Contemporary Hypnosis
Contemp. Hypnosis 26(4): 225–233 (2009)
Published online in Wiley InterScience
(www.interscience.wiley.com) **DOI**: 10.1002/ch.389

PHOTO-ACOUSTIC STIMULATION: THEORETICAL BACKGROUND AND TEN YEARS OF CLINICAL EXPERIENCE

Tibor Károly Fábián,[1] Krisztina J. Kovács,[2] Laura Gótai,[1,2] Anita Beck,[1] Wolf-Rainer Krause[3] and Pál Fejérdy[1]

[1] Semmelweis University Budapest, Faculty of Dentistry, Clinic of Prosthetic Dentistry, Budapest, Hungary, [2] Hungarian Academy of Sciences, Institute of Experimental Medicine, Laboratory of Molecular Neuroendocrinology, Budapest, Hungary, [3] Harz-Klinikum Wernigerode-Blankenburg, Klinik für Psychiatrie und Psychotherapie mit Tagesklinik, Blankenburg, Germany

Abstract

Light and sound effects have frequently been used for the induction of altered states of consciousness. Turning on and off light or sound leads to short-term excitation of the central nervous system, while longer lasting stimulation has led to drowsiness and mixed alpha-theta activity and to bodily relaxation with increased skin resistance, decreased EMG activity and a decreased salivary cortisol level; though an increased salivary IgA level and output of the salivary chaperone Hsp70 have also been reported. At the same time a strong trance inducing ability of photic stimulation (10 min) has been demonstrated. In open clinical studies orofacial psychosomatic patients have been treated: *Atypical facial pain* (n = 20) recovered in 34.9 %, improvement occurred in 40.4 %, with no effect in 24.7 %. *Initial psychogenic denture intolerance* (n = 9) symptoms recovered in 44.4 %, improvement occurred in 33.3 %, with no effect in 22.2 %. *Chronic denture intolerance* (n = 14) symptoms recovered in 21.4 %, improvement occurred in 50.0 %, with no effect in 28.6 %. In *hyposalivation* cases (n = 4), a significant increase of salivary flow rate and protein concentration occurred in 2/4. However, randomized controlled trials that might support the application of photo-acoustic stimulation are still lacking. Copyright © 2009 British Society of Experimental & Clinical Hypnosis. Published by John Wiley & Sons, Ltd.

Key words: acoustic stimulation, group-therapy, hypnosis, photic stimulation, psychotherapy, trance state

Introduction

Light and sound (tune and rhythm) effects have frequently been used for the induction of altered states of consciousness since the earliest times (Heinze, 1993; Hoppál, 1993a, b). Similarly nowadays light and sound stimuli have been used for trance induction (Fábián, Vértes, Szabó and Varga, 2002). For such purposes there are numerous stimulatory instruments commercially available. In most systems, photic and acoustic stimuli (mixed frequency of 5–10 Hz) are administered *via* glasses with built-in light emitting diodes (LED) and headphones. Light stimuli are administered under eye-closed conditions, using LEDs emitting light strong enough to pass through the eyelids. Photo-

acoustic stimuli may be administered using 'ready-to-use' available stimulatory programmes; however, individually programmed stimulation may be carried out *via* computers. Photic and/or acoustic stimuli may also be used for several biofeedback trainings, since photic and/or acoustic signals can be coupled with a selected measurable biological parameter (Krause, 1983; Krause and Fábián, 2008). Headphones used for acoustic stimuli are also suitable for barely audible relaxing music with suggestions *via* a microphone in parallel with stimulation for both experimental and therapeutic purposes (Fábián, Krause, Krause and Fejérdy, 2005; Fábián, Gótai, Krause and Fejérdy, 2009).

Psychophysiology of photo-acoustic stimulation

Early studies demonstrated that turning the light or sound on and off induces alpha desynchronization in the EEG (Berger, 1930; Walter, Dovey and Shipton, 1946), leading to a powerful stimulating effect on the central nervous system for a short time. This phenomenon is called an 'on and off' effect, typified by a prompt decrease of alpha density (Kawabata, 1972). A specificity of sense modality for this effect can be reinforced; and a larger 'on' effect has been found in occipital areas for visual stimulation, and in central areas for auditory stimulation (Arannibar and Pfurtscheller, 1978). The magnitude of the 'on' effect was both roughly related to stimulus intensity, and consistent and reproducible with small inter- and intraindividual variability (Arannibar and Pfurtscheller, 1978). In case of light stimuli, increased 'on' effects were found using certain colours of the stimulating light, such as violet-blue (453–75 nm), green-yellow (551 nm) and orange-red (615 nm) (Ciganek and Ingvar, 1969). All the above data indicate a powerful phasic stimulating effect of photo-acoustic stimulation on the central nervous system as a *short* lasting stimulus.

In contrast, most likely because of habituation to stimuli, *longer* lasting (at least 5–10 min.) stimulation with flash light and tone signals (5–10 Hz frequency) leads to drowsiness and mixed alpha-theta activity (Williams and West, 1975; Jin, Na, Kim, Ham, Lee, Lee and Lee, 2003), and to bodily relaxation with increased skin resistance, decreased EMG activity and a decreased salivary cortisol level (Brauchli, 1993). Significant immunological changes have also been reported following long lasting photic stimulation, including an increase of salivary IgA level (Brauchli, 1993) and increased output of the salivary molecular chaperone Hsp70 (Fábián, Tóth, Fejérdy, Kaán, Csermely and Fejérdy, 2004/b), which is an immunoregulator and defence protein of the oral cavity and upper gastrointestinal tract (Fábián, Fejérdy, Nguyen, Sőti and Csermely, 2007; Fábián, Sőti, Nguyen, Csermely and Fejérdy, 2008). A strong trance inducing ability of long lasting (10 min.) photic stimulation has also been demonstrated concurrently with the above effects (Fábián et al., 2002). Interestingly, data also indicated that in auto-trance conditions (meditation) no habituation of the 'on' effects takes place (Wallace, 1970), and persons experienced in meditation have a higher arousal level during the stimuli (Williams and West, 1975). Summarizing the data above it can be concluded that while long run (10 min.) photo-acoustic stimulation helps to keep the body relaxed, it also strongly activates certain trance inductive psychophysiological functions, resulting in a putatively unique trance state, which may be characterized by a somewhat increased arousal level (especially in deeper trance states) (Fábián et al., 2005).

General considerations for therapy

For therapeutic considerations it should be emphasized that there are only few clinical studies available, and most of them are not available in English, are in abstract form, or

Copyright © 2009 British Society of Experimental & Clinical Hypnosis *Contemp. Hypnosis* 26: 225–233 (2009)
Published by John Wiley & Sons, Ltd DOI: 10.1002/ch

have not been published in scientific journals. Furthermore, randomized controlled clinical trials that might support the application of photo-acoustic stimulation, and may show advantages over other approaches or in combination with other therapies, are still lacking. Despite these shortcomings there are clinical experiences (described below) which may be considered and utilized for further clinical studies.

For therapeutic purposes suggestions, often individualized, of autogenic training, relaxing hypnosis or other more complex hypnotic methods have been used advantageously (Krause 1994, Krause, Müller, Nguyen, Fábián, Fejérdy and Krause, 2007). Since photo-acoustic stimulation advantageously leads to a restricted perception of the environment, enhanced hypnotizability and increased susceptibility to suggestions may be facilitated (Barabasz 1982; Barabasz and Barabasz, 1989). Similarly, the spontaneously occurring trance state induced by the photic and acoustic stimuli (Fábián et al., 2002) also significantly enhances the efficiency of suggestions. Because of the trance state and the use of a microphone and headphones, patients frequently perceive the hypnotist's voice as if 'coming from near above', or 'from behind the head'. All the above effects strongly increase the efficiency of the suggestions: patients frequently feel that the voice of the hypnotist 'goes deep inside' (Fábián et al., 2005). Therefore, metaphors, symbols, ego-strengthening, motivation, rewarding or reframing can be used highly efficiently utilizing the additional effects of suggestions (Fábián et al. 2005).

Besides the above, flash light stimuli interact with the visual imagination, leading to the spontaneous appearance of aspecific coloured simple forms (i.e. line, curve, web, lattice, spiral, cloud, tunnel, etc.), similar to those induced by several hallucinogens in the phase of non-complex images (Siegel and Jarvik, 1975; Siegel, 1977). Since such visual imaginations appear spontaneously, a delightful experience of an altered state of consciousness can be achieved, even in case of passive, non-collaborating patients. Then again, presumably because of the flash light stimulation, a significant antidepressive effect also frequently occurs (Fábián et al., 2005), perhaps akin to the well known antidepressive effect of light exposure (Benedetti, Colombo, Serretti, Lorenzi, Pontiggia, Barbini and Smeraldi, 2003; Benedetti, Barbini, Fulgosi, Colombo, Dallaspezia, Pontiggia and Smeraldi, 2005). The characteristics of photo-acoustic stimulation could be highly important for maintaining the motivation of sceptical patients and patients with low motivation for the therapy (Fábián et al., 2005, 2009).

Using lower light intensities, 'real' visual images also frequently appear (Fábián et al., 2005). These images may be utilized under a trance state similar to guided affective imagery methods (Leuner, 1955). However, images are usually more dynamic and 'luminous' compared to those occurring under imagery without using photo-acoustic stimulation. The occurring real visual images may also be utilized in a non-altered state following the stimulatory phase. Patients usually remember a series of fragments ('hypnotic dream' fragments) following the photo-acoustic stimulation treatment. This series of 'dream'-fragments points to the core of the patient's emotional problem in many cases; and may be analysed similarly to the dream-interpretation of psychoanalysis (Freud, 1900).

In many patients photic and acoustic effects can be utilized *via* aimed suggestions and imaginations that are in harmony with the stimuli. Light and sound effects may be coupled with suggestions towards deepening the trance state. Light stimuli are also fit for symbolizing an afterlife, being in harmony with the meaning of light as a symbol of God in many cultures. Such symbolic (metaphoric) use of light effects may be especially useful for religious (but also for non-religious) patients to reduce their death anxiety (fear of death) appearing in old age (Fábián and Fábián, 1998; Fábián et al., 2005).

Copyright © 2009 British Society of Experimental & Clinical Hypnosis
Contemp. Hypnosis 26: 225–233 (2009)
Published by John Wiley & Sons, Ltd
DOI: 10.1002/ch

Photo-acoustic stimulation may also be used efficiently for making painful or fearful medical and dental treatments easier for patients (Fábián and Fábián, 2000). Photo-acoustic stimulation is highly efficient for patients having high (but not phobic) fear of such treatments. Phobic patients may have difficulties accepting the restricted contact with the environment (i.e. wearing the headphones and LED glasses) and especially losing direct contact with the therapist (Fábián and Fábián, 2000). Therefore, phobic patients may first need to be familiarized with photo-acoustic stimulation.

Photo-acoustic stimulation may also be used as a group therapy in small groups (Fábián, Mierzwińska-Nastalska and Fejérdy, 2006). For such purposes, signal distributor equipment suitable for up to 5–6 participants is also available. In our preclinical study, professionals in several fields of psychosomatic medicine and psychotherapy evaluated this possibility based on their self-experience during five photo-acoustic stimulation group sessions. The majority of the 25 participants found the method promising in group therapy under preclinical conditions (56%: 'highly efficient'; 40%: 'efficient'; 4%: 'not efficient') (Fábián et al., 2006).

Photo-acoustic stimulation is likely to be suitable as an adjunct to several other psychotherapies carried out in non-altered states of consciousness (i.e. behaviour therapy, psychodynamic or cognitive therapy, etc). In such cases photo-acoustic stimulation may support and speed up the therapeutic process *via* the unspecific healing effects of trance states, and *via* suggestions towards ego-strengthening, motivation, rewarding or reframing, etc. (Fábián et al., 2005).

Clinical efficiency

Since there are no randomized controlled trials which may show advantages over other approaches or in combination with other therapies, it is not yet possible to make clear evidence based evaluation of the photo-acoustic stimulation technique. In our pilot clinical studies orofacial psychosomatic patients have been treated. Three patient groups with symptoms of atypical facial pain, psychogenic denture intolerance, and hyposalivation (dry mouth) were studied. Patients having psychotic and prepsychotic conditions as a background to their symptoms were excluded. Patients' psychopathology belonged either to the mixed anxiety and depression (F41.2) or somatization (F45.0, F45.1, F45.3, F45.4, F45.8, F45.9) groups of the BNO-10 system.

In the instances of *atypical facial pain* patients rated the strength of their symptoms from moderate to high. They were treated once a week, for at least 10 times but up to 30 times (in some unsuccessful cases up to 40 times) with photo-acoustic stimulation treatment (ca. 20–30 min.). In each session, a discussion of the patient's treatment-related experiences completed with psychodynamic interventions was also carried out (for ca. 20–30 min). The trance state was utilized primarily through imagination of an 'inside eternal fountainhead of healing energy and love' (Fábián and Fábián, 1998; Fábián et al., 2005), and also with other suggestions of ego-strengthening, reframing and rewarding (Bálint, Krause, Krause, Kaán, Fejérdy, Gáspár and Fábián, 2003). Of the 20 patients treated, recovery occurred in 7 cases (34.9%), significant improvement occurred in 8 cases (40.4%) whereas there was no effect in 5 cases (24.7%) (Bálint et al., 2003).

In the cases of *psychogenic denture intolerance* patients, the most frequent symptoms were (fixed- or partial) denture related pain and/or 'strange' complaints related to the occlusion of teeth. In one case, a running nose as a vegetative symptom also occurred (Fábián, Kaán, Fejérdy, Tóth and Fejérdy, 2004a; Fábián et al., 2006). In case of some patients (n = 9) photo-acoustic stimulation was used as an initial therapy for symptoms

Copyright © 2009 British Society of Experimental & Clinical Hypnosis
Published by John Wiley & Sons, Ltd DOI: 10.1002/ch

occurring suddenly following prosthodontic treatments (in these cases the evaluation was done just after completing this phase) (Fábián et al., 2006). In more difficult chronic ('hopeless') cases (n = 18) photo-acoustic stimulation was offered as a final, closing phase of psychosomatic therapy; 'as a last chance' following previous unsuccessful trials with other methods (Fábián et al., 2006). Roughly 22% of the latter group of complicated patients refused photo-acoustic stimulation therapy, leaving 14 cases (77.8%) (Fábián et al., 2006). Photo-acoustic sessions were carried out once a week for a maximum of 10 weeks for both groups of patients. Following photo-acoustic stimulation (ca. 20–30 min.) there was a client-centred discussion on the patient's treatment-related experience with behavioural and cognitive interventions (for ca. 20–30 min). The trance state utilized primarily the imagination of an 'inside eternal fountainhead of healing energy and love' (Fábián and Fábián, 1998; Fábián et al., 2005) and also other suggestions of ego-strengthening, reframing and rewarding (Fábián et al., 2004a, 2006). Of the 9 patients treated in the *initial phase of therapy*; recovery occurred in 4 cases (44.4%), with significant improvement in 3 cases (33.3%), whereas there was no effect in 2 cases (22.2%) (Fábián et al., 2006). Of 14 patients treated in the *last phase of therapy*, recovery occurred in 3 (21.4%), significant improvement occurred in 7 (50.0%) whereas there was no effect in 4 (28.6%) (Fábián et al., 2006).

In the case of hyposalivation (dry mouth) problems only 4 patients were treated, which is a case number too low for evaluation. These patients were treated once a week, for 30 sessions with photo-acoustic stimulation (ca. 20–30 min.). Otherwise the procedure was as above. Resting mixed salivary flow rate and total protein concentration was measured before and after each session. An improvement of salivary gland function of dry mouth patients including a significant increase of both salivary flow rate and protein concentration occurred in two patients (Kaán, Krause, Krause, Fejérdy, Gáspár, Bálint and Fábián, 2003); possibly because of an antidepressive and/or anxiolytic effect following treatment.

Contraindications

Besides the general contraindications of psychotherapy and hypnotherapy, photo-acoustic stimulation is contraindicated in the case of seizure disorder (epilepsy) because of the danger of visually induced seizure (Lindemuth, Mayr and Schimrigk, 2000). There are other contraindications in several eye disorders especially glaucoma, and a case report indicated the possibility of blepharospasm induced by photic stimulation as well (Kaji, Katayama-Hirota, Kohara, Kojima, Yang and Kimura, 1999). Although there is no data in the literature related to pregnancy, cardiac problems and pace-maker patients, these patients should be treated carefully (Fábián et al., 2005). The use of photo-acoustic stimulation may also be contraindicated with pre-psychotic and psychotic patients (Fábián et al., 2005).

Further perspectives

Although photo-acoustic stimulation seems to be a promising method for psychotherapy and psychosomatic medicine (Fábián et al., 2002, 2004/a, 2005, 2006; Kaán et al., 2003; Bálint et al., 2003), there are numerous aspects which should be studied in more detail in the future. For example, theoretical considerations indicate that the use of stimulatory frequency higher than 10 Hz may not increase efficiency of stimulation; because 'on'

Copyright © 2009 British Society of Experimental & Clinical Hypnosis
Contemp. Hypnosis 26: 225–233 (2009)
Published by John Wiley & Sons, Ltd
DOI: 10.1002/ch

and 'off' effects appear with a latency of 100–300 msec., which can be considered as a refractory phase. However, the latency decreases when the colour of the light is between 514–576 nm wavelengths (Ciganek and Ingvar, 1969). Interhemispheric coherence was shown to be increased using a higher (15 Hz) frequency in one study (Kikuchi, Wada, Koshino, Nanbu and Hashimoto, 2000), therefore the use of stimulatory frequencies higher than 10 Hz may have some clinical benefit, which can be studied in the future. Furthermore, in the case of low stimulation frequencies the decrease in alpha density is followed by an increase of alpha activity appearing with a latency of ca. 600–800 msec. after the 'on' effect (Nogawa, Katayama, Tabata, Ohshio and Kawahara, 1976). This alpha increase is regularly blocked by stimulations with frequencies higher than 1–2 Hz. Because of the alpha increase, frequencies below 1–2 Hz may have particular effects, which should be studied in the future, especially because low frequency acoustic impulses may induce a *sudden* shift from slower (alpha/theta) to faster (beta/gamma) frequencies in the temporal lobe (Nicholson, 2006). Although the sudden shift towards faster frequencies may be characteristic of certain deep meditative states (Coromaldi, Basar-Eroglu and Stadler, 2004), the use of low frequencies should be carefully studied for safety of clinical use. Then again, there are no data in the literature about the clinical advantages and/or disadvantages of hemisphere specific stimulation; although the administration of diverse stimulatory signals to the two hemispheres may cause unique effects. Similarly, the use of diverse stimulatory patterns of light stimulation (e.g. repeated block flashes or isointense 'chequered' stimulation, etc.) may also result in specific effects (Janz, Schmitt, Speck and Henning, 2000).

Besides studying the psychophysiological and clinical effects of the stimulatory patterns, other kinds of clinical trials would also be needed. First of all, there is a need for randomized controlled trials that might support the application of photo-acoustic stimulation, and may show advantages over other approaches, or in combination with other therapies. Further, studies about the use of photo-acoustic stimulation as a *group*-therapy would also be desirable (Fábián et al., 2006), as would clinical data about the use of biofeedback training combined with photo-acoustic stimulation. In this regard feedback of breathing with light and sound signals, called *respiratory feedback*, could be especially promising (Leuner 1984, 1997; Barolin 2001). Finally, randomized controlled trials and evaluation of the possibilities and efficiency of photo-acoustic stimulation treatment with not yet investigated patient groups (especially anxious and depressive patients) would also be highly important.

Conclusion

Evaluating the evidence base of photo-acoustic stimulation it can be concluded that short lasting photo-acoustic stimulation leads to a powerful stimulation of the central nervous system, whereas *longer* lasting stimulation leads to a unique trance state with mixed alpha-theta activity and bodily relaxation with increased skin resistance, increased immune surveillance (salivary IgA, Hsp70), decreased EMG activity and decreased salivary cortisol level. It is also clear that photo-acoustic stimulation can be used safely for both research and therapeutic purposes, although some contraindications should be respected. On the other hand, it should be also emphasized that available clinical data are preliminary only, and there are also many open questions related to theoretical background. Therefore, further well designed experimental and clinical studies are needed for clear evaluation of the possibilities of the photo-acoustic stimulation method.

Copyright © 2009 British Society of Experimental & Clinical Hypnosis *Contemp. Hypnosis* 26: 225–233 (2009)
Published by John Wiley & Sons, Ltd DOI: 10.1002/ch

References

Arannibar A, Pfurtscheller G (1978) On and off effects in the background EEG activity during one-second photic stimulation. Electroencephalography and Clinical Neurophysiology 44: 307–16.

Bálint M, Krause M, Krause WR, Kaán B, Fejérdy L, Gáspár J, Fábián TK (2003) Módosítások a fény-hang stimuláció pszichoterápiás alkalmazásában. Első tapasztalatok oro-faciális kórképek terápiájában. Fogorvosi Szemle 96: 171–4.

Barabasz AF (1982) Restricted environmental stimulation and the enhancement of hypnotizability: pain, EEG alpha, skin conductance and temperature responses. International Journal of Clinical and Experimental Hypnosis 30: 147–66.

Barabasz AF, Barabasz M (1989) Effects of restricted environmental stimulation: enhancement of hypnotizability for experimental and chronic pain control. International Journal of Clinical and Experimental Hypnosis 37: 217–31.

Barolin GS (2001) Das Respiratorische Feedback (RBF) – Basis und Praxis. In: GS Barolin (ed.) Das Respiratorische Feedback nach Leuner. Berlin: VWB Verlag für Wissenschaft und Bildung, 9–32.

Benedetti F, Colombo C, Serretti A, Lorenzi C, Pontiggia A, Barbini B, Smeraldi E (2003) Antidepressant effects of light therapy combined with sleep deprivation are influenced by a functional polymorphism within the promoter of the serotonin transporter gene. Biological Psychiatry 54: 687–92. DOI: 10.1016/S0002-3223(03)01894-2

Benedetti F, Barbini B, Fulgosi MC, Colombo C, Dallaspezia S, Pontiggia A, Smeraldi E (2005) Combined total sleep deprivation and light therapy in the treatment of drug-resistant bipolar depression: acute response and long-term remission rates. Journal of Clinical Psychiatry 66: 1535–40.

Berger H (1930) Über das Elektro-Enkephalogram des Menschen. II. Journal für Psychologie und Neurologie (Leipzig) 40: 160–9.

Brauchli P (1993) Vergleichuntersuchung der psychophysiologischen Entspannungseffekte einer optisch-akustischen Mind Machine mit einer Entspannungsmusik. Zeitschrift für experimentelle und angewandte Psychologie 40: 179–93.

Ciganek L, Ingvar DH (1969) Colour specific features of visual cortical responses in man evoked by monochromatic flashes. Acta Physiologica Scandinavica 76: 82–92.

Coromaldi E, Basar-Eroglu C, Stadler MA (2004) EEG-Rythmen während tiefer Meditation: Eine Einzelfallstudie mit einem Zen-Meister. Hypnose und Kognition 21: 61–76.

Fábián TK, Fábián G (1998) Stress of life, stress of death: anxiety in dentistry from the viewpoint of hypnotherapy. Annals of the New York Academy of Sciences 851: 495–500.

Fábián TK, Fábián G (2000) A fény-hang készülék fogászati alkalmazási lehetőségei. (Módszerismertetés). Fogorvosi Szemle 93: 195–201.

Fábián TK, Vértes G, Szabó A, Varga K (2002) Photo-acoustic stimulation and hypnotherapy. An effective combination for treatment of oral psychosomatic disorders. Hypnosis International Monographs 6: 199–207.

Fábián TK, Kaán B, Fejérdy L, Tóth ZS, Fejérdy P (2004a) Fogpótlás intoleranciás betegek pszichoterápiájában szerzett tapasztalatok értékelése 25 eset alapján. Fogorvosi Szemle 97: 163–8.

Fábián TK, Tóth ZS, Fejérdy L, Kaán B, Csermely P, Fejérdy P (2004b) Photo-acoustic stimualtion increases the amount of 70 kDa heat shock proteins (Hsp70) in human whole saliva. A pilot study. International Journal of Psychophysiology 52: 211–16. DOI: 10.1016/j.ijpsycho.2003.10.004

Fábián TK, Krause WR, Krause M, Fejérdy P (2005) Photo-acoustic stimulation and hypnotherapy in the treatment of oral psychosomatic disorders. Hypnos 32: 198–202.

Fábián TK, Mierzwińska-Nastalska E, Fejérdy P (2006) Photo-acoustic stimulation. A suitable method in the treatment of psychogenic denture intolerance. Protetyka Stomatologiczna 56: 335–40.

Copyright © 2009 British Society of Experimental & Clinical Hypnosis
Published by John Wiley & Sons, Ltd DOI: 10.1002/ch

Fábián TK, Fejérdy P, NguyenMT, Sőti CS, Csermely P (2007) Potential immunological functions of salivary Hsp70 in the mucosal and periodontal defence mechanisms. Archivum Immunologiae et Therapiae Experimentalis 55: 91–8. DOI: 10.1007/s00005-007-0012-z

Fábián TK, Sőti CS, Nguyen MT, Csermely P, Fejérdy P (2008) Expected functions of salivary HSP70 in the oral cavity. International Journal of Medical and Biological Frontiers 14: 289–308.

Fábián TK, Gótai L, Krause WR, Fejérdy P (2009) Zahnärztliche Hypnoseforschung an der Semmelweis Universität Budapest. Deutsche Zeitschrift für Zahnärztliche Hypnose 8: 9–14.

Freud S (1900) Die Traumdeutung. GW II/III. London: Imago.

Heinze R-I (1993) Shamanistic states of consciousness: access to different realities. In: M Hoppál, KD Howard (eds) Shamans and Cultures (ISTOR books 5). Budapest, Los Angeles: Akadémiai Kiadó & International Society of Trans-Oceanic Research, 169–78.

Hoppál M (1993a) Shamanism: universal structures and regional symbols. In: M Hoppál M, KD Howard (eds) Shamans and Cultures (ISTOR books 5). Budapest, Los Angeles: Akadémiai Kiadó & International Society of Trans-Oceanic Research, 181–92.

Hoppál M (1993b) Studies on Eurasian shamanism. In: M Hoppál, KD Howard (eds) Shamans and Cultures (ISTOR books 5). Budapest, Los Angeles: Akadémiai Kiadó & International Society of Trans-Oceanic Research, 258–88.

Janz C, Schmitt C, Speck O, Henning J (2000) Comparison of the hemodynamic response to different visual stimuli in single-event and block stimulation fMRI experiments. Journal of Magnetic Resonance Imaging 12: 708–14.

Jin SH, Na SH, Kim SY, Ham BJ, Lee DH, Lee JH, Lee H (2003) Hemispheric laterality and dimensional complexity in schizophrenia under sound and light stimulation. International Journal of Psychophysiology 49: 1–15. DOI: 10.1016/S0167-8760(03)00078-3

Kaán B, Krause WR, Krause M, Fejérdy L, GáspárJ, Bálint M, Fábián TK (2003) A fény-hang stimulációval kombinált hipnoterápia hatásai a nyálszekrécióra. Előzetes klinikai vizsgálatok. Fogorvosi Szemle 96: 217–21.

Kaji R, Katayama-Hirota M, Kohara N, Kojima Y, Yang Q, Kimura J (1999) Blepharospasm induced by a LED flashlight. Movement Disorders 14: 1045–7.

Kawabata N (1972) Nonstationary power spectrum analysis of the photic alpha blocking. Kybernetik 12: 40–4.

Krause M, Müller O, Nguyen MT, Fábián TK, Fejérdy P, Krause WR (2007) Autogenic training in the treatment of atypical facial pain. Cell Stress & Chaperones online 12: 7E-01-P. (Budapest Meeting Abstracts 2007) (www.bioone.org)

Krause WR (1983) Grundlagen der Biofeedback-Therapie und ihre therapeutischen Anwendungsmöglichkeiten. Zeitschrift für ärztliche Fortbildung 77: 493–4.

Krause WR (1994) Hypnose und Autogenes Training (Selbsthypnose) in der Rehabilitation. In: JH Schultz, Hypnose-Technik. Praktische Anleitung zum Hypnotisieren für Ärzte. 9. Auflage – bearbeitet und ergänzt von G. Iversen und W.-R. Krause. Stuttgart, Jena, New York: Gustav Fischer Verlag, 71–9.

Krause WR, Fábián TK (2008) Biofeedback. (Abstract). Hypnose (Sonderheft) 3: 42.

Kikuchi M, Wada Y, Koshino Y, Nanbu Y, Hashimoto T (2000) Effects of normal aging upon interhemispheric coherence: analysis during rest and photic stimulation. Clinical Electroencephalography 31: 170–4.

Leuner H (1955) Eperimentelles Katahymes Bilderleben als klinisches Verfahren der Psychotherapie. Zeitschrift für Psychotherapie und Medizinische Psychologie 5: 185–203.

Leuner H (1984) Zur Indikation und wissenschaftlichen Fundierung des Respiratorisches Feedbacks. Allgemeinarzt 6: 334–54.

Leuner H (1997) Respiratorische Feedback (RFB) als atembezogene Selbsthypnose. In: H Leuner, E Schroeter (eds) Indikationen und spezifische Anwendungen der Hypnosebehandlung. Ein Überblick. (2. erweiterte Auflage.) Bern-Göttingen-Toronto-Seattle: Hans Huber Verlag, 204–9.

Copyright © 2009 British Society of Experimental & Clinical Hypnosis
Published by John Wiley & Sons, Ltd DOI: 10.1002/ch

Lindemuth R, Mayr T, Schimrigk K (2000) Visually induced seizure caused by 'opto-acoustic relaxation system'. Journal of Neurology 247: 303.

Nicholson P (2006) Does meditation predispose to epilepsy? EEG studies of expert meditators self-inducing simple partial seizures. Medical Hypotheses 66: 674–6. DOI: 10.1016/j.mehy.2005.09.023

NogawaT, Katayama K, Tabata Y, Ohshio T, Kawahara T (1976) Changes in amplitude of the EEG induced by a photic stimulus. Electroencephalography and Clinical Neurophysiology 40: 78–88.

Siegel RK, Jarvik ME (1975) Drug induced hallucinations in animals and man. In: RK Siegel, LJ West (eds) Hallucinations: Behaviour, Experience, and Theory. New York: Wiley, 81–161.

Siegel RK (1977) Hallucinations. Scientific American 237: 132–40.

Wallace RK (1970) Physiological effects of transcendental meditation. Science 167: 1751–4.

Walter WG, Dovey VJ, Shipton H (1946) Analysis of the electrical responses of human cortex to photic stimulation. Nature 158: 540–1.

Williams P, West M (1975) EEG response to photic stimulation in persons experienced at meditation. Electroencephalography and Clinical Neurophysiology 39: 519–22.

Address for correspondence:
Dr Tibor Károly Fábián
Semmelweis University Budapest
Clinic of Prosthetic Dentistry
Szentkirályi utca 47
1088 Budapest, Hungary, EU
Tel.: +36/1/338-4380
Fax: +36/1/317-5270
Email: fab@fok.usn.hu

Copyright © 2009 British Society of Experimental & Clinical Hypnosis
Published by John Wiley & Sons, Ltd DOI: 10.1002/ch