-M., & Nygård, A-M. (1971). *The relation between posthypnotic varied activation level and performance ability*. Dept. of Psych., Uppsala Univ.
- Uneståhl, L-E., Berglund, B., & Gaunitz, S. (1971). *A posthypnotic released emotion as a reinforcer of performance and behavior*. Dept. of Psych., Uppsala Univ.
- Uneståhl, L-E. (1972). *The duration of posthypnotic suggestions*. Dept. of Psych., Uppsala Univ.

- Uneståhl, L-E, Lindgren, U. & Lindström, M. (1972). *Imagery skills during various levels of relaxation and hypnosis*. Dept. of Psych., Uppsala Univ.
- Uneståhl, L-E, Granholm, G, Hilding, K. (1972). *Excretion of Catecholamins and posthypnotic modification of stress levels*. Dept. of Psych., Uppsala Univ.
- Uneståhl, L-E. (1973 a). *The Use of Hypnosis in Sport and Art*. Dept. of Psych., Uppsala Univ.
- Uneståhl, L-E. (1973b). *Hypnosis and spontaneous trance*. Dept. of Psych., Uppsala Univ.
- Uneståhl, L-E. (1973c). *Hypnosis and posthypnotic suggestions*. Doct. diss., Uppsala University.
- Uneståhl, L-E., & Appelgren, S. (1974). *Investigations of Self-Hypnosis*. Dept. of Psych., Uppsala Univ.
- Uneståhl, L-E., Hultin, K., & Sundgren, B.(1975) The effect of Images during hypnosis and relaxation on Sport performances. Report I, GIH, Örebro.
- Uneståhl, L-E., & Gustavsson, M. (1975). *Psychological factors in elite shooting*. Report II, GIH, Örebro,
- Uneståhl, L -E. (1975). *Hypnosis in the seventies*. VEJE International, Publ., Örebro
- Uneståhl, L-E., & Peterson, Y. (1976). *Motor learning & posthypnotic reinforcement*. Report VIII, GIH, Örebro.
- Uneståhl, L-E. (1977). *The effect of varied physical and mental tension in shooting*. Report IX, GIH, Örebro.
- Uneståhl, L-E., & Buuts, U. (1977). *The Summer Olympics, 1976*. Report X, GIH, Örebro.
- Uneståhl, L-E., Andersson, H., & Joelsson, B. (1978) *Immediate feedback and posthypnotic reinforcement. A methodological study in swimming*. Report XI, GIH, Örebro.

- Uneståhl, L-E., Aspelin, K., & Hermansson, M. (1979). *Inventory in alpine skiing*. Report XIX, GIH, Örebro. .
- Uneståhl, L-E. (1979a). *Self-Control by Mental Training*. VEJE International Publ., Örebro
- Uneståhl, L-E. (1979b). *Development and Evaluation of methods in Mental Training*. Report XX, GIH, Örebro.
- Uneståhl, L-E., & Breife, S. (1981). *Evaluation of Mental Training in bowling*. Report XXII, GIH, Örebro
- Uneståhl, L-E. (1981). *Motor Learning through Mental Training*. Report XXIV, GIH, Örebro.
- Uneståhl, L-E., & Thor, M. (1981). *Monotonous endurance work. a. Lidingöloppet*. Report XXV, GIH, Örebro.
- Uneståhl, L-E., & Apelqvist, L., & Gustafsson, A. (1981). *Monotonous endurance work. b. Västgötaloppet* (cross country skiing) Report XXVI, GIH, Örebro.
- Uneståhl, L-E., Henriksson, B., & Högström, J. (1981). *The Influence of Mental factors on isometric strength*. Report XXVII, GIH, Örebro.
- Uneståhl, L-E., & Ingvarsson, P-A. (1981). *Soccer. Analysis of the National league*. Report XXVIII, GIH, Örebro
- Uneståhl, L-E., & Strandh, P. (1981). *Swimming and Mental Training*. Report XXIX, GIH, Örebro.
- Uneståhl, L-E., Bexell, S., & Lanker, M. (1981). *Mental training and recovery skills*. Report XXX, GIH, Örebro
- Uneståhl, L-E., Bodin, M., & Poulsen, E. (1981). *Figure skating - model learning*. Report XXXI, GIH, Örebro
- Uneståhl, L-E. (1981). *The Mental Aspects of Gymnastics*. VEJE Publ., Örebro
- Uneståhl, L-E. (1982). *Hypnosis in Theory and Practice*. VEJE International Publ., Örebro

- Uneståhl, L-E. (Ed.) (1985a). *Contemporary Sport Psychology*. VEJE International Publ., Örebro
- Uneståhl, L-E. (Ed.) (1985b). *Sport Psychology in Theory and Practice*. VEJE International Publ., Örebro
- Uneståhl, L-E. (1989). *Motivation – The Core of Life*. VEJE International Publ., Örebro
- Uneståhl, L-E. (1990). *Laugh yourself to better Health*. VEJE International Publ., Örebro
- Uneståhl, L-E. (1992). *Yes, you can!*. VEJE International Publ., Örebro
- Uneståhl, L-E (1994). *Applied Motivation*. VEJE International Publ., Örebro.
- Unestahl, L. E., & Bundzen, P. (1996). Integrated Mental Training - Neuro-biochemical mechanisms and psycho-physical consequences. *J. Hypnosis*, 23(3), 148-156.
- Uneståhl, L-E. (1996). *Hypnosis and Self-hypnosis*. Veje International Publ., Örebro
- Uneståhl, L-E. (1998). *Integrated Mental Training*. SISU Publ., Stockholm.
- Uneståhl, L-E. (2000). *Mental Toughness Training*. SISU Publ., Stockholm.
- Uneståhl, L-E. (2001). *The New Lifestyle*. VEJE International Publ., Örebro
- Uneståhl, L-E. (2003). *Mental Aspects of Golf*. VEJE International Publ., Örebro
- Unestahl, L.-E., Bundzen, P., Gavrilova, E., & Isakov, V. (2004). The effects of Integrated Mental Training on Stress and Psychosomatic Health. *J. Hypnos*, XXXI (2), 83-88.
- Uneståhl, L-E. (2007). *Mental Training in Soccer*. VEJE International Publ., Örebro.
- Uneståhl, L-E. (2010). *Applications of Mental Training in clinical areas*. Report from Scandinavian International University, Örebro

