Doctoral (PhD) Dissertation

Interactional Synchrony during Active-Alert Hypnosis

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Doctoral School of Psychology, Eötvös Loránd University

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"We change the world not by what we say or do, but as a consequence of what we have become."

David R. Hawkins

"Life is serious, get out your magic wand."

- **Jonathan Lockwood Huie**

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EÖTVÖS LORÁND UNIVERSITY

FACULTY OF EDUCATION AND PSYCHOLOGY

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Doctoral (PhD) Dissertation

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A doktori értekezés címe és alcíme: Interactional Synchrony during Active-Alert Hypnosis

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II. Nyilatkozatok

1. A doktori értekezés szerzőjeként[2]

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2. A doktori értekezés szerzőjeként kijelentem, hogy
a) a ELTE Digitális Intézményi Tudástárba feltöltendő doktori értekezés és a tézisek saját eredeti, önálló szellemi munkám és legjobb tudomásom szerint nem sértem vele senki szerzői jogait;
b) a doktori értekezés és a tézisek nyomtatott változatai és az elektronikus adathordozón benyújtott tartalmak (szöveg és ábrák) mindenben megegyeznek.

3. A doktori értekezés szerzőjeként hozzájárulok a doktori értekezés és a tézisek szövegének plágiumkereső adatbázisba helyezéséhez és plágiumellenőrző vizsgálatok lefuttatásához.

Kelt:2022. június 10

a doktori értekezés szerzőjének aláírása

[2] A megfelelő szöveg aláhúzandó.
[3] A doktori értekezés benyújtásával egyidejűleg be kell adni a tudományági doktori tanácshoz a szabadalmi, illetőleg oltalmi bejelentést tanúsító okiratot és a nyilvánosságra hozatal elhalasztása iránti kérelmet.
[4] A doktori értekezés benyújtásával egyidejűleg be kell nyújtani a minősített adatra vonatkozó közokiratot.
[5] A doktori értekezés benyújtásával egyidejűleg be kell nyújtani a mű kiadásáról szóló kiadói szerződést.

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Table of Abbreviations

AAH	Active-alert hypnosis
AIM	Archaic Involvement Measure
ANS	Autonomic Nervous System
DIH	Dyadic Interactional Harmony
EDA	Electrodermal Activity
EEG,	Electroencephalogram
EMG	Electromyography
ERPs	Event-Related Potential
HGSHS	Harvard Group Scale of Hypnotizability
OT	Oxytocin
PCI	Phenomenology of Consciousness Inventory
PNS	Parasympathetic Nervous System
SCL	Skin Conductance Level
SCR	Skin Conductance Response
s-EMBU	Egna Minnen Beträffande Uppfostran Questionnaire (My Memories of upbringing-short version)
SHSS	Stanford Hypnotic Susceptibility Scale
SNS	Sympathetic Nervous System
STAI	State and Trait Anxiety Inventory
WSGC	Waterloo Stanford Group scale

List of publications containing results of the dissertation

Kasos, E., Kasos, K., Pusztai, F., Polyák, Á., Kovács, K. J., & Varga, K. (2018). Changes in Oxytocin and Cortisol in Active-Alert Hypnosis: Hormonal Changes Benefiting Low Hypnotizable Participants. *International Journal of Clinical and Experimental Hypnosis*, *66*(4), 404–427. https://doi.org/10.1080/00207144.2018.1495009

Kasos, E., Kasos, Krisztian., Költő, A., Józsa, E., & Varga, K. (2020). Phenomenological Experiences during Active-Alert Hypnosis: Comparison of Hypnotist and Subject. *International Journal of Clinical and Experimental Hypnosis*, *68*(4), 451–465. https://doi.org/10.1080/00207144.2020.1802733

Kasos, E., Kasos, K., Kekecs, Z., Szekely, A., & Varga, K. (2021). *Electrodermal orienting response during active-alert hypnosis: do verbal suggestions influence us differently?* "in press". *International Journal of Clinical and Experimental Hypnosis*

Kasos, E., Kasos, K., Józsa, E., Varga, K., Bányai, É., Költő, A., & Szabó, A. (2021). Altered States of Consciousness During Exercise, Active-Alert Hypnosis and Everyday Waking State "in press". *International Journal of Clinical and Experimental Hypnosis*.

Interactional Synchrony during Active-Alert Hypnosis

Subjective Introduction

My official history with hypnosis started when I arrived to ELTE on the first day of my master's studies. I was walking up the stairs at the Izabella Street building and read the sign on the first floor: Hypnosis Labor. I remember rolling my eyes, thinking what an occult thing to teach at a "supposedly" serious university. But I took my first elective class with Prof. Katalin Varga, listened to Prof. Éva Bányai talk about how she convinced the bigger boys in her school to help her collect metal, volunteered at my first hypnosis conference, and was hooked. I am grateful to have a dissertation topic as exciting and little researched as the active-alert hypnosis (AAH) and will be forever grateful for the opportunities and support I have received in this Hypnosis Labor.

During my master's and PhD studies, my understanding of hypnosis turned from seeing something almost magical to a deeper understanding of a modality of healing and helping. It was amazing to learn about hypnosis from Prof Varga Katalin, whose creative approach to research not only deepened my understanding of hypnosis but also my grasp of research and interpretation of different results. Watching Prof. Éva Bányai teaching, her methodological approach to research helped me understand that doing something you love can help you through almost everything and that a thorough knowledge of your subject and talking about it in a way your audience understands, whether they are doctors or laypeople, is essential.

It was always interesting for me to see that at hypnosis conferences both therapists and researchers participate and try to find common ground. I hope that besides promoting a

deeper understanding of hypnosis my dissertation contributes to understanding how it can be used in a practical, clinical setting and does this without taking away the magic.

I would like to thank my supervisor Professor Katalin Varga for her support that always manifested in a way I needed it. Positive comments, phone calls, silent trust or very real and practical help. I learnt a lot from your patience, willingness to learn, and positive attitude towards the most difficult situations. Thank you for our willingness to share your knowledge.

My mentor Professor Éva Bányai, whose stamina, kindness and example inspired and humbled me equally. I am in awe of your knowledge, energy, and willingness to help others every day.

As the head of the doctoral school, Dr. Anna Veres-Székely provided me with a great initiation into the world of academia.

In the case of my dissertation the adage “it takes a village…” proved very accurate. My colleagues from the department, Emese Józsa, András Költő – thank you for all your professional help and friendship. Zoltán Kekecs for his mentoring and Nándor Hajdú for being a great help the last minute.

I want to thank my family, for all their help and support. Especially my parents Enikő and Imre, sisters Judit and Orsolya and kids Alexandra, Lili and Dani, who helped me when I needed it and left me alone when that was better. Also, my friends, Kriszti Bakos, Anita Kovács, Aditi Gandotra, Irmelin Hovland-Hegg, Rita Hoffman, Melinda Lazay who were always there when I needed them.

Overview

In this doctoral dissertation, I would like to examine altered states of consciousness (ASC) during increased activity, focusing on different aspects of active-alert hypnosis (AAH), a specific form of ASC within the interactional framework, and how AAH compares with ASC occurring during sport. My PhD dissertation emphasizes the evolutionary value of hypnosis and how it influences development, physical and mental health. The four studies included examine the similarities of AAH comparing it with traditional hypnosis and sport, then examining its hormonal, phenomenological and endocrine aspects emphasizing the interactional framework.

Hypnosis research, especially AAH is not only a relatively new area but its connection to different areas in psychology, like perception, learning and clinical psychology makes it an especially exciting area of research. It provides an important milestone in the understanding pf the hypnosis phenomenon, as it has refuted an often-cited theory, that hypnosis is similar to sleep. Éva Bányai in her social-psychobiological theory of hypnosis described the interactional aspect of hypnosis as socially and biologically adaptive. It is possible for participants of hypnosis to form a special connection for a certain period of time, similar to close significant relationships that take much longer to develop. The Human Interaction Research Group from the Eötvös Loránd University demonstrated this synchrony during traditional hypnosis in several studies examining the phenomenological, physical, and behavioural experiences of participants.

It is increasingly clear that oxytocin and cortisol play an intricate role in the regulation of our behaviour and emotions impacting health, relationships and well-being. Their long term, cross-generational effect makes them an important focus of the first study, which showed that active-alert hypnosis can affect cortisol and oxytocin levels in both subjects and hypnotists, and that hormonal changes are related to the subject's hypnotizability and the phenomenology of altered state of consciousness. The level of oxytocin increased while the level of cortisol decreased in the hypnotist. When comparing the oxytocin changes of subjects with their hypnotizability, those with low hypnotizability scores experienced an increase in oxytocin, and those with medium and high hypnotizability scores showed no change or decrease. These findings can be incorporated into an interactional framework of hypnosis and support the beneficial therapeutic effects of active-alert hypnosis.

Hypnosis is a uniquely intimate experience and as such, it is hard to examine without the subjects' experiences of the participants. It is a unique feature of the PhD thesis, that in connection physiological "hard" indicators, we analyse and present subjective data as well. In the second study we assessed the subjective experiences of 31 subjects and 5 hypnotists during AAH using Pekala's Phenomenology of Consciousness Inventory (PCI), the Dyadic Interactional Harmony (DIH) scale and the Archaic Involvement Measure (AIM). The subjective experiences of subjects and hypnotists showed important similarities while the only significant difference shown by the PCI highlighted the differences stemming from the different roles of hypnotist and subject.

In the third study, we showed, by analysing changes in electrodermal activity of 32 participants, that low-hypnotizable subjects under active-alert hypnosis maintained left hemispheric dominance at the end of induction, characteristic of the everyday waking state of consciousness. At the same time, high hypnotizable subjects developed a right hemisphere predominance. This pattern is also associated with corresponding subjective changes in state of consciousness.

The third study compared exercisers' state of consciousness with subjects of active-alert hypnosis and students in a class. Three hundred and seventy-five participants completed the PCI and results are the first to suggest that exercise is associated with an ASC which in some of its aspects is not different from the ASC experienced during hypnosis. Moreover, we suggest that changes in consciousness during physical activity may lead to greater susceptibility to suggestions. This study may highlight the importance of ASC-focused training techniques aimed at the more positive communication between coaches/fitness instructors and exercisers.

The results presented in this dissertation provide an important inside into AAH furthering our understanding of the hypnosis phenomena and emphasize the role and importance of corrective experiences provided by hypnotherapy and how its beneficial effects are not dependent on the hypnotizability of the subject.

Chapter 1.

General Introduction

1.1 Interactional synchrony

The movement of humans is naturally varied, so one would assume, that synchronizing such varied rhythm must be incredibly hard (Dahan et al., 2016; Mills et al., 2019). While in the animal kingdom there are some spectacular examples for synchronized behaviour, like the duetting of gibbons (Ravignani, 2018) or the murmuration of starlings (Couzin, 2018), humans took synchronization a little further. Humans change their biologically determined rhythm, like speech or movement, in certain social situation (Atkinson & Heritage, 1985). Not only do we align ourselves with each other with little effort, but we also do it for fun when dancing (Weinstein et al., 2016) and often without really being aware of it (Heath, 2010).

Interactional synchrony, a term coined by Condon and Ogston (1966,1967) not only means behavioural synchrony (Condon & Ogston, 1966, 1967) but it can be observed in physiological changes like cardiological synchrony between mother and child (Feldman et al., 2011) heartrate or blood pressure (Levenson & Ruef, 1997), hormonal synchrony (E. Kasos et al., 2018; Varga & Kekecs, 2014) or synchronization in brain activity (Dumas et al., 2010).

1.2 Effects of interactional synchrony

Our affinity for synchronization is an innate ability, it plays a role in harmonizing the groups emotional state, behaviour, and fosters cooperation. Because this is evolutionarily advantageous, synchronization has strong rewarding effect. In every culture there are rituals using music or dance or even different games for its synchronizing effect, but we may employ clapping similarly, or even the "wave" at sporting events (Buda, 2012; Csányi, 2016; Levenson & Ruef, 1997)

The absence of interactional synchrony may indicate depression (Bouhuys & Sam, 2000), and autistic adults showed better synchronization when attempting to imitate the prespecified movements of a robotic hand while the actions of adults not on the autistic spectrum matched better when imitating a human hand (Bird et al., 2007). The adaptive value of interactional synchrony is evident throughout our development. There are studies examining the effects of in utero synchronization (Feldman, 2007a), and there is evidence emphasizing its influence on attachment and the development of parent-child relationship in early childhood (Feldman, 2003; Harrist & Waugh, 2002; Isabella & Belsky, 1991; Lindsey et al., 2009) as well as in the teenage years (Barber et al., 2001; Lindsey et al., 2008). When testing attachment in one-year old babies, those who showed more synchrony with their mother at 3 and 9 months demonstrated secure attachment. Babies in the insecure-avoidant or insecure-resistant group had mothers who demonstrated less responsiveness during interaction with their babies (Isabella & Belsky, 1991). Synchrony plays an important role in emotional regulation (De Jaegher & Di Paolo, 2008; Fuchs & de Jaegher, 2009; Trevarthen & Aitken, 2001), language development (Kuhl, 2007), social cognition and memory (Miles et al., 2010).

1.3 Advantages of Asynchrony

While the advantages of interactional synchrony throughout our development is undeniable, periods of asynchrony may also be important. A mother may communicate her disapproval of the child's behaviour though temporary asynchrony. Through the experience of asynchrony and participation in the process of repair, the child can learn that her/his social needs are not necessarily met right away and more importantly, that asynchrony may happen and can be corrected by the child as well. The child's dependence on the mother for behavioural regulation (external regulation) turns into mutual regulation. An optimum level of synchrony may be more beneficial, and the occasional mismatched state is also desirable, and it is considered to be an important learning process to experience the re-gaining of synchrony, following an asynchronous period (Feldman, 2007b; Varga, 2013a).

Most hypnosis research focus on the subjects, but contemporary studies found that the hypnosis is hard to fully understand without the considering both participants, subject and hypnotists. Another unique aspect of the studies presented in this dissertation is examining participants of AAH within the interactional framework.

1.4 Hypnosis in the interactional framework

According to Bányai's social psychobiological model, hypnosis is an altered state of consciousness, established during the interaction between the subject and the hypnotist. This interaction is an intense regulatory relationship that is characteristic of close intimate human relationships (Bányai, 1991, 2008b). This model is considered a paradigm shift in contrast with hypnosis research at the time. It considers both the hypnotist and the subject, emphasizing the interactional dimension of hypnosis. Hypnosis is the model situation of the interpersonal adaptational processes and can be interpreted as the prototypical setting for peer support (Józsa, 2012). There are three basic dimensions to hypnosis, hypnotic depth (behavioural – hypnotizability), hypnotic role taking (archaic involvement) and trance depth (changes in experience) (Józsa, 2012; Shor, 1962), and it may be considered as parallel to the developmental factors of a child's socialization. During hypnosis the subjects allows the hypnotist to control the situation, similarly to a parent child relationship (Vandenberg, 1998). Several studies attribute the attunement of hypnotist and subject to the mirror neuron system and consider this attunement essential to success in clinical hypnotherapy (Antonelli & Luchetti, 2010; Bányai, 1991; Gallese et al., 2004; Rizzolatti et al., 1996).

1.5 Possible processes of synchrony

There is evidence that suggest that increased synchrony in adult interactions may promote improved emotional connection (Chartrand & Bargh, 1999; Hatfield et al., 1993; Lakin et al., 2003; Levenson & Ruef, 1997), and improved rapport and cooperation in a clinical setting (Bernieri et al., 1994; Tickle-Degnen & Rosenthal, 1990; Valdesolo et al., 2010; Wiltermuth & Heath, 2009). It also proved to be important when the participants had opposing interests, like during police interrogation (Walsh & Bull, 2012). Interactional synchrony boosts the viability of the given relationship, functioning as a regulator in interpersonal processes. Baby-mother studies found that babies through synchronous behaviour compelled the mother to continue with a certain activity and signalled that they "had enough" through asynchrony (Varga, 2013a).

Observing another person expressing an emotion, the areas in our brain responsible for that emotion will activate. The mirror neuron system – containing special visual motor neurons - is responsible for us automatically mimicking others' emotions or actions, the so-called "chameleon effect" (Chartrand & Bargh, 1999). Babies two to three weeks after being born, prompted by their mirror neurons, mimic behaviour, and facial expressions (Jaffe, 2006). The mirror neuron system, the most important area for mentalization (Frith & Frith, 2006) translates the actions or emotions of the observed person through certain processes to the explanation of the perceived actions or emotion, thus providing the basis of mentalization. Mentalization, the understanding of our own and others mental state is an essential process for interactional synchrony (Költő, 2015).

There are several studies that mapped the observable signs of interactional synchrony, like the physiological, neurological, and behavioural aspect of hypnosis (Barker & Burgwin, 1949; Crawford, 1989; Dynes, 1947; K. Kasos, Zimonyi, et al., 2018; Kekecs et al., 2016; Lazarus, 1973; Sturgis & Coe, 1990; Ulett et al., 1972; Varga, 2013b; Varga & Kekecs, 2014; Varga S. & Varga, 2009), and the focus on oxytocin provided with important insights into the relational significance of hypnosis.

When talking about hypnosis, whether it is clinical application, its connection with the OT system or the relationship between hypnotists and subject, again and again there are parallels between the connection between hypnosis and the parent-child relationship (Bányai, 2008a; Költő, 2015). While the attachment between caretaker and child has a lasting effect on their psychological characteristics, influencing their affective processes (Bowlby, 1953; Giddens & Bowlby, 1970), hypnosis, as model situation for these formative relationships can be a corrective measure (Whorwell, 2003).

According to the social-psychobiological theory, interactional processes are key elements of hypnosis (Bányai, 1991). The effectiveness of hypnosis in the treatment of illnesses rooted in childhood traumas may be attributed to the similarity between hypnosis – like the interaction between child and caretaker- and social biofeedback (Költő, 2015).

1.6 Oxytocin and interaction

Central oxytocin (OT) is a neurotransmitter that plays an important role in the regulation of social affective processes and affiliation, influencing attachment, parental behaviour and bonding in adults (Insel, 1992; Insel & Hulihan, 1995). It lowers anxiety and depression (Huber et al., 2005; Uvnäs-Moberg et al., 1999), promotes offering and accepting social support (Grewen et al., 2005). It may increase prosocial behaviour (Hollander et al., 2003). and trust (Damasio, 2005). (*Picture 1.)* Besides reducing stress, it is also associated with stress reaction unlike the so-called “masculine” or fight or flight response. In response to stress, the level of central OT increases suppressing the neuroendocrine stress response. The OT-based stress management is called “calm and connection” because individuals utilize social support as a coping mechanism. It is more typical of women, since they are more likely to be responsible for and be in the company of children, which makes the “flight or fight” response less useful (DeVries et al., 2003; Uvnäs-Moberg et al., 2005). OT has been the focus of a number of human studies in recent years. While in the case of both men and women, reliable social support is associated with increased levels of OT, women enjoy more of its health benefits, like better cardiovascular strength (Grewen et al., 2005). Recall of a certain emotional state also influenced OT levels. Women in stable relationships, maintained their level of OT levels during the recall of experiences associated with negative emotion, and showed higher levels of OT in response to positive emotions, while higher base level of OT correlated with interpersonal distress. OT is released in response to social stimuli and makes positive social interaction more rewarding (Turner et al., 1999). Especially interesting is the role of OT in parent child interactions. Transgenerational OT studies using rats, focused on licking and grooming behaviour as an indicator of the quality of maternal behaviour. Some female rats display increased levels of licking and grooming behaviour and because their estrogenic-OT-dopamine system is more sensitive thus find this behaviour more rewarding. They also experienced higher levels of OT during lactation than rats who displayed lower levels of maternal behaviour (Cameron et al., 2008).

Increased OT expression mitigates neophobia (fear of new things) in new mothers, reduces anxiety and acts as a reward system when carrying out maternal tasks. Interesting, that this maternal behaviour is not genetically determined. Offsprings of rat mothers displaying high levels of licking and grooming, fostered by mothers low in maternal behaviour, conformed to the foster mother (Champagne, 2008). Lower levels of mothering also resulted in high stress-reactivity in rat pups (Fish et al., 2004; Weaver, 2007).

Picture 1: Effects of oxytocin

There is theoretical association between the OT system and hypnosis. Trust and tolerance for intense social stimuli is essential for the development of hypnotic connection (Esch & Stefano, 2005; Varga, 2021)

1.7 Oxytocin and hypnosis

There is a close link between the OT and dopamine systems as both play integral part in social relationships (Esch & Stefano, 2005), and between hypnotizability and COMT (catechol-O-methyltransferase), one of several enzymes that degrade catecholamines like dopamine (Lichtenberg et al., 2000, 2004; Raz, 2005; Raz et al., 2006; Szekely et al., 2010). Intranasally administered OT was shown to increase hypnotizability compared with the placebo control although they did not observe lower anxiety levels or increases in trust. The researchers theorized that the introduced OT has a positive effect on the rapport between hypnotists and subject and as a result the subject was more inclined to comply with the suggestions (Bryant et al., 2012). At the same time, OT proved to impede the suggestion for word blindness on the Stroop test during hypnosis (Parris et al., 2014). OT's stress-buffering effect inhibits the stress-induced activity of the hypothalamic–pituitary–adrenal (HPA) axis, decreasing the level of cortisol, but it is unclear whether it is the only connection between hypnosis and cortisol. Suggestions for feelings of happiness seemed to result in a decrease in plasma cortisol during hypnosis while suggestions for anger and depression resulted in decrease in serum cortisol but it did not reach significant level (Zachariae et al., 1991). Another study examining the pain perception and cortisol levels of subjects randomly assigned to hypnosis and no intervention control group found that while the hypnosis group reported significantly lower pain intensity and unpleasantness, their level of cortisol did not differ significantly from the control group (Goodin et al., 2012). The theory that hypnosis on its own does not, only hypnotically suggested emotions are able to prompt alterations in hormone levels (Adlercreutz et al., 1982) seem to be verified by another study that found no decrease in the overall cortisol levels of individuals after 10 traditional relaxational hypnosis sessions. It is true that in order to measure cortisol saliva samples were taken during the first and the tenth week of the study and on a day when there was no hypnosis. It is possible, that the cortisol level at the time of the hypnosis may have been affected (Thompson et al., 2011). When considering the relational experiences during relaxational hypnosis, Varga et al (2014) found that the increases in OT level was connected with the subjects' perceived communion with the hypnotist as measured by the Dyadic Interactional Harmony questionnaire (Varga & Kekecs, 2014). At the same time increases in the hypnotists' OT levels were negatively correlated with the subjects' perception of emotional warm expressed by their parents measured by the Egna Minnen Beträffande Uppfostran

Questionnaire (My Memories of Upbringing - short version – s-EMBU) (Arrindell et al., 1999). While these results were significant from an interactional perspective, they have to be treated with caution because of the small sample size and because all participants were male (Varga & Kekecs, 2014).

1.8 Neurophysiology of Hypnosis

Understanding the role hypnotizability, a person's responsiveness to hypnosis, plays during hypnosis is essential to the understanding of the hypnosis phenomena and even ASC. As a measure of individual differences during research, the importance of hypnotizability is undeniable, and it has been linked to increase in susceptibility to suggestions (Kekecs et al., 2016). At the same time, it does not always explain the individuals' reaction to the effects of hypnosis, especially in a clinical setting where it has not proven to be a reliable measure of success (Montgomery et al., 2011; Thompson et al., 2019). It is still debated whether changes in ANS during hypnosis is the result of relaxation (position, posture, eye closure) or can be attributed to some other characteristics of hypnosis, like hypnotisability.

Depending on what aspect of hypnosis they focus on, there are several models explaining the mechanism of the hypnotic effect (Bányai, 1991; A. J. Barnier et al., 2012; Gruzelier, 1998; Hammond, 2005; Kirsch, 1991; Lynn et al., 2012; Nash, 2012; Spiegel, 2012; Wagstaff et al., 2020; Woody & Sadler, 2012). Focusing exclusively on the subject, the social cognitive models consider her/his attitudes, attributions, motives and expectations (Lynn et al., 2012), while the dissociation model – coined by Janet (1901) is focused on the association and dissociation between cognitive monitoring and control, consciousness, sensation and experience (Woody & Sadler, 2012). According to the ability-aptitude model, hypnotizability is influenced by the subjects' covert cognitive affinity for hypnotic susceptibility and her/his belief regarding it (Benham et al., 2006). One of the most comprehensive models are Bányai's social-psychobiological model of hypnosis emphasizing the significance of the relationship between hypnotist and subject, and the interaction between their personal trait, physiological and psychological mechanisms (Bányai, 1991) does not take all factors into consideration (Jensen et al., 2015). Jensen has proposed the biopsychosocial model of hypnosis, suggesting that the interaction biological, psychological and social factors play a role in hypnotic responsiveness. In order to formulate a comprehensive model to explain the mechanism of hypnosis and its effect on participants, it is important to examine the biological, psychological, and social factors of hypnosis (Jensen et al., 2015). Since recent years brought us great advancements in the neurophysiological field, the neurological results are always very interesting.

Besides comparing results from active-alert and traditional hypnosis, it can also be helpful to understand how hypnosis influences the autonomic nervous system (ANS), whether the physiological changes are the effect of the relaxation, suggested during traditional hypnosis (feeling relaxed, body position) or is it connected to another aspect.

1.8.1 Electrodermal Activity and the Central nervous system

Neurophysiological changes during hypnosis are well documented. Baghdadi and Nasrabadi (2012) found by measures taken at the beginning and the end of the induction, that the depth of hypnosis did not significantly affect the mutual phase synchronization. Similarly, to our results, they also found interesting differences based on hypnotizability. They found greater delta, theta and beta band phase synchrony between the introduced paired-channels on EEG measures taken during hypnosis for medium and low hypnotizable subjects than during awake EEG, while high hypnotizables demonstrated opposite results. High hypnotizables also showed less phase synchronization on the frontal lobe than either the low or medium hypnotizable subjects (Baghdadi & Nasrabadi, 2012). Several studies have shown right hemispheric functional dominance by the end of the induction in high hypnotizables. At the same time, low hypnotizables, over the course of the induction demonstrated increasing left hemispheric dominance, as if they were special attention to what the hypnotists said and often "switched" to right hemispheric dominance over the course of the deinduction (Bányai, 2008a). Increased theta activity is characteristic of altered states and is demonstrated during hypnosis even in low hypnotizables although high hypnotizables show higher levels during both hypnosis and an awake state (Vaitl et al., 2005). Although studies have demonstrated cortical delta activity during deep hypnosis, according to some theorists this occurs when the contact between subject and hypnotist is disrupted, and the subjects falls asleep (Bányai & Benczúr, 2008; Mészáros, 1984). Some studies demonstrated that during hypnosis low hypnotizables show lower alpha wave activity in the occipital area than high hypnotizables (Akpinar et al., 1971; Bakan & Svorad, 1969; Edmonston & Grotevant, 1975; Engstrom et al., 1970; London et al., 1968; Morgan et al., 1974) but other studies have failed to replicate this result (Barabasz, 1983; Perlini & Spanos, 1991). In high hypnotizables increased frontal theta and alpha activity (Jamieson & Burgess, 2014; Sabourin et al., 1990; Terhune et al., 2011) as well as increased beta and gamma activity together with reduced global functional connectivity has been a well-established pattern during hypnosis (Cardeña et al., 2013).

Several areas in the brain play a role in the control of EDA. EDA affected by the excitatory control of the amygdala represents affective processing, while the inhibitory influence of the hippocampus is part of the thermoregulatory control (Dawson et al., 2016). The limbic pathway is responsible for the ipsilateral control of the EDA and -not exclusively- for processing emotions, and the corticospinal pathway –motor cortex, basal ganglia- is responsible for the contralateral control of the EDA (Boucsein, 2012). Attentional processes are reflected in EDA produced by the frontal brain regions, while thermoregulation and thus sweat glands are controlled by the hypothalamus (Dawson et al., 2016) and emotional processed indicate amygdala activation, the principal source for EDA (Mangina & Beuzeron-Mangina, 1996).

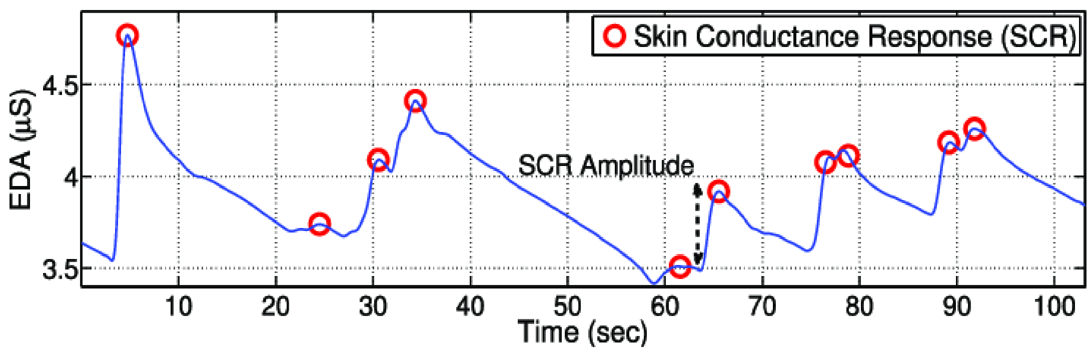
With the development of more sensitive and easier to use ways to measure physiological changes (Picture 2) during research, we may be closer to connect objective measures such as changes in neurological functions and alterations in consciousness during hypnosis.

Picture 2. Open-source Bio-Monitor (OBIMON) for electrodermal measurement (K. Kasos et al., 2019) used in Study 3.

1.8.2 Electrodermal Activity and the Peripheral Nervous system

Some studies seem to support the effect of relaxation, showing increased activity of the parasympathetic nervous system (PNS) during hypnosis (Aubert et al., 2009; De Benedittis et al., 1994; S. G. Diamond et al., 2008; Van Der Kruijs et al., 2014; VandeVusse et al., 2010) but others were not able to replicate these results (De Pascalis & Perrone, 1996; Gemignani et al., 2000; Hippel et al., 2001; Ray et al., 2000). The results regarding the sympathetic nervous system (SNS) seem to be just as divided, some showing lower activity during hypnosis (Aubert et al., 2009; De Benedittis et al., 1994; De Pascalis & Perrone, 1996; Griffiths et al., 1989; Gruzelier et al., 1984; Gruzelier & Brow, 1985; Hippel et al., 2001), while others did not (Diamond, 1984; Edmonston, 1968; Gruzelier et al., 1988).

Electrodermal activity is often used in psychological research because it is easy to measure and is a trusted method for assessing SNS and PNS activity (Boucsein, 2012; Boucsein et al., 2012; Kekecs et al., 2016). An indicator of emotional response or arousal, EDA refers to the variation of the electrical conductance of the skin in response to sweat secretion. Constant, low, imperceptible electric voltage is applied to the skin, and changes in skin conductance is recorded (Benedek & Kaernbach, 2010; Boucsein et al., 2012). EDA is representative of the intensity of a certain emotion not what type it is, as both “positive” (happiness) or “negative” (fear) emotions increase skin conductance. EDA signal is usually measured at the hand and foot regions, where most sweat glands can be found (Dawson et al., 2016). Data is attained with sampling rates between 1 – 10 Hz and is measured in units of micro-Siemens (μS). Tonic component of skin conductance (skin conductance level – SCL) is characterized by slow fluctuations, measuring the background activity of SNS and is believed to indicate changes in autonomic arousal. The phasic component (skin conductance response – SCR) is characterized by faster-varying changes (Boucsein, 2012; Boucsein et al., 2012). SCR can be identified as a distinctive peak in the data stream, with steep incline and slow decline compared to the baseline *(Picture 3)*. Information regarding emotional response to a stimulus is indicated by EDA peaks or Event-Related Skin Conductance Response (ER-SCR) indicating substantial variations in EDA activity (Chaspari et al., 2015).



Picture 3. Example of an electrodermal activity (EDA) signal of skin conductance response (SCR), marked with red "o," and an indicative notation of SCR amplitude measure. (Chaspari et al., 2015)

Kekecs et al (2016) found lower average tonic electrodermal activity (EDA) after induction than the musical control and found that EDA decreased during hypnosis but not during the control, even though the two groups were matched for test suggestions, body position, eye closure, sound and movement. This seem to suggest that the lower SNS activity was the result of hypnosis and not the relaxation. Our study employing AAH also support this theory. Interesting result that hypnotizability did not seem to play a role in these results (Kekecs et al., 2016). Bilateral electrodermal measures taken during AAH indicate that high hypnotizable subjects during induction demonstrate a shift to right hemispheric dominance, while during the musical control condition neither low nor high hypnotizable subject displayed laterality shifts (K. Kasos, Kekecs, et al., 2018). This seems to support the idea, that the left frontal activation, demonstrated by highly hypnotizable subjects high corresponds with right posterior dominance with inhibition in the left (Gruzelier, 1996) as opposed to low hypnotizables who demonstrate left hemispheric activation, causing electrodermal dominance on the left side (Gruzelier & Warren, 1993). This shift may be the result of activation of left hemispheric attentional networks generated by the verbal processing of the hypnotist's words and suggestions regarding focused attention (Rainville et al., 1999). Cognitive flexibility, the ability to respond to changing environment is linked to hypnotizability (Crawford & Allen, 1983), explaining how high hypnotizable subjects are able to switch between effortful and effortless attention during hypnosis promoting deeper absorption in hypnosis (Crawford et al., 1993). Kasos et al (2018) showed a right shift in EDA in highly hypnotizable subjects during AAH, which indicates a change to right hemispheric dominance, and it may allow for a deeper absorption during hypnosis and an easier attentional focus (K. Kasos, Kekecs, et al., 2018).

1.9 Active-alert hypnosis

AAH was standardized by Éva Bányai after inconsistences were found during studies conducted with relaxational hypnosis that did not support the contemporary Pavlovian theory of hypnosis being a sleep-like state. Of the 24 initial subjects 4 did not exhibit the expected passive behaviour, instead they moved and spoke faster, became more animated (Bányai, 2018). Following the EEG and phenomenological results, that also supported the difference between sleep and hypnosis, the standard procedure for AAH was developed (Bányai & Hilgard, 1976). *(Picture 4)*

Picture 4. Illustration of traditional (left) and active -alert (right) hypnosis (Bányai, 2018)

The surroundings during AAH are similar to those of traditional hypnosis and a normal laboratory, regular lightning and noise levels. The challenging aspect is proper temperature, since the subject is physically exerting her/himself, so it is important to ensure proper ventilation (Bányai, 2018). Since it was important to remain as analogous as possible to relaxational hypnosis, the subject is pedalling (seated) on a stationary ergometer. Resistance is set by the subject so that it requires effort to pedal as if going uphill, but it can be changed during the experiment, if necessary, in order for the pedalling to be continuous. The standardized text for induction and suggestions follows Stanford Hypnotic Susceptibility Scales (forms A, B, C, profile I, II,) and during rapport building, the hypnotist emphasizes that hypnosis can be achieved in different ways (Bányai, 1987; Weitzenhoffer & Hilgard, 1959, 1962). During the induction instead of suggestions for relaxation, eye closure, feelings of tiredness and sleepiness emphasis is placed on feeling energized, fresh and rested.

Initial studies on AAH were focused on distinction from traditional relaxational hypnosis (Bányai & Hilgard, 1976) but there are very few hypnosis studies devoted attention specifically to the AAH (Alarcón et al., 1999; Bányai, 2018; Cardeña et al., 1998; Cikurel & Gruzelier, 1990; K. Kasos, Kekecs, et al., 2018; Miller et al., 1991; Robazza & Bortoli, 1995). Five studies assessed participants' responses to motor and cognitive suggestions, neurophysiological (EEG, EMG - electromyography and ERPs- event-related potential) indicators during AAH; comparing results with those gained from traditional hypnosis. They found that the altered state of consciousness achieved during AAH is genuine and while it is not the same as the one experienced during traditional hypnosis, all the major characteristics are present (Cikurel & Gruzelier, 1990; E. Kasos et al., 2018; K. Kasos, Kekecs, et al., 2018; Malott, 1984; Miller et al., 1991). Major differences are that participants during AAH move faster, reported to find tasks interesting and felt no irritation after failing to perform them, they feel more alert, and describe feeling more positive. They often felt like that after the initial fatigue, they caught a second wind and were able to keep pedalling longer (Bányai, 2018).

AAH has been used in sport psychology with great success and understanding the effect of ASC during sport and its role in exercise performance has important implications for training and preparation for athletes and coaches as well.

1.10 Altered State of Consciousness and Sport

Defining what consciousness is, has been a major focus of interdisciplinary research. In contemporary views consciousness is conjectured in terms of its experienced presence or absence (Bányai & Benczúr, 2008). In psychology, it refers to the individual's awareness of their thoughts, memories, feeling, sensations and environment (Kihlstrom, 2008). It includes a wide range of subjective experiences, influenced by psychological and social environment, mood and arousal, whether we focus on our surroundings or the inner experience and can change significantly from moment to moment (Farthing, 2008). Even if consciousness is very hard to describe, people seem to have a shared understanding or innate intuition about what it is and its essential properties (Schneider, 2008).

Altered state of consciousness (ASC) can be described as one of the basic states of humankind (Farthing, 2008). Certain aspects of consciousness can change during ASC, such as attention, perception, imagery and fantasy, inner dialogue, memory, time perception, cognition, affect, arousal, suggestibility or body image (Pekala et al., 1986). While change in one aspect does not mean ASC, one does not need to experience changes in all aspects, to achieve ASC (Bányai & Benczúr, 2008; Pekala, 1991; Pekala & Levine, 1981; Varga et al., 2014).

Many people who exercise report experiencing changes in consciousness (Chavez, 2008), describing feeling in control, effortless focused attention, less anxiety, and being able to move easily (Ravizza, 1977). These experiences, indicating an alteration in consciousness are similar to those expressed by participants of AAH (Bányai, 1987). Research into altered state of consciousness (ASC) during sport and exercise - apart from the "flow" or "the zone" experience (Csikszentmihalyi, 1990) - is lacking in the literature, maybe because of the ambiguity of definitions and the challenges associated with the specific state that accompanies sport performance.

Why is it important to draw parallels between states of consciousness during hypnosis and sport activities? Some individuals become highly suggestible during hypnosis and increased suggestibility is often associated with ASC (Kihlstrom, 2008). Studies have linked spontaneously occurring ASC during emergencies with increased suggestibility, and in these altered states positive and negative suggestions have a profound effect on people (Kekecs & Varga, 2011, 2013; Szilágyi et al., 2007, 2014; Varga et al., 2013) because under these circumstances, we tend to take communication literally, very personally and with negative meaning (Bejenke, 1996; Kekecs & Varga, 2011; Varga et al., 2007). Studies focusing on communication during different medical procedures, found support for the significant effect of positive suggestion (Cruise et al., 1997; Lang & Berbaum, 1997; Nilsson et al., 2001), reducing recovery time, the need for pain medication, even the length of time patients had to spend on mechanical ventilation (Benczúr, 2012; Szilágyi et al., 2014; Varga et al., 2013).

Similar changes in conscious awareness during exercise and hypnosis context would make a strong case that during exercise susceptibility to suggestions may similarly increase. This parallel would mean that the quality of communication among coaches and athletes or teammates has profound importance and maintaining ASC during exercise or competition may have significant benefits. Negative communication may influence performance and anxiety through the suggestions itself or by interrupting the exercisers' altered state. ASC, both in flow state and AAH, has a documented positive effect on sport performance, via reduced anxiety, and enhanced cooperation (Bányai et al., 1993; Chavez, 2008; Robazza & Bortoli, 1994; Stein et al., 1995).

Previous investigations show that positive suggestions from coaches can reduce anxiety and help improve sport performance (Smith et al., 2007) while hypnosuggestive techniques are used increasingly during training (Jara & Gracés, E., 1995). Because of the apparent performance enhancing properties of ASC, it would be very desirable to be able to enter ASC at will. AAH has been used in sports to reduce anxiety, help exercisers focus, move more effortlessly (Robazza & Bortoli, 1994). Participants during AAH find that pedalling becomes effortless and an increase in their speed can be observed (Bányai & Hilgard, 1976). Although AAH has been used successfully to enhance sport performance, few empirical studies have been conducted on this topic (J. B. Barker et al., 2013; Robazza & Bortoli, 1994, 1995).

During group activities strong affective contagion is often observed among members (Zumeta et al., 2016). This emotional synchrony is also observed during hypnosis and ASC seems to enhance it. Some even theorize that the enhanced synchrony and thus cooperation, faster understanding is one of the evolutionary adaptive aspects of ASC (Bányai, 1991). Interpersonal synchrony is also associated with more self-esteem (Lumsden et al., 2014) and trough positive emotions can increase performance, reduce stress (Carreres-Ponsoda et al., 2017) and thus promote the maintenance of ASC.

Sensitive, conscious communication is essential, especially during a game or when exercisers train. Although ASC during exercise is not negative as it usually is during medical procedures the presence of ASC supports the notion that suggestibility may also be increased. Utilizing the increased suggestibility through positive communication can be a valuable tool and a relatively simple way that can reduce competitive and performance anxiety, fatigue, increase performance, even improve synchrony between teammates or coach and athlete.

Chapter 2: Studies 1-4

Study 1.

Changes in Oxytocin and Cortisol in Active-Alert Hypnosis: Hormonal Changes Benefiting Low Hypnotizable Participants

Abstract

It is increasingly clear that oxytocin and cortisol play an intricate role in the regulation of our behaviour and emotions impacting health, relationships and well-being. Their long term, cross-generational effect makes them an important focus of the present study.
This exploratory research examined changes in oxytocin and cortisol levels and their correlations with different phenomenological measures during Active-Alert Hypnosis.
The level of oxytocin increased while the level of cortisol decreased in the hypnotist. When comparing the oxytocin changes of subjects with their hypnotizability, those with low hypnotizability scores experienced an increase in oxytocin, and those with medium and high hypnotizability scores showed no change or decrease. This could explain why clients' hypnotizability is not considered an important factor during hypno-therapy.

Keywords: oxytocin, cortisol, active-alert hypnosis, interaction

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CHANGES IN OXYTOCIN AND CORTISOL IN ACTIVE-ALERT HYPNOSIS: Hormonal Changes Benefiting Low Hypnotizable Participants

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CHANGES IN OXYTOCIN AND CORTISOL IN ACTIVE-ALERT HYPNOSIS: *Hormonal Changes Benefiting Low Hypnotizable Participants*

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Abstract: It is increasingly clear that oxytocin and cortisol play an intricate role in the regulation of behavior and emotions impacting health, relationships, and well-being. Their long-term, cross-generational effect makes them an important focus of the present study. This exploratory research examined changes in oxytocin and cortisol levels and their correlations with different phenomenological measures in both hypnotist and subject during active-alert hypnosis. The level of oxytocin increased whereas the level of cortisol decreased in the hypnotist. When comparing the oxytocin changes of subjects with their hypnotizability, those with low hypnotizability scores experienced an increase in oxytocin, and those with medium and high hypnotizability scores showed no change or decrease. This could explain why clients' hypnotizability is not considered an important factor during hypnotherapy.

It is more and more recognized today that hypnosis is a social situation (Bányai, 1991; Jensen et al., 2015; Thompson, Steffert, & Steed, 2011; Whitehead, Noller, & Sheehan, 2008; Zelinka, Cojan, & Desseilles, 2014). Because oxytocin (OT) as a neuromodulator regulates the processes of social affiliation in the brain and cortisol is a stress hormone, it is promising to join these branches of research.

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Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/nhyp.

Most research has focused only on the subject; one of the rare exceptions is Susan Whitehead, who looked at the hypnotist as well as the subject. Whitehead et al. (2008), examining the reports of hypnotists, found that hypnotists are very much present and influenced by the subjects in the hypnosis situation. They found that hypnotists made judgments about the subjects according to first impressions or stereotypes that in turn influenced the subjects (Whitehead et al., 2008).

It seems to be a promising avenue to explore the relationship between changes in the level of OT and cortisol in both parties of the hypnotic dyad in response to hypnosis for a better understanding of both fields.

Central OT as a neurotransmitter regulates social affiliation, and peripherally it plays a significant role in perinatal processes (Insel, 1992). Although there are still doubts, anatomical and behavioral evidence seems to link the two (Crockford, Deschner, Ziegler, & Wittig, 2014). Social circumstances further complicate this process, influencing the effects and release of OT (Bartz, Zaki, Bolger, & Ochsner, 2011; Olff et al., 2013). There is emerging evidence that although OT has numerous positive effects on social behavior—such as aiding social-cognition, -memory, -recognition, -attention, and -motivation (Chang, Barter, Ebitz, Watson, & Platt, 2012)—it can also increase negative, preexisting social preconceptions, motivation, and perception (De Dreu, 2012). OT, alhtough having a positive effect on attitude toward members of a perceived in-group, can have an opposite effect on the attitude directed at members of an out-group (De Dreu, 2012). It seems that early life experiences also influence the role OT plays (Feldman, 2012), as neglected children's OT systems showed slower reactions (Fries, Ziegler, Kurian, Jacoris, & Pollak, 2005). Although significant relationships have a stronger influence on peripheral OT (Bick & Dozier, 2010; Feldman, Weller, Zagoory-Sharon, & Levine, 2007; Fries et al., 2005; Gordon, Zagoory-Sharon, Leckman, & Feldman, 2010), there is also evidence that OT plays a role in bonding between nonkin humans as well (Holt-Lunstad, Smith, & Layton, 2010),

In the field of hypnosis, so far almost all studies measuring OT during hypnosis have applied intranasal manipulation (instead of measuring natural changes). After finding that intranasally introduced OT increased the subjects' susceptibility to suggestion (Bryant, Hung, Guastella, & Mitchell, 2012), Bryant and colleagues (2012) examined the effect of OT (introduced through intranasal spray) on the subjects' hypnotic responses. Although they did not observe the anxiety-decreasing and trust-increasing influence of OT, they did observe an increase in hypnotic responses. They argued that this was the result of improved rapport between hypnotist and subject, and thus the subjects were more motivated to respond to hypnotic suggestions. In contrast with previous studies, intranasal OT has been shown to have a detrimental effect on memory processes, inhibiting the posthypnotic suggestion for word blindness on a Stroop test (Parris, Dienes, Bate, & Gothard, 2014).

The stress hormone cortisol was also only sporadically investigated with regard to hypnosis and, to our knowledge, no research has examined how the *interactional* situation influenced changes in cortisol levels. Adlercreutz, Kuoppasalmi, Närvänen, Kosunen, and Heikkinen (1982) suggested that hypnosis on its own cannot inflict hormonal changes, only hypnotically suggested emotions can. This was supported by the study that instructed subjects to experience different emotional states (angry, depressed, happy) during hypnosis and showed that anger or depression increased cortisol and had an immunosuppressive effect, whereas happiness decreased cortisol (Zachariae et al., 1991). Sobrinho (2003) refined this question further, associating cortisol surges with shock and intimidation but not rage, stating that whereas hormonal changes are elicited by emotions induced during hypnosis, different hormones respond to specific emotions (Sobrinho, 2003).

The Gruzelier group dedicated several studies to examining changes in cortisol during hypnosis. Two separate studies found that tiredness had a positive correlation with cortisol before hypnosis training but had actually reversed after, and tiredness was correlated with the decrease of cortisol (Gruzelier, Clow, Evans, Lazar, & Walker, 1998; Gruzelier, Levy, Williams, & Henderson, 2001). They also found that subjects who reported higher levels of tension before the intervention increased their cortisol (Gruzelier et al., 2001).

So far, the only study that approached OT and cortisol levels interactionally (focusing not only on the participant but on the hypnotist as well) was by Varga and Kekecs (2014). They tracked how OT and cortisol levels changed during standardized traditional relaxational hypnosis (TRH) in 24 healthy male subjects and four male hypnotists and explored the relationship between these changes and several phenomenological measures (such as s-EMBU, STAI-s, STAI-t, AIM, PCI, DIH, see details below).

They found that OT levels decreased in subjects and increased in hypnotists, although none of these results were significant, whereas the decrease in cortisol levels reached significance in both subjects and hypnotists. Maybe because of the small sample size, but they found no correlation between hypnotizability and changes in OT and cortisol. Interestingly, at the same time, there was significant correlation between the changes in OT, cortisol, and the participants' relational experiences.

Of the relational questionnaires used, the perceived harmony between subjects, reported by the subject on the Dyadic Interactional Harmony Questionnaire (DIH; Varga, Józsa, Bányai, & Gősi-Greguss, 2006)—especially the communion subscale—showed significant correlation with the OT increase of the subject. At the same time, subjects' emotional warmth toward their parents expressed on the Egna Minnen

Beträffande Uppfostran (My Memories of Upbringing) Questionnaire, short version (s-EMBU; Arrindell et al., 1999) showed significant negative correlation with the hypnotists' OT increase. They found no connection between the subjects' OT and the results on the Archaic Involvement Measure (AIM; Nash & Spinler, 1989). Because of the exploratory nature of the study, their sample size was small, and they cautioned readers to treat the results carefully. Varga and Kekecs (2014) excluded female participants to avoid the impact of menstrual cycles and oral contraceptives on the hormonal levels.

The current study aims to replicate the study of Varga and Kekecs (2014) using active-alert hypnosis (AAH) induction to bring about a trance state in subjects.

AAH was developed and standardized by Bányai and Hilgard (1976), who later proved that AAH and TRH share common features in most aspects (relinquishing of the planning function, lack of reality testing, and highly focused attention). They also described differences between the two types of hypnoses: Subjects in AAH reported a higher sense of agency as well as more positive emotions.

We expect that hypnotizability will have no influence on the changes in OT and cortisol levels, whereas the quality of relationships between the participants—reflected in the self-report tests—will, as described above.

Our hypotheses, based on the findings of Varga and Kekecs (2014), are that cortisol levels but not OT levels will decrease both in subjects and hypnotists from pre- to posthypnosis, but neither will positively correlate with hypnotic susceptibility. We also hypothesize that the emotional warmth (s-EMBU, see below) regarding the subjects' relationship will be positively correlated with the increase in OT levels of the hypnotist. Furthermore, we hypothesize that the subjects' increase in OT will be positively correlated with the communion score (DIH). Because this is the first time that OT and cortisol have ever been measured during active-alert hypnosis, we plan to conduct explorative analysis of the changes in the level of OT and cortisol and their association with the scores obtained on the phenomenological measures (DIH, s-EMBU, PCI).

Method

The research was approved by the Institutional Ethical Board of the Eötvös Loránd University.

Because of the interactional nature of the study, the data of both the hypnotist and subject were considered for analysis, so the term *participant* covers both, and we use the term *subject* when talking about those who were hypnotized and *hypnotist* in the case of the person who was conducting the hypnosis.

Subjects

Thirty-one adult female individuals (N = 31, mean age = 23.28, SD = 3.54) were recruited for the study from the database of the Department of Affective Psychology Hypnosis Laboratory. An initial invitation was sent out via email to every female in the database who indicated a willingness to participate in subsequent research. Addressees could choose from multiple appointments, making sure they did not know the hypnotist.

All of the contacted subjects had prior experience with group hypnosis, in which, using the Harvard Group Scale of Hypnotic Susceptibility: Form A (HGSHS:A; Shor & Orne, 1962), their hypnotizability was scored. Each hypnotist was paired with two low and two high hypnotizable participants, low being in the range of 1 to 6, and high in the range of 7 to 12 of the HGSHS:A score.

Hypnotist

Only female hypnotists were chosen for the study (N = 5, mean age = 54.2, SD = 11.43). They were all certified hypnotherapists and members of the Hungarian Association of Hypnosis.

The inclusion criteria for both subjects and hypnotists were female, physically and mentally healthy (self-reported), over age 18, fluent in Hungarian, and literate. Only participants who did not take any medication containing any hormones (i.e., contraceptives) were included in the study.

Procedure

When the acceptable appointment was chosen, participants received instructions regarding the day of the hypnosis. They were asked to refrain from smoking and consuming caffeine or alcohol on the day of the session. They could eat up to an hour before the appointment, after which they could only drink regular water. Both subjects and hypnotists were waiting in separate rooms before the session for 15 minutes to reduce the stress of arrival. During this time, informed consent was obtained and the State Anxiety Questioner from State Trait Anxiety Inventory (STAI-s; Spielberger, Gorsuch, & Lushene, 1970) was filled out. After 15 minutes, the baseline saliva sample was collected. During the session, electrodermal activity was measured (Kasos et al., 2017); the results of this measurement are discussed elsewhere in the article.

Following the saliva collection, the subject was led into the hypnosis chamber and set up on the stationary ergometer. Then the hypnotist came in, meeting the subject for the first time. The hypnosis followed the text of SHSS:C (Weitzenhoffer & Hilgard, 1962), developed for the active-alert situation by Bányai and Hilgard in 1974. The session was video recorded. The hypnotists were not informed about the hypnotizability of the subjects.

After the session, both participants returned to their respective rooms, finishing their Stanford booklets and filling out the following tests: AIM, PCI, DIH, STAI-S, STAI-T. After 15 minutes, the second saliva sample was collected, and then the s-EMBU was added to the end of the sequence of tests, ensuring that no mention of parental connection happened before the collection of saliva samples.

In order to control for the influence of the circadian cycle on hormones, all sessions were conducted between 11 A.M. and 1 P.M.

Saliva Collection, Sample Processing, and Hormone Measurement. Unstimulated saliva samples were collected by passive drool and stored at −20 Celsius until analysis. Salivary OT was measured by enzyme immune assay (EIA; ENZO Life Sciences ADI 900–153); 1.5 ml saliva was precipitated by 1xVol 0.1 M trichloroacetic acid (TCA) followed by C18 Sep Pack column extraction using acetonitrile: TCA 1:1 mixture. The final eluate was lyophilized by Speed-Vac concentrator, and the sample was reconstructed in 300 µl assay buffer (5x concentrate of the original saliva). The EIA steps were performed according to the instructions of the kit protocol.

Salivary cortisol concentration was assessed from the original saliva samples by EIA (Salimetrics State College, PA, USA; cat number: 1–3002). Salivary cortisol samples were assayed in duplicate using 25 µl saliva per well, according to the manufacturer instructions. The sensitivity of the assay is 0.003 µl/dL. Intra- and interassay coefficients (CV) were 3,35% and 3,75–6,41 respectively. The assay does not show significant cross-reactivity with other corticosteroid hormones or sex steroids. The correlation with plasma is 0.91.

Questionnaires

AIM. The AIM, developed by Nash and Spinler in 1989, measures the archaic experience occurring between the participants of the hypnotic interaction (Nash & Spinler, 1989). Answers are registered on a 7-point Likert scale in which 1 means "I did not feel this at all" and 7 means "I felt this very strongly." In order to assess the interactional aspect of hypnosis, a modified version was used during the study. Both hypnotists and subjects received separate, specific tests and, in addition to the 19 questions of the original, three negative items were added. The total AIM score was used during calculations, based on the 19 positive items, as per the original study (Varga & Kekecs, 2014). Cronbach's alpha in the subjects' sample (αs) = .93; Cronbach's alpha in the hypnotists' sample (αh) = .84.

PCI. The Hungarian version (Szabó, 1989, 1993) of the PCI (Pekala, 1991; Pekala, Steinberg, & Kumar, 1986) was used to assess the subjective experience of participants regarding alterations in consciousness. Participants received 53 dipolar statements and had to indicate on a 6-point Likert scale which of the two they agreed with more. The phenomenology of experience is described through 12 major and 14 minor scales as follows (minor scales in brackets): *altered experience* (altered body image, perception, meaning, and time sense), *positive affect* (joy, sexual excitement, and love), *negative affect* (anger, sadness, and fear), *visual imagery* (amount and vividness), *attention* (direction and concentration), *self-awareness*, *altered state of awareness*, *internal dialogue*, *rationality*, *volitional control*, *memory*, and *arousal*.

DIH. Measuring the phenomenology of the relationship between subject and hypnotist, the DIH Questionnaire (Varga et al., 2006) consists of 50 items, in which participants indicate on a 5-point Likert scale how much a certain adjective was consistent with how they felt about the previous hypnosis session. Because of time constraints, the shortened version was used, with 40 items and four subscales: *intimacy* (αs: .72, αh: .87), *communion* (αs: .87, αh: .92), *playfulness* (αs: .75, αh:,67), and *tension* (αs: .69, αh: .60).

s-EMBU. The s-EMBU measures adults' recollection of the childrearing style of their parents (Arrindell et al., 1999). In this shortened version, participants scored the parenting style of their mother and father separately through 23 statements. The measure contains three subscales: *rejection* (the parent behavior is characterized as cold, critical, shaming, and punishing; αs: .80, αh: .77); *emotional warmth* (the parent behavior is characterized as loving, accepting, and safe; αs: .86, αh: .98); and *protection* (the parent behavior is characterized as excessively fearful and anxious; αs: .85, αh: .42). Hypnotists only filled out this questionnaire once.

STAI. The STAI, developed by Spielberger, measures anxiety as a stable trait as well as related to the moment (Spielberger et al., 1970). The measure consists of 40 items (20 state and 20 trait items), and participants indicate their answers on a 4-point Likert scale about how much the different statements describe how they feel at the moment and how they feel generally: 1 (not at all) to 4 (completely). Minimum possible score was 20 and maximum was 80. Results from this test are not reported here.

Results

The saliva samples of 31 hypnosis sessions were collected; 13 sessions (52 saliva samples) were excluded because the amount of saliva did not reach the level necessary for analysis. This resulted in 18 (72 saliva samples) sessions for OT analysis; five samples were excluded from the cortisol analysis because of low levels.

Results Regarding Pre- and Post-OT and Cortisol Levels

Eighteen valid cases were analyzed in terms of changes in OT from pre- to posthypnosis (see Figure 1). The results of the paired sample *t*-test show no significant changes between pre- and posthypnosis in the subjects' OT levels, $t(17) = .89$, $p = .385$. However, the test yielded a nonsignificant trend in the hypnotists' OT levels, $t(17) = -1.85$, $p = .081$. The OT levels tended to be higher in hypnotists after hypnosis as compared to before hypnosis.

The analysis of the 67 samples regarding cortisol levels yielded significant results for the hypnotist, $t(14) = 2.33$, $p = .035$, Cohen's $d = .60$ (see Figure 2). Cortisol levels significantly decreased between pre- and posthypnosis in the hypnotists. There were no significant changes in the subjects' cortisol levels, $t(17) = 1.12$, $p = .28$.

Results Regarding Hypnotizability

There was no significant correlation between cortisol levels and hypnotizability. Spearman correlation between hypnotizability and baseline OT levels of participants was significant in both baseline, (Spearman's $r = .58$, $p = .011$; see Figure 3) and change in OT levels (Spearman's $r = .70$, $p = .001$; see Figure 4).

A repeated measures ANOVA was conducted using OT level (before and after hypnosis) as the within-subjects factor and hypnotizability (low, 0–6, or high, 7–12) as the between-subjects factor (see Figure 5). According to the results, there were no significant main effects; however, there was a significant interaction of OT level and hypnotizability, $F(1, 17) = 8.63$, $p = .01$, $\eta 2 = .35$. High hypnotizable subjects had lower

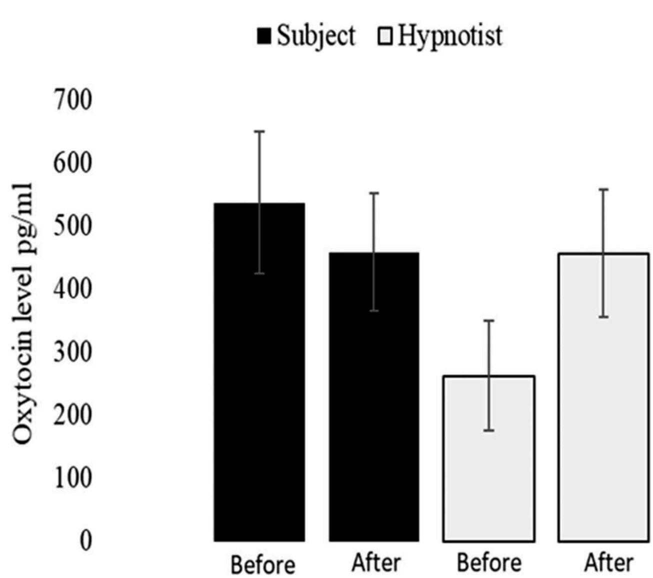

Figure 1. **Oxytocin levels before and after hypnosis in the hypnotist and subject. Y error bars represent ± one standard error the mean.**

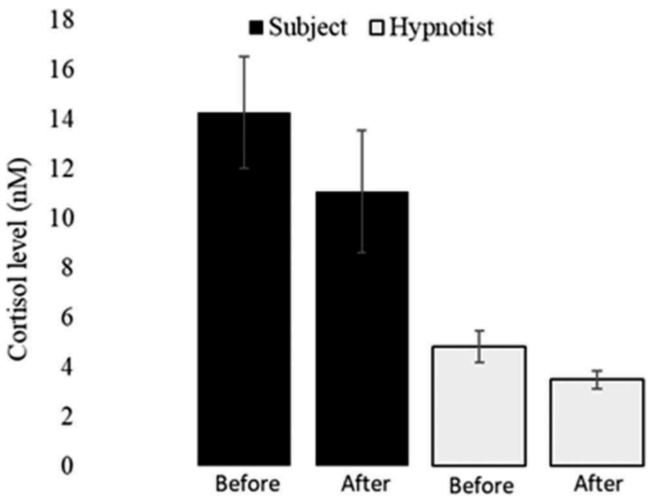

Figure 2. **Cortisol levels before and after in the hypnotist. Y error bars represent ± one standard error the mean.**

OT levels, and low hypnotizable subjects had higher levels after hypnosis compared to OT levels at baseline.

Regarding the changes in subjects' OT levels, three distinct groups were identified during data exploration: those who experienced an increase in their OT levels, those whose OT levels decreased, and those who showed no or minimal change during hypnosis (see Figure 6). A one-way ANOVA was conducted to explore whether there was a difference of hypnotizability among the three groups, $F(2, 15) = 5.25$ $p = .019$ $\eta 2 = .41$. An independent sample t-test after Bonferroni adjustment revealed significant differences in hypnotizability between the group with increasing OT level and the one with no change in OT levels, $t(11) = 2.62$, $p = .044$, and between increasing and decreasing level of OT, $t(6) = 4.45$, $p = .020$. There were no other significant differences between groups. According to the results, the average hypnotizability in the group with increasing OT level was significantly lower than the average hypnotizability in the other two groups.

Spearman correlations were calculated for the change in cortisol levels and the subscales of self-report questioners.

Results Regarding the Communion Subscale of the DIH and the Changes in OT Levels in the Participants

Opposed to our hypothesis, the *communion* subscale of the DIH as rated by the subject did not show a significant correlation with the changes in OT levels of the subject, Spearman's $r = -.13$, $p = .594$.

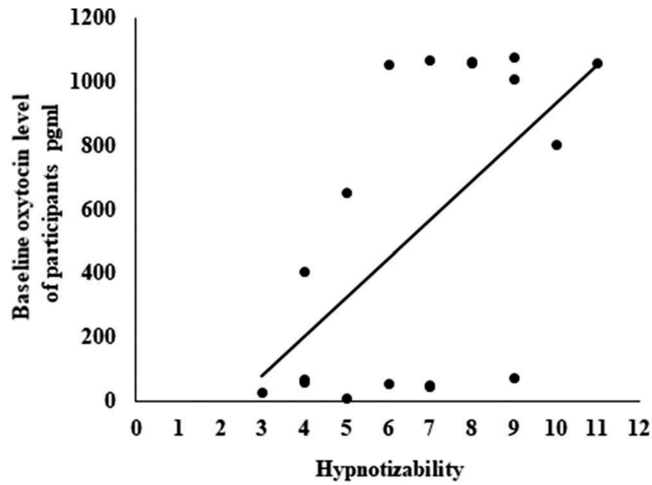

Figure 3. **Correlation between baseline oxytocin levels of the subjects and their hypnotizability.**

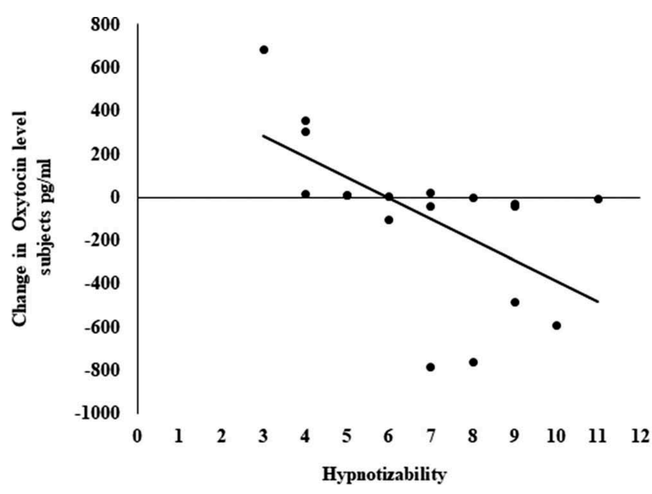

Figure 4. **Correlation in the change in oxytocin levels in subjects and their hypnotizability.**

However, there was a nonsignificant negative trend between the changes of the subject's OT and the *communion* subscale of the DIH as rated by the hypnotist, Spearman's $r = –.45$, $p = .061$ (see Figure 7).

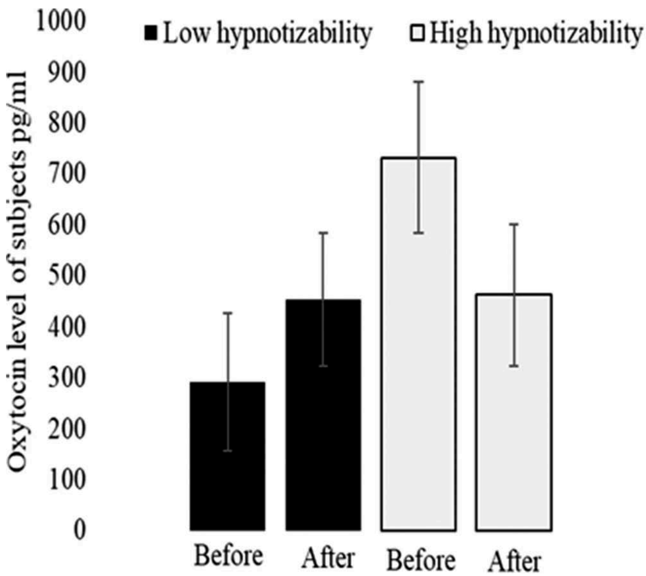

Figure 5. **Oxytocin levels in low and high hypnotizable before and after hypnosis. Y error bars represent ± one standard error the mean.**

Results Regarding the Correlation of s-EMBU of the Subjects and Changes in OT of the Hypnotist

Spearman correlation with regards to the *emotional warmth* subscale of s-EMBU and changes in OT levels in the hypnotist yielded a nonsignificant result, Spearman's $r = .24$, $p = .335$. However, the *protectiveness of the father* subscale of s-EMBU of the subject yielded a significant negative correlation with the changes in OT in the hypnotist, Spearman's $r = -.48$, $p = .045$ (see Figure 8). *Parental protectiveness* also yielded a nonsignificant trend, Spearman's $r = -.41$, $p = .087$.

Main Results of the Explorative Analysis

Table 1 displays the results of the correlation between the subjects' PCI and change in OT and cortisol levels in the subject and hypnotist. According to the results, the more OT participants have after hypnosis compared to before hypnosis, they rate their *altered state of awareness* lower and they rate their *self-awareness* higher, their *time sense* and *perception* is less distorted, and they report less *concentration* and *vividness* of imagery. The more cortisol participants have after hypnosis compared to before hypnosis, they report more *imagery* in general and more *vivid* imagery in particular. There was only one

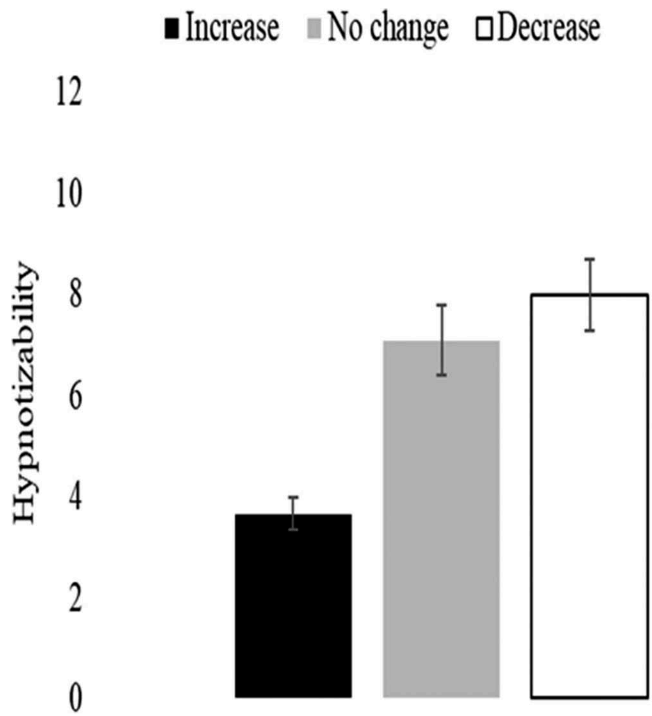

Figure 6. **Hypnotizability and changes in oxytocin levels of subjects.**

significant correlation found between the participants' PCI and changes in hormonal levels in the hypnotist. The more cortisol the hypnotists had after hypnosis compared to their baseline level, the higher the subjects rated their *rationality* during the hypnosis session (for details, see Table 1).

Regarding the correlation between the hypnotists' PCI and change in OT and cortisol levels in the subject and hypnotist, the more OT the participants had after the hypnosis compared to baseline levels, the lower the hypnotists rated their own *altered state of awareness* and *arousal*, $r = -.53$, $p = .05$, $r = -.60$, $p = .01$, respectively. There were no other significant correlations. The detailed results of this analysis are available from the authors.

Discussion

We wanted to repeat the study of Varga and Kekecs (2014) conducted in traditional, relaxational hypnosis (TRH) experimental sessions, this time using active-alert induction.

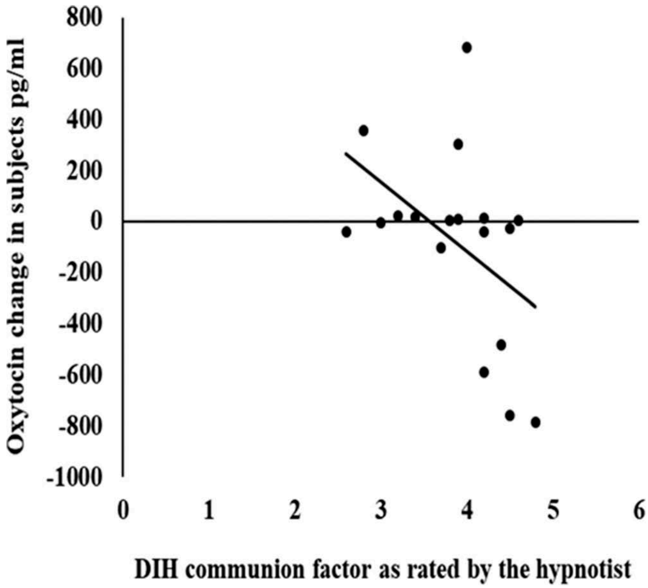

Figure 7. **Correlation between oxytocin change in the subjects and the communion subscale of the DIH as rates by the hypnotist.**

Unlike during traditional hypnosis, no significant change in the OT levels of the subjects was found during the hypnosis session. Both studies found an increase in OT in the hypnotists, which proved to be significant during AAH.

In both studies, cortisol level decreased in both hypnotists and subjects, but in the present study the change in subjects did not reach significance.

Varga and Kekecs (2014) reported no significant correlation between hypnotizability and changes in OT and cortisol levels in either low or high hypnotizable participants. In our results, the OT level of low hypnotizable subjects increased from pre- to postsession, whereas for high hypnotizable subjects, the OT level decreased. Further analysis also revealed a third group, whose OT level did not change during hypnosis.

These three categories seem to correspond to various hypnotizability levels: OT-increasing subjects being the low hypnotizables, OT-same-level subjects the medium ones, and OT-decreasing the high hypnotizables. At first glance, this seems to be counterintuitive, as traditionally the low hypnotizables are considered as not benefiting from hypnosis; nevertheless, their OT level increases in response to the hypnotic situation. This could be a new set of data in understanding more precisely the regulatory function of OT in humans (Crockford et al., 2014). On the other hand, this information

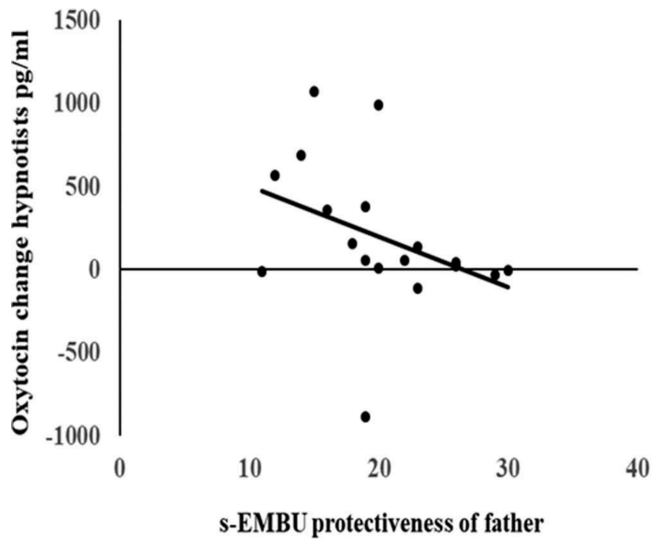

Figure 8. **Correlation between changes in oxytocin and the protectiveness of the father subscale of the s-EMBU as rated by subjects.**

is a possible explanation how those who are not "high" in overt behavioral responses to hypnosis can still get meaningful experiences.

The phenomenological analysis leads to a complex picture. Unlike during traditional hypnosis, the *communion* subscale of the subjects' DIH did not show correlation with the changes in OT.

Based on the results of Varga and Kekecs (2014), we expected there would be a negative correlation between the subjects' *emotional warmth* toward their parents expressed on the s-EMBU and the increase of the hypnotists' OT. The results of the AAH did not show this correlation, but the *protectiveness of the father* subscale did show a significant negative correlation with the changes of the hypnotists' OT, whereas the *parental protectiveness* showed a nonsignificant trend.

As mentioned above, low hypnotizability—based on behavioral scoring—seams to be connected to increasing OT level in participants. The same pattern appears on the basis of phenomenological data: Increased OT is connected with lower *altered state of awareness*, higher *self-awareness*, less distorted *time sense* and *perception*, and less *concentration* and *vividness of imagery*. These data seem to show that those who are not or are less involved in hypnosis (both behaviorally and phenomenologically) nevertheless could mobilize their OT system in this special social setting. This could be a remarkable factor that can explain why hypnotic susceptibility is not an issue in most clinical settings and

Table 1
Correlation Between the Subjects' PCI and Change in Oxytocin and Cortisol Levels in the Subject and Hypnotist

Subject's PCI	S-Oxytocin change	S-Cortisol change	H-Oxytocin change	H-Cortisol change
Altered experience	−.37	.14	−.04	−.19
Body image	.07	.08	.22	.33
Time sense	−.68**	.17	−.18	−.10
Perception	−.44	−.10	−.15	−.19
Meaning	.08	.32	.00	.00
Positive affect	.37	−.05	−.42	−.16
Joy	.16	.03	−.40	−.08
Sexual excitement	.37	.04	.24	.14
Love	.20	.00	−.43	−.13
Negative affect	.25	.02	.06	−.11
Anger	.16	−.32	−.12	−.12
Sadness	.28	.15	.15	−.08
Fear	.23	−.20	.11	−.07
Attention	−.39	−.09	−.22	−.16
Direction	−.13	−.11	−.29	−.26
Concentration	−.56*	−.08	.03	.07
Imagery	−.22	.64**	−.38	−.22
Amount	.05	.50	−.45	−.23
Vividness	−.48*	.54*	−.28	−.29
Self-Awareness	.60**	−.33	−.11	−.39
Altered State of Awareness	−.49*	.37	−.24	.02
Arousal	−.18	.04	−.37	−.39
Rationality	.33	−.28	.54*	−.35
Volitional Control	.23	−.12	.23	.02
Memory	.30	−.07	−.09	−.10
Internal Dialogue	.22	.22	.10	−.20

Note: *Correlation is significant at the .05 level (2-tailed). **Correlation is significant at the .01 level (2-tailed).

clinical effectiveness is not a direct function of hypnotizability (Barabasz, Olness, Boland, & Kahn, 2010).

Another finding of the exploratory analysis was that the higher the imagery (and its vividness), the higher the cortisol increase in subjects, as if the internal "work" on imagery would function as a stressor. Studies found that mental imagery is a central element of hypnosis (Landry, Lifshitz, & Raz, 2017). For example, visualization is a useful tool in improving different immune parameters, and those more capable of vivid mental imagery experience the positive effects of hypnosis more (Gregerson, Roberts, & Amiri, 1996; Kwekkeboom, Huseby-Moore, & Ward, 1998; Thompson, Steffert, & Gruzelier, 2009; Watanabe et al., 2006)

Even if there is a danger of higher probability of type I error, an interesting pattern arises when we interrelate the data of subjects and those of the hypnotists. It is as if the members of the diad would function as a "system": positive correlation between the *rationality* subscale of the subjects' PCI and the hypnotists' OT change, and a negative correlation between the *altered state of awareness* and *arousal* subscales of the hypnotists' PCI and the subjects' OT change. It can be observed that often, when one member of the diad moves in a certain direction on a specific subscale, the other compensates. This is reminiscent of the classic affiliative conflict theory (Argyle & Dean, 1965), stating that both interactional partners tailor the outcome of the situation. The original theory focuses on the approach and avoidance forces behind an individual's attempt to achieve a comfortable level of intimacy; our data seem to show an interactional equilibrium between the partners in alteration of consciousness.

There was only one significant correlation found between the participants' PCI and changes in hormonal levels in the hypnotist. The more cortisol the hypnotists had after hypnosis compared to their baseline level, the higher the subjects rated their *rationality* during the hypnosis session. Could it be that it is stressful for the hypnotist to face the lack of involvement of the subject? This is in line with a study that found that the cortisol level decreased below the critical level only when the subjects' archaic involvement was positive, whereas conflicted involvement was not associated with such change (Sachar, Cobb, & Shor, 1966).

There is a dynamic field focused on the late or even transgenerational effects of early life experiences. Cross-fostering studies on rats showed that wehreas high or low licking and grooming (LG) style was stable over time and over generations (Francis, Champagne, & Meaney, 2001), rats bread to low LG style mothers but raised by high LG mothers exhibited the brain OT profile and caring pattern of the high LG strain. (Champagne, 2008; Francis et al., 2001) This seems to indicate that although genetics influence OT profile, it can be changed during development.

When examining the changes in OT during parent-child interaction, Feldman, Gordon, Schneiderman, Weisman, and Zagoory-Sharon (2010) found that although an increase was observed in both mothers and fathers, it was related to their typical mode of contact. Fathers experienced an increase while engaged in stimulatory and mothers while engaged in affectionate contact, and not vice versa (Feldman et al., 2010). An interesting avenue of further study would be how different hypnosis styles (maternal, paternal, sibling, etc.) are related to OT changes.

Furthermore, Feldman, Gordon, Schneiderman, et al. (2010) found that parents' and their children's OT correlated significantly both before and after intervention, suggesting a cross-generational transmission. They also found support that OT levels in both parent and child are influenced by early social experiences (Feldman et al., 2010), highlighting the importance of corrective experiences in accordance with the social-psychobiological model (Bányai, 1991).

An important physiological stress study by Pesonen and colleagues (2010) examined subjects separated as children from either their father or both parents during World War II and found that whereas separation from only the father did not result in significant differences in cortisol, separation from both parents did, also resulting in increased severity of depressive symptoms (Pesonen et al., 2007). This emphasizes the importance of childhood experiences and the long-term effect of cortisol, even as late as adulthood (Pesonen et al., 2010).

Regarding the regulation of social affiliation, hypnosis seems to be a good explanatory model. While interacting with others, we need to set a balance between *defense* and *attachment* systems: lower defenses when appropriate (threat and uncertainty is not all prevailing) and trust and care in a social context, again, when appropriate (the ability to experience attachment and proximity; De Dreu, 2012; Taylor et al., 2006). These aspects can be easily controlled under the standardized circumstances of a hypnosis setting, matching or contrasting the interactants' age, gender, familiarity, hypnotizability, and so on.

Limitations and Suggestions for Future Studies

Compared to the original study of Varga and Kekecs (2014), there were two important changes in the present study: Instead of TRH we used AAH and the gender of the participants.

We cannot rule out that physical exercise also influences OT and cortisol levels. Because exercise and changes in some peptide hormones have already been found to be associated in studies conducted on rats (Braga, Mori, Higa, Morris, & Michelini, 2000), it raises the question of whether being physically active itself might influence changes in OT levels in the present study. Relatively few human studies sought to measure this relationship; so far, results indicate that a single, short-term exercise (< 60 minutes) is not followed by changes in OT level (Altemus, Deuster, Galliven, Carter, & Gold, 1995; Altemus, Roca, Galliven, Romanos, & Deuster, 2001; Hew-Butler, Noakes, Soldin, & Verbalis, 2008). However, these results are limited in regard to our purposes because these studies all used blood samples to determine changes in OT level, whereas we measured OT changes through saliva testing.

These same studies indicated, on the other hand, that elevated cortisol levels follow even short-term exercise; this relationship has been shown to hold true examining salivary cortisol response following physical exercise as well (Kirschbaum & Hellhammer, 1994). It is worth noting that the aerobic fitness of participants and circadian influences can both affect such measurements (VanBruggen, Hackney, McMurray,

& Ondrak, 2011). Keeping in mind these limitations, it is possible that changes in cortisol, but not in OT levels, were influenced by the physical activity of the procedure; further studies are required to determine this question. Future studies should include nonhypnotic but physically active sessions to control for this variable.

In the present study, only female participants were chosen, in line with emerging research that posits that when females take no oral contraceptives (or any other medication containing hormones) they are ideal subjects when it comes to OT research (Ditzen et al., 2013; Feldman, Gordon, & Zagoory-Sharon, 2010; Insel & Hulihan, 1995; Rilling et al., 2014; Yamamoto et al., 2004). Several studies have examined the differences between the sexes pertaining to their reaction to OT and how these effects manifest (Ditzen et al., 2013; Insel & Hulihan, 1995; Rilling et al., 2014; Yamamoto et al., 2004) and found that sex steroids and behavioral subscales probably play a major role in influencing these processes (Jezová, Juránková, Mosnárová, Kriska, & Skultétyová, 1996; Petersson, Ahlenius, Wiberg, Alster, & Uvnäs-Moberg, 1998; Uvnäs-Moberg, 2011). Miller and colleagues (2009) illustrated that whereas the OT levels of female participants increased after contact with their bonded dogs, the levels of the male participants remained the same or decreased (Miller et al., 2009).

Although menstrual cycles are a seemingly important factor influencing OT levels, Feldman and colleagues (2010) found no effect of menstrual cycle phase on OT changes, so it was not taken into consideration during the current research.

The interactional, multilevel study of hypnosis creates an enormous statistical problem, increasing the possibility of a type I error. PCI in itself yields 26 scores instead of only a final one, and this problem is multiplied by the fact that we are examining an interactional paradigm. Further studies should focus on more specific research questions based on the explorative analysis like the present study.

Conclusion

Studying the neurohormonal changes of participants in the hypnotic interaction is important for many reasons: We can better understand hypnosis itself and, on the other hand, we can explore the possibilities of the hypnotic interaction in the regulation of OT and cortisol levels, possibly resetting optimal levels to achieve reparative effects on the imbalance of the attachment, defense, and coping mechanisms.

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Veränderungen von Oxytocin und Cortisol während Aktiv Wach-Hypnose: Hormonelle Veränderungen nützen Niedrig-Hypnotisierbaren

ENIKO KASOS, KRISZTIAN KASOS, FANNI PUSZTAI, ÁGNES POLYÁK, KRISZTINA J. KOVÁCS, UND KATALIN VARGA

Abstract: Es wird immer klarer, daß Oxytocin und Kortisol eine verzwickte Rolle in der Regulation von Verhalten und Emotionen, die auf die Gesundheit, Beziehungen und Wohlbefinden Auswirkungen haben, spielen. Ihr über mehrere Generationen reichender Effekt ist der wichtige Fokus der vorliegenden Studie. Diese explorierende Untersuchung prüfte Veränderungen der Oxytocin und Kortisol-Spiegel und ihre Korrelation mit verschiedenen phänomenologischen Ausmaßen sowohl beim Hypnotherapeuten als auch beim Probanden während einer Aktiv Wach-Hypnose. Der Oxytocin-Spiegel stieg bei den Hypnotherapeuten an während der Kortisol-Spiegel sank. Als man die Oxytocin-Veränderungen mit der Hypnotisierbarkeit verglich, zeigten niedrig Hypnotisierbare einen Anstieg des Oxytocins und mittel und hoch Hypnotisierbare keine Veränderungen oder sogar eine Abnahme. Dieses könnte erklären, weshalb die Hypnotisierbarkeit eines Klienten eher als untergeordneter Faktor während einer Hypnotherapie angesehen wird.

STEPHANIE RIEGEL, M.D.

Variations de l'ocytocine et du cortisol en hypnose active-alerte: les changements hormonaux sont favorables aux personnes peu sensibles à l'hypnose

ENIKO KASOS, KRISZTIAN KASOS, FANNI PUSZTAI, ÁGNES POLYÁK, KRISZTINA J. KOVÁCS ET KATALIN VARGA

Il est de plus en plus évident que l'ocytocine et le cortisol jouent un rôle complexe dans la régulation du comportement et des émotions touchant la santé, les relations interpersonnelles et le bien-être. Leur effet transgénérationnel à long terme en fait un élément important de la présente étude. Les auteurs* de cette étude exploratoire ont examiné les variations des niveaux d'ocytocine et de cortisol et leur corrélation avec différentes mesures phénoménologiques, tant chez l'hypnotiseur que chez son sujet pendant une séance d'hypnose active-alerte. Le niveau d'ocytocine augmentait chez le sujet alors que le niveau de cortisol diminuait chez l'hypnotiseur. En comparant les variations d'ocytocine des sujets avec leur susceptibilité à l'hypnose, on a découvert que le niveau d'ocytocine augmentait chez les sujets peu sensibles à l'hypnose, et qu'il demeurait le même ou diminuait chez les sujets moyennement ou très sensibles à l'hypnose. Cela pourrait expliquer la raison pour laquelle la susceptibilité à l'hypnose n'est pas considérée comme un facteur important pendant une hypnothérapie.

JOHANNE RAYNAULT
C. Tr. (STIBC)

Cambios en oxitocina y cortisol durante hipnosis activa-alerta: Cambios hormonales que benefician a los poco hipnotizables.

ENIKO KASOS, KRISZTIAN KASOS, FANNI PUSZTAI, ÁGNES POLYÁK, KRISZTINA J. KOVÁCS Y KATALIN VARGA

Resumen: Es cada vez más claro que la oxitocina y el cortisol juegan un papel intricado en la regulación de la conducta y emociones que impactan la salud, las relaciones y el bienestar. Sus efectos a largo plazo trans-generacionales los hacen un enfoque importante del presente estudio. Esta investigación exploratoria examinó los cambios en oxitocina y cotisol y sus correlaciones con distintas medidas fenomenológicas tanto en el hipnotista como en el sujeto durante hipnosis activa-alerta. El nivel de oxitocina incrementó mientras el nivel de cortisol decreció en el hipnotista. Al comparar los cambios en oxitocina con la hipnotizabilidad de los sujetos, se encontró que aquellos poco hipnotizables experimentaron un incremento en oxitocina mientras que los de hipnotizabilidad media no mostraron cambios o decrementos. Esto pudiese explicar por qué la hipnotizabilidad de los clientes no se considera un factor importante durante la hipnoterapia.

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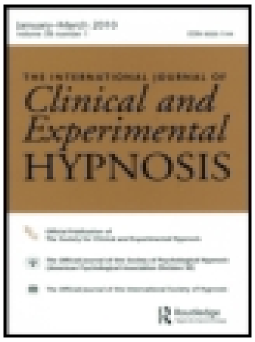
Study 2

Phenomenological Experiences during Active-Alert Hypnosis: Comparison of Hypnotist and Subject

Abstract

There has been increasing clinical interest in active-alert hypnosis (AAH), however relatively few studies have been devoted to studying its properties systematically. The present study compared the subjective experiences of subjects (31) and hypnotists (5) during AAH, using Pekala's Phenomenology of Consciousness Inventory (PCI), the Dyadic Interactional Harmony (DIH) scale and the Archaic Involvement Measure (AIM). Results demonstrated similarities between the experiences of subjects and hypnotists. The only significant difference between the subjects' and the hypnotists' experiences was shown by the PCI which highlighted the differences stemming from the different roles of hypnotist and subject during the AAH. The study suggests it may be important to examine subjective descriptors in the exploration personal experiences in studies of AAH.

Keywords: active-alert, hypnosis, interactionality, subjective experience,



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Eniko Kasos , Krisztian Kasos , Andras Kolto , Emese Józsa & Katalin Varga

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Phenomenological Experiences during Active-Alert Hypnosis: *Comparison of Hypnotist and Subject*

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ABSTRACT

There has been increasing clinical interest in active-alert hypnosis (AAH). However, relatively few studies have been devoted to studying its properties systematically. The present study compared the subjective experiences of subjects (31) and hypnotists (5) during AAH, using Pekala's Phenomenology of Consciousness Inventory (PCI), the Dyadic Interactional Harmony (DIH) scale and the Archaic Involvement Measure (AIM). Results demonstrated similarities between the experiences of subjects and hypnotists. The only significant difference between the subjects' and the hypnotists' experiences was shown by the PCI, which highlighted the differences stemming from the different roles of hypnotist and subject during the AAH. The study suggests it may be important to examine subjective descriptors in the exploration of personal experiences in studies of AAH.

ARTICLE HISTORY

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Introduction

Hypnosis, by nature, is a very personal, intimate experience, and many experts state that it is not possible to explore without the phenomenological experiences of the participants (Eisen & Fromm, 1983; Field, 1965; Fromm et al., 1981, 1988; Kahn et al., 1989; Lombard et al., 1990; Orne, 1959) However the phenomenology of active-alert hypnosis (AAH) and alert hypnosis in general is a field that has not received much attention. For this reason, we find it essential, in addition to studies exploring objective measures (E. Kasos et al., 2018) to examine the phenomenology of AAH.

Developed and standardized by Bányai and Hilgard (1976), AAH is a way to induce an altered state of consciousness by employing a method generally meant to increase strain, alertness and physical activity (Bányai & Hilgard, 1976). In most aspects, AAH is similar to traditional-relaxational hypnosis (TRH), as in subjects during AAH display similarly vacant facial expression and have similar subjective experiences. But there are some differences as well; during AAH, subjects reported a higher sense of agency and more positive feelings as well as faster, more exaggerated movements (Bányai, 1987).

Recently, hypnosis has been connected to the fundamental relationships of our lives, such as parent and child and lovers. Heterohypnosis as a special dyadic interaction has been proposed as the model situation of these relationships, as a very special synchrony may

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appear between the hypnotist and subject (Bányai, 2008; E. Kasos et al., 2018; Varga et al., 2013; Varga & Kekecs, 2014; S. K. Varga & Varga, 2009). It was also proposed that hypnosis may serve as a corrective or reparative experience in cases of unfavorable attachment or traumatic early experiences (Bányai, 1998; Varga, 2013; Zelinka et al., 2014).

The observation of dyadic interactions initially focused on mother-child interactions (Lindsey et al., 2009), and several studies showed their influence on development, mental and physical health, and relationships (Feeney, 2000; Feeney & Noller, 1990; Feldman, 2007; Feldman et al., 2013). The maintenance and development of such connections is a basic motivational need (Barber et al., 2001). Still, considering both parties (mother and child) as competent participants took several studies and extrapolating from them to the dynamic interaction in such relationships took even longer (Feldman, 2007). The motivational drive to maintain interpersonal relationships remains strong throughout adulthood. In order to maintain them, participants tend to their improvement, development, and preservation in several different ways (Werner & Baxter, 1994). During the exploration of dyadic interactions increasing importance is attached to synchrony as an indicator of the different ways participants of the interaction influence each other.

Interactional synchrony under a different label appears in several areas of psychology (for a summary, see Varga, 2013) and is an important characteristic of dyadic interactions (Tickle-Degnen & Rosenthal, 1990). Interactional synchrony is characterized by coordination reflected in behavior (movements, speech patterns, posture, Varga, 2013) or physiological indicators (heart rate, blood pressure, hormone levels, E. Kasos et al., 2018). Participants are responsive to each other (Cappella, 1997). Interactional synchrony can develop in a wide variety of situations – between teacher and student, mother and child, partners in conversation – and is defined as a match between indices of any phenomenological, physiological, behavioral, or subjective experience (Varga, 2013).

The various types of interactional synchrony range from the nonconscious to the consciously perceived regulation of human interaction. Our approach in this study is to examine synchrony in the conscious experience of participants. The evaluation is conducted after the interaction is concluded instead of during (Varga, 2013).

The interactional aspect of hypnosis is beyond question. In line with the social-psychobiological model of hypnosis (Bányai, 1991, 1998), participants are not only equally important but how they influence each other affects the experience and result of hypnosis. Interactionality is especially significant during the clinical application of hypnosis (Barabasz & Watkins, 2005; Diamond, 1980, 1984, 1986, 1987; Peebles, 2012; Peebles-Kleiger & Nash, 2001), where hypnosis can provide very intense connection between two people and may serve as a corrective measure for interpersonal difficulties (Bányai, 1991), early social experiences (Feldman et al., 2010).

Hypnotists reported experiencing altered states of consciousness, transference, even dreaming during hypnosis, thus highlighting the importance of examining the subjective experiences of both participants. Most studies focus on physiological and behavioral synchrony (Kasos et al., 2019, 2018), but together with objective measures and staying conscious of the limitations phenomenological data may yield valuable results.

The purpose of this paper is to consider the phenomenological experiences of subjects and hypnotists during AAH within the interactional framework. The subjective experiences were measured using the Archaic Involvement Measure (AIM), Phenomenology of Consciousness Inventory (PCI), and Dyadic Interactional Harmony Questionnaire (DIH). Since such examination of participants during AAH has not been done before, no concrete hypothesis could be formulated, and our study is explorative.

Method

The study was approved by the Institutional Ethical Board of the University. The data of both the hypnotists and subject were taken into account during the analysis because of the interactional nature of the study, so the term participant means both subject and hypnotist, while subject means the person who was hypnotized, and hypnotist is the person leading the hypnosis.

Participants

Subjects

Thirty-one adult female individuals (mean age = 23.74, SD = 4.26) were recruited from the database of the Hypnosis Laboratory at Eötvös Loránd University. Potential subjects were contacted through e-mail and could choose from multiple dates and times while ensuring that they did not know the hypnotist. All subjects had previously participated in group hypnosis, during which their hypnotizability was scored using the Hungarian version (Költő et al., 2015) of the Harvard Group Scale of Hypnotic Susceptibility: Form A (HGSHS:A; Shor & Orne, 1962). According to their previous hypnotizability scores, there were 11 subjects with low scores (1–6) and 20 with high score (7–12). Subjects were all mentally and physically healthy (as per their declaration form), over 18 years old, and received no compensation for their participation.

Hypnotists

Five adult female individuals (mean age = 54.2 SD = 11.43) participated in the study as hypnotists. The hypnotists were all certified clinical hypnotherapists who completed the EAPTI (European Accredited Psychotherapy Training Institute) certified training of the Hungarian Association of Hypnosis. They did not know the subjects they were paired with and were not informed of the subjects' hypnotizability.

Participants were all female, because the study also examined the interactional synchrony between the oxytocin levels of hypnotists and subjects (E. Kasos et al., 2018). These results are reported elsewhere. According to contemporary research, females are ideal subjects for OT research if they take no oral contraceptives (Ditzen et al., 2013; Gordon et al., 2010).

Measures

Archaic Involvement Measure *(AIM)*

The AIM was developed by Nash and Spinler in 1989 and measures the archaic experience occurring between the participants of the hypnotic interaction (Nash & Spinler, 1989). Participants rate statements such as "I wanted the hypnotist to tell me what to do" and "When I couldn't do what the hypnotist said, it made me feel guilty" on a 7-point Likert scale from 1 (*I did not feel this at all*) to 7 (*I felt this very strongly*). The measures used during the study contained 19 questions and was modified to assess the interactional aspect of hypnosis where hypnotists and subjects received separate, role-specific tests (Bányai et al., 1990; Józsa et al., 2019; Varga, 2017; K. Varga et al., 1994). Because the factor structure of the test is a little different in the subjects' and the hypnotists' version (Bányai et al., 2019), we compared the total score of the 19 items (AIM) (αs:.94; αh: .85).

Phenomenology of Consciousness Inventory *(PCI)*

The Hungarian version (Szabó, 1989, 1993; K. Varga et al., 2001) of the PCI (Pekala, 1991; Pekala et al., 1986) was used to assess the subjective experience of participants regarding alterations in consciousness. Participants indicated their answers on a 6-point Likert scale to 53 dipolar statements. Items included: "I was forever distracted and unable to concentrate on anything" or "My body ended at the boundary between my skin and the world." The PCI contains 12 major and 14 minor scales as follows (minor scales in brackets): altered experience (altered body image, perception, meaning, and time sense), positive affect (joy, sexual excitement, and love), negative affect (anger, sadness, and fear), visual imagery (amount and vividness), attention (direction and concentration), self-awareness, altered state of awareness, internal dialogue, rationality, volitional control, memory, and arousal. It also contains a reliability indicator, and the authors suggest excluding those who score 2 or higher on this scale. (Description of factors in Appendix I.)

Dyadic Interactional Harmony *(DIH)*

Assessing the relationship between subject and hypnotist, the DIH Questionnaire (K. Varga et al., 2006) comprises 33 items. Participants specify on a 5-point Likert scale how much a specific adjective (such as: *happiness, harmony*, or *anxiety*) was consistent with their feelings regarding the previous hypnosis session. The test consists of four subscales: intimacy (αs: .74, αh: .88), communion (αs: .85, αh: .90), playfulness (αs: .83, αh:,79), and tension (αs: .80, αh: .58). (Description of subscales in Appendix II.)

Procedure

Participants arrived at their appointment separately and were seated in different rooms, filling out the informed consent form and the State-trait Anxiety Inventory (STAI; Spielberger et al., 1970). The results from the STAI (along with the s-EMBU (mentioned later; My Memories of Upbringing; Arrindell et al., 1999) are discussed in another paper. During the study, electrodermal measurements were taken and saliva samples collected for the purposes of hormonal measurements. The results of these measures are discussed elsewhere (E. Kasos et al., 2018; K. Kasos et al., 2018).

First, the subject was led into the hypnosis chamber and set up on a stationary ergometer. Following the set-up, the hypnotist came in. The hypnosis followed the text of Stanford Hypnotic Susceptibility Scales (SHSS:C; Weitzenhoffer & Hilgard, 1962) modified for AAH (Bányai & Hilgard, 1976) and included 12 tasks, both cognitive and motor. The session was recorded on video.

After the hypnosis was concluded, both participants returned to their rooms separately, where subjects finished their Stanford booklets, and both participants filled out the required tests in the following order: AIM, PCI, DIH, STAI-s, STAI-t, and s-EMBU.

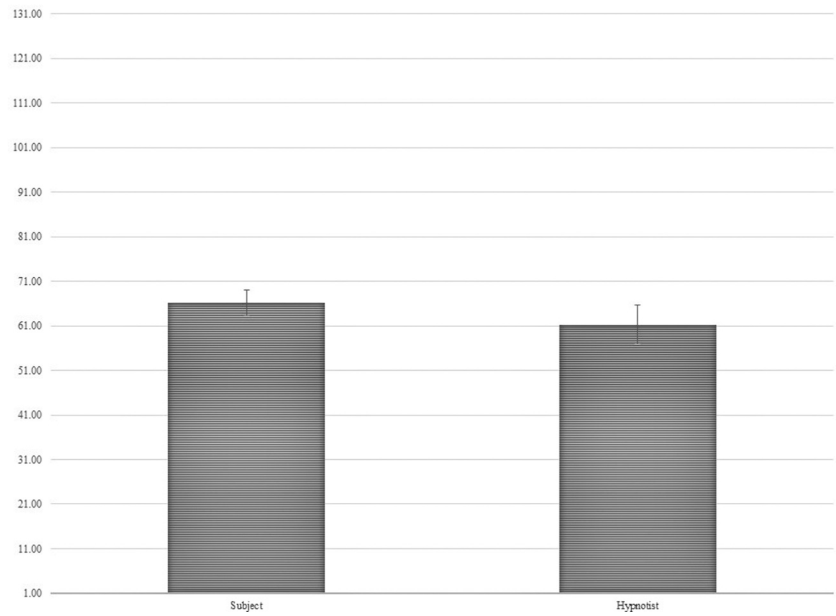

Figure 1. Total AIM Scores of Subjects and Participants
Y error bars represent ± one standard error from the mean.

Results

Results Regarding AIM

A paired samples *t* test was conducted to compare the subjects and hypnotists scores on the total AIM score. There was no significant difference between the two scores as far as the group averages are concerned. (Figure 1.)

Pearson correlation was computed to assess the relationship between the AIM score of the subject and the hypnotist. There was no significant correlation between the two variables ($r = .11$, $n = 32$, $p = .55$)

Results Regarding PCI

From the total number of PCI data, we had to exclude 1 subject and 1 hypnotist because the reliability average score was 2 or higher reflecting too diverse answers to the built-in reliability item pairs. The analysis was concluded on the remaining 30 valid subject and hypnotist PCI (Figure 2).

A paired samples *t* test was conducted on the main and subscales of the PCI between the scores of the hypnotists and subjects. Hypnotists scored significantly **higher** on the *self-awareness, rationality, volitional control*, and *memory* scales, and significantly **lower** on the *altered experience, body image, time sense, perception, meaning, sadness, attention, direction, altered state of awareness*, and the *internal dialogue* scales. (Table 1).

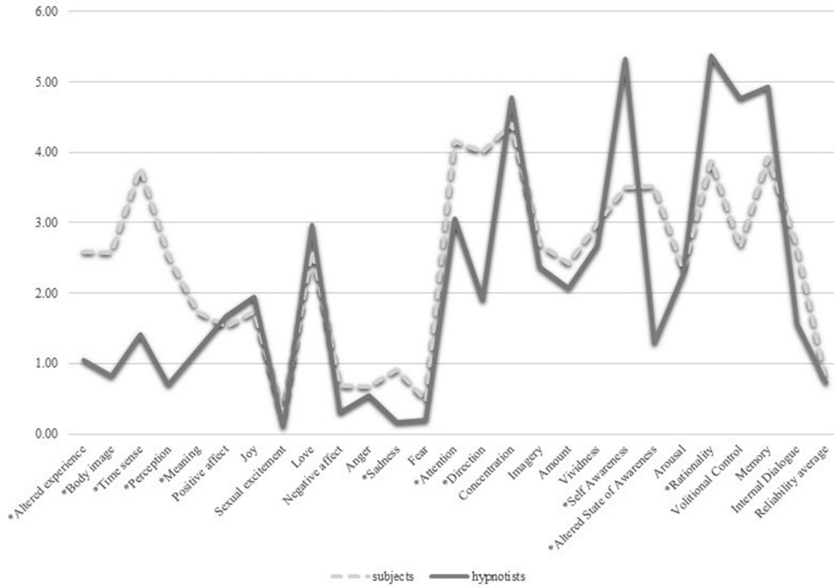

Figure 2. Subjects' and Hypnotists' Scores on the Scales of the PCI

Table 1. T Values for the Scales of the PCI Where There Was Significant Difference between the Scores of the Subjects and Hypnotists *P* <.05

	Scales	t(29)	*p*		Scales	t(29)	*p*
I.	Altered experience	6.03	.000	IV.	Attention	5.09	.000
1	Body image	5.05	.000	11	Direction	8.64	.000
2	Time sense	4.96	.000	12	Concentration		
3	Perception	4.99	.000	V	Imagery		
4	Meaning	2.25	.032	13	Amount		
II.	Positive affect			14	Vividness		
5	Joy			VI	Self-awareness	−6.26	.000
6	Sexual excitement			VII	Altered state of awareness	6.99	.000
7	Love			VIII	Arousal		
III.	Negative affect			IX	Rationality	−6.06	.000
8	Anger			X	Volitional control	−7.50	.000
9	Sadness	2.79	.009	XI	Memory	−3.97	.000
10	Fear			XII	Internal dialogue	2.55	.016

Results Regarding DIH

When analyzing the DIH scores, 29 pairs of data were used, because of missing information. A paired samples *t* test was conducted on total score and the subscales of DIH comparing the scores of the subjects and the hypnotists. There were no significant differences between the subjects' and hypnotists' scores on either subscale. (Figure 3).

Discussion

During AAH, we compared the subjective experience of the hypnotists and subjects on three different measures. AAH is procedurally different from TRH, because instead of both

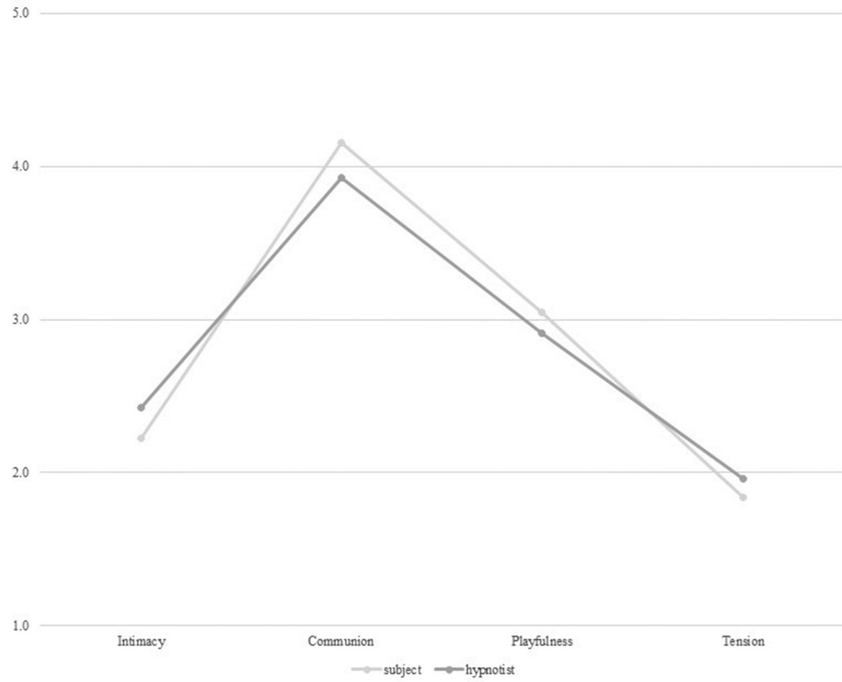

Figure 3. Subjects' and Hypnotists' Scores on the Subscales of the DIH

participants sitting in a chair, here the subject is pedaling on a stationary ergometer, a physically very active condition, while the hypnotist is standing in one spot and not moving very much. Another important difference is that while the subjects are not instructed to close their eyes, there is also no eye contact between the participants (Bányai & Hilgard, 1976). Consequently, during AAH, besides the participants' role and goal, they are also in a different position and on a very different activity level, not to mention that for subjects the experimental situation as well as the hypnosis was new while the hypnotists had experience in both. According to our results, there were no significant differences between the subjects' and hypnotists' scores on either the AIM or DIH while the PCI showed important differences between the hypnotist and subject.

Because of the differences in factor structure for the hypnotist and the subjects in the AIM instrument, only the total score was considered (Józsa, 2012). There were no significant differences and no correlation between the scores. The results demonstrated that subjects and hypnotists do not differ as a group, suggesting that archaic mobilization of the two roles is similar. At the same time, lack of correlation indicates that the two groups of participants experience this involvement differently.

There are only a very limited number of studies examining the properties of AAH, emphasizing the need for more. According to Bányai et al. (1993), AAH has been shown to elicit more intense positive emotions than TRH (Bányai et al., 1993), so the fact that the subjects did not score significantly higher on the AIM than the hypnotists is interesting. It might be the effect of the situation, which was more unusual for subjects than hypnotists, as well as the fact that hypnosis is still more commonly thought of as relaxational. The active aspect of the hypnosis might have influenced the results as well.

According to Shor, the connection between subject and hypnotists is one of the main dimensions of hypnosis, and hypnosis can only be understood by considering it as a dynamic interaction (Shor, 1962, 2017). Even though Shor thought that archaic involvement is only possible in a clinical situation (Shor, 1962), our results demonstrate, that even in an experimental situation, hypnotists can experience involvement similar in intensity to the subjects'.

When considering the results of the PCI, we expected the participants to have more similar subjective experiences in this standard situation, since both sets of participants are subjected to the same suggestions (subjects by listening and hypnotists by reading). At the same time, the different role as well as the level of activity stemming from the nature of AAH led us to expect a larger than usual influence. We found that there were differences in the experiences reported. Subjects scored significantly higher on *altered experience, body image, time sense, perception, meaning, attention, direction, altered state of awareness*, and the *internal dialogue* scales. This is in line with what one would expect in the situation, since changes in consciousness, flow of time, perception, dissolved body boundaries, stronger inner-focused attention, and more inner silent talk are characteristic of hypnosis (Pekala et al., 1986). At the same time, subjects scored significantly higher on *sadness*. This result seems to further support the finding of positive *affect* induced by AAH (Bányai et al., 1993). This relationship might become stronger with practice, even though the unusual situation can counter it.

At the same time hypnotists scored significantly higher on the PCI scales of *self-awareness, rationality, volitional control*, and *memory*. This pattern of consciousness is more similar to the alert state, clearer, more logical thinking, feeling of deliberate control of thinking and attention, and clearer memories. These results again support the notion that the participants' role influenced their subjective experience. Hypnotists – as expected resulting from their role in the AAH situation – remained more in control, reporting less alterations in their consciousness.

The DIH made it possible for participants to directly evaluate the elements of the situation that connects them to each other. The DIH was fundamentally imagined in and for an interactional framework, so it is suitable for comparison of the partners (Varga & Józsa, 2013).

Among the DIH subscales, participants scored highest on the *communion* and lowest on the *tension* subscales. There were no significant differences between the hypnotists' and subjects' score on any of the subscales.

Our results demonstrated the similarities between the experiences of the subjects and the hypnotists during AAH. Overall, our results indicate that there may be a remarkable match between the phenomenological measures of hypnotist and subject – at least at a group level during AAH. The differences found are very likely connected to the roles of the dyad.

Limitations

This study is unique both in its interactional approach as well as in employing AAH as the experimental condition. Certainly, the low number of participants is a limitation of the study, but these early results highlighted the importance of continued studies in order to increase our understanding of interaction as well as AAH. During the study, we only invited female participants, which was very important for the hormonal analysis in order to control for the influence of gender and hormonal differences (E. Kasos et al., 2018), but it became a limitation for the phenomenological analysis, since gender may influence hypnosis style and certainly limits the variety of interactional connection.

Conclusion

The pilot nature of our study emphasized the need to further explore AAH through searching for individual patterns, different types of synchrony and the relationship between the different measures of synchrony, and other features of hypnosis. There are a number of studies employing TRH, whereas AAH is rarely employed, so there are opportunities both in clinical application and theoretical hypnosis research. AAH may be a great alternative to TRH not just during research but in clinical practice as well, because the subjects' eyes may be open, it can be a useful alternative to those feeling uncomfortable closing their eyes, and because of its active aspect it may be more suited for children or those having trouble with relaxation (Bányai et al., 1993). Discovering something common to both AAH and TRH could mean getting closer to the real essence of hypnosis, to the effect independent from the procedure. Thus, a deeper understanding of the mechanisms behind AAH is essential to the field of hypnosis in general.

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Appendix I. Description of Factors of the Phenomenology of Consciousness Inventory scales

Altered experience	
Altered body image	Feelings about dissolved body boundaries
Perception	Change in the perception of the world
Meaning	Presence of transcendental, mystical, or spiritual experiences
Time sense	Feelings about the change in the progress of time
Positive affect	
Joy	Feelings of happiness and ecstasy
Sexual excitement	Sexual feelings
Love	Feelings of love
Negative affect	
Anger	Feelings of rage
Sadness	Feelings of sadness, unhappiness, or dejection
Fear	Feelings of being frightened
Visual imagery	
Amount	Amount of visual images
Vividness	Reality of images
Attention	
Direction	Focus of attention; focus on inner feelings and experiences instead of the outside world
Concentration	Ability to concentrate on relevant things and excluding disturbing ones
Self-awareness	Retained consciousness and self-awareness, similar to alert state
Altered state of awareness	Experience of state of consciousness as different from the usual
Internal dialogue	Inner silent talk
Rationality	Clear, logical thinking
Volitional control	Feelings about deliberate controlling of thoughts and attention
Memory	Clear memories
Arousal	Feelings of muscle tension

Appendix II. Description of Subscales of the Dyadic Interactional Harmony

	Example Items
Intimacy	Liking, cordial, eroticism, passion, love, tenderness
Communion	Sympathy, attunement, understanding, patience, harmony
Playfulness	Freedom, openness, humor, inspiring
Tension	Relaxed (inverted), anxiety, fear, tension

Phänomenologische Erfahrungen während der Aktiv-Wach-Hypnose: Ein Vergleich zwischen Hypnotisierendem und Hypnotisiertem

ENIKO KASOS, KRISZTIAN KASOS, ANDRAS KOLTO, EMESE JÓZSA, UND KATALIN VARGA

Zusammenfassung: Es besteht ein zunehmendes klinisches Interesse an der Aktiv-Wach-Hypnose (active-alert hypnosis, AAH). Indessen sind relativ wenige Untersuchungen dem systematischen Studium ihrer Eigenschaften gewidmet worden. In der vorliegenden Studie werden die subjektiven Erfahrungen von Versuchspersonen (31) und Hypnotisierenden (5) während AAH verglichen unter Verwendung von Pekala's Phenomenology of Consciousness Inventory (PCI), der Dyadic Interactional Harmony (DIH) Scale und dem Archaic Involvement Measure (AIM). Die Ergebnisse zeigten Ähnlichkeiten im Erleben der Versuchspersonen und der Hypnotisierenden. Der einzig signifikante Unterschied in den Erfahrungen von hypnotisierten Versuchspersonen und Hypnotisierenden zeigte sich im PCI, in welchem die Unterschiede der verschiedenartigen Rollen als Hypnotisierende und als Versuchspersonen während der AAH hervorgehoben werden. Die Untersuchung legt nahe, dass es wichtig sein könnte, bei der Erkundung persönlicher Erfahrungen beim Studium der AAH die subjektiven Beschreibungen zu untersuchen.

ALIDA IOST-PETER, *DIPL.-PSYCH.*

Expériences Phénoménologiques Au Cours De L'hypnose En Alerte Active: Comparaison De L'hypnotiseur Et Du Sujet

ENIKO KASOS, KRISZTIAN KASOS, ANDRAS KOLTO, EMESE JÓZSA, ET KATALIN VARGA

Résumé: Il y a eu un intérêt clinique croissant pour l'hypnose d'alerte active (AAH). Cependant, relativement peu d'études ont été consacrées à l'étude systématique de ses propriétés. La présente étude a comparé les expériences subjectives de sujets (31) et d'hypnotiseurs (5) au cours de l'AAH, en utilisant la Phenomenology of Consciousness Inventory (PCI) de Pekala, l'échelle Dyadic Interactional Harmony (DIH) et l'Archaic Involvement Measure (AIM). Les résultats ont démontré des similitudes entre les expériences des sujets et des hypnotiseurs. La seule différence significative entre les expériences des sujets et des hypnotiseurs a été montrée par le PCI, qui a mis en évidence les différences résultant des différents rôles d'hypnotiseur et de sujet pendant l'AAH. L'étude suggère qu'il peut être important d'examiner les descripteurs subjectifs dans l'exploration des expériences personnelles dans les études sur l'AAH.

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Président of the European Society of Hypnosis

Experiencias fenomenológicas durante hipnosis activa-alerta: Comparación entre el hipnotista y el sujeto.

ENIKO KASOS, KRISZTIAN KASOS, ANDRAS KOLTO, EMESE JÓZSA, Y KATALIN VARGA

Resumen: El interés por la hipnosis activa-alerta (HAA) se ha incrementado. Sin embargo, relativamente pocos estudios se han enfocado a estudiar sistemáticamente sus propiedades. El presente estudio comparó las experiencias subjetivas de 31 sujetos y cinco hipnotistas durante HAA, utilizando el Inventario Fenomenológico de Conciencia (PCI) de Pekala, la Escala de Interacciones Diádicas Armoniosas (DHI por sus siglas en inglés), y la Medida de Participación Arcaica (AIM). Los resultados muestran similitudes entre las experiencias de

sujetos e hipnotistas. El PCI fue el único que mostró diferencias significativas entre las experiencias de los sujetos e hipnotistas, que enfatizó las diferencias que surgen de sus distintos roles durante HAA.

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Study 3

Electrodermal orienting response during active-alert hypnosis: do verbal suggestions influence automatic attentional processes?

Abstract

This study explored the influence of suggestions on differences in electrodermal laterality of the skin conductance orienting response (SCR). Thirty-two participants were randomly assigned to either *permitting* or *excluding* suggestions. During the dream task in the permitting condition the suggestion was: "*..you are aware of your surroundings and any distractions that might disturb your dream..*" while in the excluding condition the wording was: *"..no outside stimulus will disturb your sleep..".* Participants were presented with twelve standard and two deviant computer-generated tones during active-alert hypnosis and musical control conditions in a mixed within-between design. High hypnotizables produced higher SCRs after *permissive* compared to *excluding* suggestions during hypnosis, while low hypnotizables did the same in the control condition. Study limitations include some loss of data due to equipment failure and relative homogeneity of sample, therefore results cannot be considered definitive.

Keywords: active-alert hypnosis, attention, automatic processing, electrodermal activity, hypnotizabilty, suggestions

Electrodermal orienting response during active-alert hypnosis: do verbal suggestions influence automatic attentional processes?

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DISCLOSURE STATEMENT

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Abstract

This study explored the influence of suggestions on differences in electrodermal laterality of the skin conductance orienting response (SCR). Thirty-two participants were randomly assigned to either *permitting* or *excluding* suggestions. During the dream task in the permitting condition the suggestion was: "..*you are aware of your surroundings and any distractions that might disturb your dream.."* while in the excluding condition the wording was: *"..no outside stimulus will disturb your sleep..".* Participants were presented with twelve standard and two deviant computer-generated tones during active-alert hypnosis and musical control conditions in a mixed within-between design. High hypnotizables produced higher SCRs after *permissive* compared to *excluding* suggestions during hypnosis, while low hypnotizables did the same in the control condition. Study limitations include some loss of data due to equipment failure and relative homogeneity of sample, therefore results cannot be considered definitive.

Key words: active-alert hypnosis, attention, automatic processing, electrodermal activity, hypnotizabilty, suggestions

Electrodermal orienting response during active-alert hypnosis: do verbal suggestions influence automatic attentional processes?

While our understanding of hypnosis phenomena is increasing, its effect on physiological changes, especially its influence on the autonomic nervous system (ANS) and the mechanism behind its benefits is still not clear. It is still debated whether changes in ANS during hypnosis are the result of relaxation (position, posture, eye closure) or some other characteristic. Most studies focus on how suggestions influence consciously controlled behavior, while their effect on unconscious processes deserves more attention.

One way to assess attentional processes is to measure skin conductance. When a stimulus draws our attention, we respond with an orienting response, which can be measured in electrodermal activity (EDA) as the skin conductance orientation response (SCOR), specific skin conductance responses (SCRs) given to external or internal stimuli. Whether low and high hypnotizables show different physiological responses to hypnosis is debated, but there is some evidence that they react to hypnosis with different sympathetic responses and tone (Kekecs et al., 2016), even showing lateral differences in their electrodermal tone during the induction or in their electrodermal responses (K. Kasos, Zimonyi, et al., 2018).

The skin conductance response (SCR), the faster changing phasic component of skin conductance (a proven method to measure the effects of hypnosis on ANS through eccrine sweat glands) measures the autonomic response (Dawson et al., 2016b). But differences in methodology offered very different results. While Kekecs et al. (2016) found that SCR decreased during hypnosis compared to the musical control condition, but found no differences between high and low hypnotizables (Kekecs et al., 2016, Sturgis & Coe, 1990). Others found that high hypnotizables had lower SCR amplitude during auditory oddball task (De Pascalis et al., 2004), and in response to hypnotic analgesia than low and medium hypnotizables. At the same time, participants in the waking control condition had higher amplitude responses regardless of their hypnotizability scores (De Pascalis et al., 1999). Measuring SCR bilaterally is a reliable way to assess changes in hemispheric dominance (Hugdahl, 1984). During hypnosis, medium hypnotizables showed lower skin conductance levels, while highs showed a reduction in their orienting response and lows showed an increase. There was no change in habituation during hypnosis, relaxation or listening to a story (Gruzelier & Brow, 1985). EDA is also often used to measure physiological differences between hypnosis and awake control or simulators, but results are varied. Some studies have found no differences in EDA between hypnosis and the awake control (Edmonston & Pessin, 1966; Levine, 1930; Sears & Beatty, 1956) or between the hypnosis and simulator groups in response to pain stimuli (Shor, 1962), while Gruzelier et al. (1988) found higher right side skin conductance level in the simulator group with more frequent nonspecific SCRs at the start (Gruzelier et al., 1988). In contrast, Fehr and Stern (1967) showed that during hypnosis the electrodermal orienting response was lower than during the control condition (Fehr & Stern, 1967) and Pessin et al. (1968) found lower number of nonspecific responses during hypnosis (Pessin et al., 1968).

The purpose of the present study was to investigate how simple direct verbal suggestions affect attention, measured by the electrodermal orienting response, and to compare how verbal suggestions effect bilateral SCR amplitude in response to a standard tone and a deviant tone during active-alert hypnosis and a control condition. Group comparisons were carried out between high and low hypnotizable subjects who received two different suggestions, *excluding*, and *permitting* regarding the standard and deviant tone. We expected that verbal suggestions would have different effects on the electrodermal orienting response of low and high hypnotizables and this will be moderated by the condition (hypnosis or control). Based on the results of Kasos and colleagues (2018), we expected differences in electrodermal laterality between low and high hypnotizable subjects (K. Kasos et al., 2018).

Method

Participants

The study was conducted with the permission of the ethical board of the Eötvös Loránd University in Budapest. Participants were invited from the Human Interaction Research Group's Hypnosis Laboratory's database of prospective participants whose hypnotizability was assessed using the standardized Waterloo-Stanford Group Scale of Hypnotic Susceptibility, Form C (Bowers, 1998). They were chosen from the lower (0-4) and from the upper (8-12) end of the hypnotizability scale. Exclusion criteria for the study were: present use of psychiatric drug, sedatives or any psychiatric illness (based on self-report).

The study sample size was determined based on a simulation-based power analysis to detect an effect of condition (music vs. hypnosis) on tonic EDA, the main hypothesis tested in the study. The parameters in the simulation were based on the results of a previous study (Kekecs et al., 2016). The analysis yielded that 22 participants will be needed to detect a condition effect with 80% power, with an effect size of 0.33 standardized SCL units if the correlation between repeated measures is at least r = 0.7. (The study was not powered to detect an effect on SCR.) We also accounted for a dropout rate of 30%, due to SCR non-responders and artifacts/electrode detachments, since we expected that the intense exercise during the active-alert hypnosis can increase the probability of these events. Thus, the recruitment target was set to 32.

Procedure

The study followed a mixed (within – between) design. Participants were exposed to two consecutive experimental conditions, hypnosis, and a music control condition, on the same day with at least 30 minutes rest period in between.

In the hypnosis condition a standard active –alert induction was used which was derived from the original induction developed and standardized by Bányai and Hilgard in

1976 (Bányai & Hilgard, 1976). During active-alert hypnosis (AAH) participants pedal on a stationary ergometer - an activity that is usually associated with increased strain, activity, and alertness - with their eyes open (there are no suggestions to eye closure). Unlike during traditional hypnosis suggestions were made regarding feeling fresh and energetic (Bányai, 2018; Bányai & Hilgard, 1976), and participants reported feeling more positive feelings, exaggerated movements and a higher sense of agency (Bányai, 2018; Bányai & Hilgard, 1976). For the present study AAH was used because it is still not clear whether changes in ANS are the result of the relaxation aspect of traditional hypnosis or some other mechanism (Kekecs et al., 2016), so changes in ANS during AAH are more likely to be the effect of hypnosis.

The induction was followed by the administration of a shortened version of the Waterloo-Stanford Group Scale of Hypnotic Susceptibility, Form C standardized scale (data not presented here) (Bowers, 1998). Suggestions regarding moving of both hands (suggestion 2), age regression (suggestion 8) and negative visual hallucination (suggestion 10) were excluded, to avoid movement artifacts and the influence of eye opening and closing on EDA. The music condition differed from the hypnosis condition only in that the hypnotic induction and deinduction was replaced with listening to music (different styles) for the same period of time (K. Kasos, Kekecs, et al., 2018; Kekecs et al., 2016). while subjects received the same test suggestions.

During the experiment, participants were randomly assigned to either *permitting* or *excluding* suggestion, which they received in both conditions during the “dream” task on the Waterloo-Stanford Group Scale of Hypnotic Susceptibility, Form C. The order of the conditions (hypnosis and music) was also randomized. The dream task adhered to the standardized text but was followed by the suggestion: *permitting*: “*Although you are in a deep relaxed sleep, you are aware of your surroundings and any distractions that might* *disturb your dream. When you hear me speak again, you will pay attention to me once more.*" or *excluding* suggestion: "*You are in such deep and relaxed sleep, that no outside stimulus will disturb your sleep. Only when you hear me speak again, will you be awake once more*." These couple of words were the only difference between the conditions, and these were told to participants only once.

Three blocks of sound stimuli were presented in each condition. A baseline block of stimuli was presented before induction in the hypnosis condition or before music in the control condition, while the participant was already sitting on the stationary bicycle. The hypnotherapist referred to this as "the calibration of the equipment". Immediately after the dream task and the *permitting* or *excluding* suggestions, there was the second block of stimuli. During the second block of stimuli, the participant was pedaling and was not forewarned about the coming sound stimuli. The third block of sound stimuli was presented at the end of the experimental conditions.

The blocks of sound stimuli started with silence lasting 30 seconds and consisted of twelve standard tones (1000Hz) and two deviant sounds (animal sounds) organized according to an auditory oddball paradigm (Figure 1). The tones and animal sounds were 0.5 seconds long. The first four tones were always standard tones to allow for habituation, the two deviant tones never followed each other directly, and the final stimuli was always a standard stimulus. The inter-stimulus interval was set to a mean of 6 seconds with a standard deviation of 1.5 seconds to avoid anticipatory responses. Each block lasted about 120 seconds. Comparable protocols showed evidence to elicit event related electrodermal responses in previous studies (Kekecs et al., 2016; Steiner & Barry, 2011). In this paper, data analysis is restricted to the second presentation of the blocks of sound stimuli within each condition, since suggestions were given only before these blocks.

[Figure 1 around here]

Equipment

The hypnosis sessions were held in a sound attenuated room. EDA was measured with OpenEDA an open-source bio monitor, with a four-Hertz sampling rate (Kasos et al., 2019). For the measurements, disposable Skintact FS-RG1 Ag/AgCl electrodes were used with solid gel electrolyte. The disposable electrodes were placed on the back part of the shoulders of the participants, both left and right side (Kasos, Kekecs, et al., 2020) and the non-dominant hand 10 minutes before the start of the experiment. The non-dominant hand was used for measuring EDA because participants had to use the dominant hand to write and for some of the suggestions. The shoulders were chosen to avoid movement artifact and detachment of the electrodes due to participants gripping the handle of the stationary bicycle. Data collected from the non-dominant hand is not discussed here. For the present study, we chose to analyze data collected from the shoulders. Previous studies suggested the shoulders as acceptable for EDA assessment (van Dooren et al., 2012). Also, while instructions were made for participants to avoid moving their non-dominant hand, in some cases that was difficult.

Data Processing

EDA during the second block (in each condition) was extracted and visually inspected for artifacts. Only participants, whose bilateral responses were obtained, were included in the analysis. Out of the 32 participants, 7 were excluded because of equipment failure or because bilateral responses were not detected. EDA was analyzed with Ledalab 3.4.8 (Benedek & Kaernbach, 2010). To decrease error noise, the data was first smoothed with a Gaussian window. Afterwards, skin conductance responses (SCR) were obtained by optimized continued decomposition analysis (Benedek & Kaernbach, 2010). SCRs were extracted from the window between 1 and 5 seconds after stimulus onset. The minimum amplitude of SCRs was set to 0.01 microSiemens (Dawson et al., 2016a; Payne et al., 2016). SCR amplitudes in response to the first standard and the first deviant tone were extracted and used in the statistical analysis. We hypothesized that responses to these tones are the strongest because habituation would decrease response to subsequent tones (Barry & Sokolov, 1993; Steiner & Barry, 2011)

Results

In accordance with the accrual goal, 32 participants were successfully recruited. Mean age of participants was 29.51 (*SD* = 9.74) and the sample included 12 females. Repeated measure ANOVA was conducted on the first standard tone delivered to the participants with the within subject factors of condition (hypnosis and music control), side (left and right), the between subject factors of hypnotizability (high and low) and type of suggestion (*permitting* or *excluding*).

The Repeated measure ANOVA on the first standard tone yielded a main effect of side $F(3,21) = 9.84$, $p = 0.006$, $\eta 2 = .35$. Participants gave higher amplitude responses on the right side compared to the left side. Two-way interactions were not significant. A significant three-way interaction effect of condition, hypnotizability and suggestion was found $F(3,21) = 5.65$, $p = .029$ $\eta 2 = .24$. During the hypnosis condition, high hypnotizables exposed to the permissive suggestion gave higher amplitude responses compared to the responses of high hypnotizables receiving *excluding* suggestions. During the control condition, low hypnotizables receiving permissive suggestions gave higher amplitude responses compared to low hypnotizables receiving *excluding* suggestions. There were no other significant three-way interactions, with all possible interactions included.

Repeated measure ANOVA was conducted on the first deviant tone delivered to the participants with the within subject factors of condition (hypnosis and music control), side (left and right), the between subject factors of hypnotizability (high and low) and type of suggestion (*permitting* or *excluding*).

The repeated measure ANOVA on the first deviant tone, with all possible interactions included, did not yield main or interaction effects. Visual analysis indicates that those who received permissive suggestions showed higher amplitude responses than those who received *excluding* suggestions, but this difference was not statistically significant.

Discussion

In this study, we explored electrodermal laterality differences and the effects of *permitting* vs. *excluding* suggestions on the SCR. When analyzing responses to the first standard tone, we found that SCRs recorded on the right side of the body were higher overall, independent of condition, suggestions, or hypnotizability. As expected, high hypnotizables produced higher SCRs after permissive compared to *excluding* suggestions during hypnosis but not during the control condition. However, unexpectedly, the same effect was found for low hypnotizables as well, just in the control condition instead of the hypnosis condition.

Our visual analysis indicated that SCRs after *permitting* suggestions were higher than after *excluding*, and this was independent of condition or hypnotizability, but this finding was not statistically significant. Our results show that verbal suggestions regarding external stimuli have a differential effect on SCORs, indicating that the content of the suggestions matter and may influence automatic attentional processes (Raz et al., 2005). Our results revealed that both low and high hypnotizables showed suggestion-specific responses, high hypnotizables during hypnosis, while low hypnotizables during the control condition. This result was somewhat unexpected, but not entirely unprecedented. Kasos et al. (2018) for example found that low and high hypnotizables showed opposing EDA during the hypnotic induction. Thus, both end of the hypnotic susceptibility spectrum responded to the induction but in the opposing direction (K. Kasos et al., 2018).

The suggestion specific responses of low hypnotizables during the control condition but not during hypnosis may be due to resisting suggestions during hypnosis, but not resisting during the control condition. It is noteworthy that we did not find a suggestion-specific response in high hypnotizable individuals in the control condition. Previous research has indicated that responsiveness to suggestions is only slightly enhanced by the application of hypnosis induction (Braffman & Kirsch, 1999). However, this assumption may need to be modified to consider the type of suggestion as well, for example hypnotizability seems to have a significant impact on determining responsiveness to suggestions of analgesia (Milling et al., 2010).

The study's limitations include homogeneity of participants' gender and race, loss of data due to equipment failure, and the conduction of the study in a laboratory setting. To improve generalizability, future research should include more participants and measurements taken under more ambulatory settings. Therefore, results cannot be considered as definitive and findings should be cautiously interpreted due to the limitations of the research and should be verified by a pre-registered confirmatory study. Nevertheless, our results warrant future laboratory studies of suggestions designed to alter automatic attentional processes.

Data availability statement

The data used in this study are available on request from the corresponding author, (EK). The data are not publicly available due to ethical reasons, specifically their containing information that could compromise the privacy of research participants.

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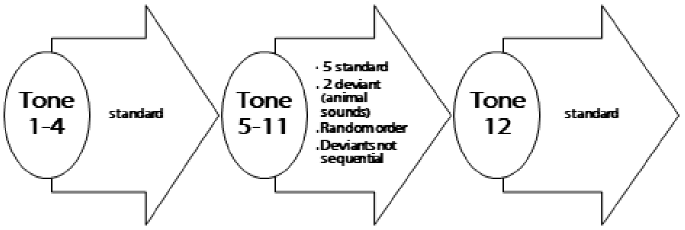
Figure 1: The blocks of sound stimuli organized according to the oddball paradigm.



Study 4

Altered States of Consciousness During Exercise, Active-Alert Hypnosis and Everyday Waking State

Abstract

This retrospective study was a nonrandomized comparison of exercisers' (runners and participants of a spinning class) states of consciousness with subjects of active-alert hypnosis (AAH) and students in a class (control). Three hundred and seventy-five participants completed the Phenomenology of Consciousness Inventory Runners, spinners, and participants of AAH scored higher on the altered experience and altered state of awareness dimensions of the PCI than the control group. Runners scored higher than participants of AAH and the control condition on the rationality dimension, and spinners scored higher than participants in the AAH condition. The AAH group scored lowest on the self-awareness dimension. On the volitional control dimension, the spinning- and control groups scored significantly higher than the runner- and AAH groups. The results suggest that exercise may lead to states of consciousness similar to AAH, thus increase responsiveness to a coach's training suggestions.

Keywords: active-alert hypnosis, consciousness, communication, exercise, training

Altered States of Consciousness During Exercise, Active-Alert Hypnosis and Everyday Waking State

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Altered States of Consciousness During Exercise, Active-Alert Hypnosis and Everyday Waking State

People who exercise often report experiencing changes in consciousness, especially when they perform better than expected (Chavez, 2008). People engaged in physical activity often describe experiencing focused attention, feeling of increased control, reduced sense of anxiety, and that they moved without conscious effort (Ravizza, 1977). These reports of alterations in consciousness are very similar to the experiences described during active-alert hypnosis (AAH) (Bányai, 1987). During AAH the individual rides a bicycle ergometer while receiving suggestions of freshness and increased activity. This feature makes AAH a valuable tool in sport psychology (Bányai, 2018). Although exercise and active-alert hypnosis seem to be similar in that both of them may induce alterations in consciousness, to our knowledge they have not been directly compared in this sense. The aim of this study is to examine the subjective experiences (related to the phenomenology of consciousness) during solitary running and group spinning exercise and compare them with experiences during AAH and everyday waking state.

Until recently, there had been few research projects on altered states of consciousness (ASC) in the context of sport and exercise, apart from the study of “flow” or “the zone” experience described by many athletes (Csikszentmihalyi, 1990). Mindfulness-based meditation techniques are closely related to the description of “flow” (Gardner & Moore, 2004; Kaufman et al., 2009; Kee & John Wang, 2008; Pérez & Crobu, 2018), as well as hypnosis (Hernández Mendo et al., 2017), and both have been used successfully to enhance sport performance (De Petrillo et al., 2009; Kaufman et al., 2009; Wolanin & Schwanhausser, 2010) or assist injury rehabilitation (Palmi et al., 2018). According to the transient hypofrontality theory of consciousness similarities between exercise and hypnosis can be explained by overlapping changes in brain activity (Dietrich, 2006). However, to our knowledge, there has been no systematic research on ASC that occurs spontaneously in response to exercise. More specifically, there is no empirical evidence whether a single bout of exercise, like running or spinning, can be associated with ASC.

We hypothesize that individuals engaged in exercise (running and spinning), contrasted to those in everyday waking state, are more likely to experience ASC. Our other hypothesis is that participants engaged in exercise as well as those undergoing active-alert hypnosis would experience ASC, but these would differ in some aspects. The aim of the present study was to determine whether there are subjective changes in consciousness during exercise similar to those experienced during AAH and different from a conscious awake state, such as paying attention during a lecture.

Material and Methods

The study protocol was approved by our university's institutional ethical board. Participants were invited through email and word of mouth to join the study on a voluntary basis; they were not offered compensation. Data for this study were collected by and retrieved from the database of the university's Hypnosis Lab.

Participants

Four groups of participants (self-reported to be mentally and physically healthy) totalling 375 volunteers, completed the Hungarian version of the Phenomenology of Consciousness Inventory (PCI) (Józsa et al., 2019) during 2018-2019. The four groups were (1) Solitary runners (*n* = 54); (2) Spinners – participants of spinning class (*n* = 36); (3) Subjects undergoing active-alert hypnosis (*n* = 26) and (4) awake control participants (*n* = 259). Exclusion criteria in the study for participants were self-reported use of psychiatric drugs, and/or self-reported diagnosis of mental and physical illness. A general description of participants can be found in Table 1.

Table 1 around here

Group 1 (54 solitary runners) ran outdoors, except for two participants who ran indoors, on a treadmill. Most Group 1 participants (31 people – 57,4%) ran 3-4 times a week, one ran less than once a week, and one person ran twice a day. Participants were invited to complete the questionnaire online, thinking back to a particularly memorable running experience, without any specific timeframe for filling out the questionnaire. The data has not been reported before.

Group 2 (36 spinners – participants of spinning class) attended two separate but identical spinning classes at two urban fitness centres. Instructors of both classes have studied under the same master trainer, had had similar techniques, and used similar music. Participants were approached trough the trainers and asked to complete the questionnaire online thinking back to a particularly memorable spinning experience. Participants were invited to complete the questionnaire online, thinking back to a particularly memorable spinning experience, without any specific timeframe for filling out the questionnaire. The data has not been reported before.

Group 3 (26 individual AAH participants) participants for the AAH group were selected from the Hypnosis Laboratory database, their hypnotizability was assessed during a traditional group hypnosis session. The group hypnosis followed the protocol of the standardized Harvard Group Scale of Hypnotic Susceptibility: Form A (HGSHS:A) (Költő et al., 2015; Shor & Orne, 1963), and included all 12 items. The range of hypnotizability scores were 6-11 (M= |8|, SD=1.48). These participants were then invited to the AAH study series, were they participated in individual AAH sessions. Results for the AAH series have been reported elsewhere: (E. Kasos et al., 2018, 2020; K. Kasos et al., 2018).

All hypnosis sessions followed the standardized protocol of laboratory AAH (Bányai & Hilgard, 1976) and were conducted by certified clinical hypnotherapists who completed the EAPTI (European Accredited Psychotherapy Training Institute) certified training of the country's prominent hypnosis association and follow their ethical guidelines regarding psychotherapy and hypnotherapy. Participants filled out the paper-pencil form of the PCI immediately after the hypnosis session with regards to their experiences during hypnosis. Phenomenological results, including the PCI for this group was reported in Kasos et al (2020) (E. Kasos et al., 2020).

Group 4 (259 awake control participants) consisted of college or university students who completed the paper-pencil form of the PCI immediately after classes in arts or natural sciences, with regards to their experiences during class. Each class consisted of at least 10 participants. Participants from psychology classes were not included in order to keep the classes' subject matter neutral to the topic of this study. Participants were approached as a group before the end of the class with the instructors' permission and filling out the PCI was voluntary.

Instrument

Phenomenology of Consciousness Inventory (PCI)

The Phenomenology of Consciousness Inventory (PCI) is a retrospective 53 item self-report test that measures subjective experiences in relation to alterations in consciousness along 12 major and 14 minor dimensions (Pekala, 1991). It can be completed regarding any event which may induce ASC, like hypnosis, psychoactive substances, music, etc. (Józsa et al., 2019), therefore it is a suitable method to compare the subjective experiences related to

ASCs occurring in various contexts. We used the validated Hungarian version of the PCI (Józsa et al., 2019). Participants received identical instructions that followed the original version (Pekala, 1991). and completed the questionnaire immediately following an experience (Group 3: AAH and Group 4: classroom) or thinking back to a particularly memorable event or experience (Group 1: solitary runners and Group 2: spinners). Test items consist of binary statements, and participants rate on a 7-point Likert scale how much the statement described their experience (i.e.: “I felt very very sad.” versus “I felt no feelings of sadness whatsoever”). For dimensions of the questionnaire, see Appendix I. The PCI contains a reliability measure that can be calculated based on the comparison of answers given to similarly worded items. Its value varies between 0 and 6, and according to the suggestion of Pekala (1991) data of participants who scored above 2 should be excluded from the analysis. In our data set, none of the participants scored above the suggested threshold.

The PCI has adequate construct and discriminant validity for the assessment of subjective states associated with hypnosis (Pekala, 1991). Out of the 26 dimensions of the PCI, four dimensions are especially relevant to altered states of consciousness. These are *altered experience*, *altered state of awareness*, *rationality* and *self-awareness* (Farthing, 2008; Varga et al., 2014). *Altered experience* consists of four sub-dimensions and expresses changes in body image, time sense, perception and meaning. The study also includes results for the dimension *volitional control* for two reasons. First, there is ample evidence that under hypnosis, sense of *volitional control* is changing especially among high hypnotizable subjects (Chavez, 2008; E. Kasos et al., 2020; Pekala, 1991). Second, its examination across the four groups may help understanding whether exercisers’ sense of volitional control changes during exercise the same way it does in hypnosis. Cronbach alpha for the dimension *volitional control* is somewhat lower than the desirable threshold of .70, but it is similar to the results in the Hungarian validation study (Józsa et al., 2019).

Stanford Hypnotic Susceptibility Scale Form C (SHSS:C)

Stanford Hypnotic Susceptibility Scale Form C (SHSS:C): contains 12 progressively more difficult items, including cognitive suggestions like hallucination and age regression (Weitzenhoffer & Hilgard, 1959). Test-retest reliability of the SHSS:C has been shown to be ρ=.66, 95% [.47-.86] (Kekecs et al., 2021)

Procedure

Participants engaged in physical activity (running and spinning) completed an online questionnaire thinking back to a particularly memorable exercise. This method was chosen because one cannot assume that spontaneous ASC occurs each time a person exercises and so we relied instead on our instructions that participants retrospectively recall a particularly "intensive and in some way defining" occasion as the basis for their subsequent responses. Participants of the AAH and control groups completed the test in a paper and pencil format immediately after their experiences.

Statistical analysis

Analyses were carried out with SPSS statistical software (Version 24). To examine the difference in alteration of consciousness among the four groups (runners, spinners, AAH and waking state control) a Kruskal-Wallis tests were performed for the five identified scales of the PCI (*altered state of awareness*, *altered experience*, *rationality*, *self-awareness*, *volitional control*). The Kruskal-Wallis test is the non-parametric equivalent of a one-way ANOVA and the preferred method for analysing data that is derived from Likert scale type questionnaires such as the PCI (Dodge, 2008). Pairwise differences were tested with subsequent non-parametric Mann-Whitney tests. To prevent the accumulation of Type I errors, p-values of the Mann-Whitney tests were adjusted with Bonferroni correction. Statistical significance was defined as $p < .05$.

Results

Altered Experience

A significant difference was observed across the groups on *altered experience* dimension of the PCI: $\chi^2(3) = 57.42$, $p < .001$. Runners' scores on this dimension were significantly higher than participants' in the control condition: $Z = -6.31$, $p < .001$. The effect was strong (Cohen's $r = .32$). Spinners scored significantly higher than participants in the control condition: $Z = -4.27$, $p < .001$, with a medium sized effect (Cohen's $r = .22$) Participants undergoing AAH scored higher than participants in the control condition: $Z = -3.50$, $p < .001$, with a medium sized effect (Cohen's $r = .18$). There were no other statistically significant differences.

Altered State of Awareness

A significant difference was found between *altered state of awareness* across the four groups: $\chi^2(3) = 111.76$, $p < .001$. Runners gave higher scores on this dimension than participants in the control group: $Z = -6.31$, $p < .001$, with a strong effect (Cohen's $r = .32$). Spinners reported higher scores than participants in the control group: $Z = -5.97$, $p < .001$, the effect was strong (Cohen's $r = -.30$). Participants in AAH scored higher than participants in the control group: $Z = -6.80$, $p < .001$, with a strong effect (Cohen's $r = -.35$). There were no other statistically significant differences.

Rationality

A significant difference was found across the groups in *rationality* scores: $\chi^2(3) =$ 21.33.37, $p < .001$. Runners reported higher scores than participants in the AAH group: $Z = -3.59$, $p < .001$, with a medium sized effect (Cohen's $r = .18$). Runners reported higher scores than participants in the control group: $Z = -3.68$, $p < .001$, the effect was medium (Cohen's $r = .19$). Spinners reported higher scores than participants in the AAH group $Z = -2.65$, $p <$

.048, with a small-to-medium effect (Cohen's r = .13). There were no other statistically significant differences.

Self-Awareness

A significant difference in *self-awareness* scores was found across the groups: $\chi^2(3)$ = 20.76, $p < .001$. Participants in the exercise groups scored higher than those in the control and active-alert condition. Post hoc comparisons revealed that all three groups (running, spinning and waking control) scored significantly higher than the active-alert group, with strong effect: $Z = -3.24$, $p < .001$ Cohen's r = .36; $Z = -2.90$, $p < .004$, Cohen's r = .37; $Z = -4.60$, $p <$ .001, Cohen's $r = -.23$, respectively. There were no other statistically significant differences.

Volitional Control

A significant difference was found in *volitional control* scores across the groups: $\chi^2(3)$ = 30.64, $p < .001$. Spinners reported higher *volitional control* than participants in the AAH condition $Z = -2.98$, $p = .024$, with a medium sized effect (Cohen's r = .15). Control participants scored higher than participants in the AAH condition: $Z = -4.13$, $p < .001$, with a medium effect (Cohen's r = .21). The running group did not differ significantly from the AAH and the other differences were not statistically significant either.

Discussion

Results of the current work demonstrate that young adult participants' retrospective recall of earlier exercise training experiences reflected an altered sate of consciousness. As measured by dimensions of the PCI, these *altered experience*s were comparable to the experiences reported by highly hypnotizable subjects who had undergone AAH. Overall, one might presume from these findings that important mental changes occur during exercise. It seems that participants of running and spinning exercise at least sometimes experience altered states of consciousness that mirror that of hypnosis participants’, including changes in perception, body image, time sense, meaning and altered states of awareness.

The transient hypofrontality theory of consciousness (Dietrich, 2006) may explain the similarities between sport and hypnosis. This model states that during exercise certain areas of the brain are not essential to performing the task. In these areas, such as the prefrontal cortex, a decrease of activity can be observed, because processing in the brain is competitive and resources are limited. This leads to a shift in the brain’s activity from the anterior to the posterior regions, which can be observed during meditation and hypnosis too (Bányai, 2008). The state of frontal hypofunction can explain the influences of sport on emotion and cognition (Dietrich, 2006).

The *altered experience* dimension of the PCI resulted in significant differences between the participants in the awake control condition and those in the running, spinning and active-alert hypnosis conditions. According to these results, participants in all three “physically active” conditions reported higher scores for altered state than did those in the awake control condition. This finding underlines the differences in subjective experiences between waking state and various forms of physical activities (Farthing, 2008), also supporting the idea that there are different ways to induce/get into an altered state of consciousness.

Altered state of awareness also significantly differed for participants in all three active condition groups (running, spinning and AAH) compared to participants in the waking state control group. Meanwhile, no significant differences in *altered state of awareness* were detected between the various active conditions. Participants in the exercise groups rated the change of their state of awareness similarly to that experienced by participants during hypnosis. Meanwhile, participants in the everyday waking state control condition reported significantly lower alteration in their awareness than the other three groups. This finding gives further support to the hypothesis that changes in consciousness during exercise can be similar to those experienced by high hypnotizable subjects during hypnosis (Bányai et al., 1993).

The *rationality* dimension of the PCI represents the experience of clear thinking. In that dimension runners had significantly higher scores than participants in the AAH group. Spinners did not report *rationality* scores that differed from participants in the control condition, while runners scored significantly higher. This divergence of experience between the two types of physical activities in contrast with the awake condition may suggest that not all physical exercises result in the same alterations in consciousness. The difference might be attributed to the fact that participants in both spinning, and the awake control conditions were grouped, while running was a solitary activity. Solitary runners may have a harder time relinquishing *rationality* than spinners engaged in a group situation (Varga et al., 2014). Indeed, many people who regularly run associate (solitary) running activity with “mind cleaning”, and empirical evidence also support a link between running and cognitive clarity (Lambourne & Tomporowski, 2010). An associated potential explanation might be that while runners who run outside need to constantly monitor their environment and adapt to it (e.g., avoiding barriers), those who ride a stationery spinning bicycle or attend a frontal-lead classroom lecture, may find it easier to let their minds wander.

On the *self-awareness* dimension of the PCI, participants in AAH scored significantly lower than the other three groups. During spinning, running or even in a class, participants tend not to surrender themselves to the same extent, and as a result, they seem to stay more aware of themselves than during hypnosis.

Volitional control was significantly lower for participants in AAH than for those in the spinning and the waking control condition. This result implies that the degree of perceived control is lowest among participants in hypnosis (an expected natural aspect of hypnosis) (Kihlstrom, 2008). One of the hallmarks of the hypnotic phenomena is that during hypnosis the sense of agency changes (Költő & Polito, 2017) and monitoring of intentionality is reduced (Dienes & Perner, 2007). It is evident from our results that during spinning self-monitoring and agency do not change significantly and remain like in normal waking state. During hypnosis, the subject - at least partially - allows the hypnotist to take the lead, follows the hypnotist’s suggestions (Barušs, 2003; Nash, 1991; Nash & Barnier, 2008; Varga et al., 2013) and several of the hypnotic suggestions are focused on the directionality of attention. The results of the running group were similar to the AAH group. This finding may suggest that when one exercises with others, they have to pay attention to the instructor or other people, therefore their attention is directed outwards. In contrast, during solitary running, attention is more likely directed inward, just as during AAH. This may indicate that attention can be directed as the circumstances require it, even during ASC.

Limitations

The current work has some limitations that should be considered in interpreting these results. Participants were not randomly assigned to their group and this may give way to some bias (Költő et al., 2015). Also. all participants filled out the questionnaires after the experience. Athletes recalled running and spinning in a retrospective fashion, while subjects in AAH and in the waking control condition completed the PCI immediately after the event. Retrospective recall, while used successfully before in data collection (Roussel & Bachelor, 2001) may be subject to memory distortion, perhaps limiting the accuracy/generalizability of our findings.

Further, the hypnotizability of participants in our running and spinning conditions was not assessed, though it might have been important to determine these participants’ ability to enter an altered state of consciousness through exercise. Their hypnotizability may have impacted their presumed sensitivity to athletic training suggestions.

These altogether imply that future research should employ a more methodologically robust data collection method, take participant measures during and after exercise, and assess the hypnotizability and motivation of all participants.

In spite of these limitations, this investigation suggests that changes in consciousness can occur during exercise. These altered experiences are, to some extent, similar to those occurring during active-alert hypnosis, while they are remarkably different from experiences recalled by individuals who participate in an everyday awake task. These findings provide a basis for further research that addresses whether exercise can be a path to greater suggestibility and enhanced performance. Based on our findings we also suggest the consideration of more conscious employment of suggestive techniques in sport. Based on our findings we suggest the more conscious application of suggestive techniques in sports.

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Appendix I. Description of Factors of the Phenomenology of Consciousness Inventory scales

Factors	**Description**	**Items (reversed items in bold)**
Altered experience	Higher score corresponds with increased -	11,**26**,51,15,30,42,**17**,**29**, 39,**4**,**23**,32,47
body image	- feelings about dissolved body boundaries	11,**26**,51
perception	- change in the perception of the world	**17**,**29**,39
meaning	- presence of transcendental, mystical or spiritual experiences	**4**,**23**,32,47
time sense	- feelings about the change in the progress of time	**15**,**30**,43
Positive affect	- positive feelings	46,**9**,**5**,35,**49**,20
joy	- feelings of happiness and ecstasy	46,**9**
sexual excitement	- sexual feelings	**5**,35
love	-feelings of love	**5**,35
Negative affect	- negative feelings	**33**,14,31,**7**,**16**,42
anger	- feelings of rage	**33**,14
sadness	- feelings of sadness, unhappiness or dejection	31,**7**
fear	- feelings of being frightened	**16**,42
Visual imagery		44,**12**,**18**,48
amount	- amount of visual images	44,**12**
vividness	- reality of images	**18**,48
Attention		**52**,28,**8**,1,**34**,
direction	- focus of attention, focus on inner feelings and experiences instead of the outside world	**52**,28,**8**
concentration	- ability to concentrate on relevant things and excluding disturbing ones	1,**34**
Self-awareness	- retained consciousness and self-awareness, similar to alert state	**50**,**27**,13
Altered state of awareness	- experience of state of consciousness as different from the usual	21,**40**,53
Internal dialogue	- inner silent talk	45,**6**
Rationality	- clear, logical thinking	**2**,**24**,36
Volitional control	- feelings about deliberate controlling of thoughts and attention	41,**25**,**3**
Memory	- clear memories	10,22,**38**
Arousal	- feelings of muscle tension	37,**19**,

Table 1. General description of participants

	N	Female	Male	Mean Age	Range	SD
Group 1: solitary runners	54	34	20	36.74	19-52	8.1
Group 2: spinners	36	27	9	31.39	18-45	7.75
Group 3: AAH	26	18	8	27	19-49	8
Group 4: control	259	154	105	21.84	18-44	3.07

Table 2. Cronbach alpha values for associations among the items in each PCI dimension

PCI dimensions associated with altered state of consciousness	Cronbach alpha	Cronbach alpha of the Hungarian translation
altered experience	.86	.91
self-awareness	.75	.85
altered state of awareness	.89	.88
rationality	.76	.80
volitional control	.63	.70

Chapter 3: Discussion

3.1 Interactional synchrony

Active-alert hypnosis (AAH) is a psychotherapeutic method popular in most countries, especially in Hungary (Biró, 2012). Pre-industrial societies often utilized altered states of consciousness (ASC) achieved through increased activity for healing, religious or other rites. A breakthrough in the understanding of trance states associated with activity occurred in 1976 when Eva Bányai developed the active form of traditional relaxational hypnosis, the active-alert hypnosis (Bányai, 2018; Bányai & Hilgard, 1976).

During AAH, the subject pedals on a bicycle ergometer, eyes open, and during the induction the hypnotist emphasizes freshness, alertness and vigilance instead of relaxation and calmness suggested during traditional relaxation hypnosis. This approach focuses on the subject's or (in therapy) the client's own resources and coping abilities, thus providing an even greater opportunity for active participation in the hypnotic interaction through physical activity (Bányai et al., 1993). Research conducted with healthy volunteers has shown that AAH have subjective properties that are different than those characteristics of traditional hypnosis, such as increased alertness, more positive emotions and more active participation (Bányai, 1987).

During traditional hypnosis both participants were in a similar, seated position, facing each other, while during AAH the hypnotist was standing still, while the subjects exerted effort pedalling the ergometer in a seated position. The subject was also facing away from the hypnotist, who was standing next to the ergometer. In spite of the different levels of activity, body position and role of the participants, it was AAH that motivated Éva Bányai, to formulate the social-psychobiological theory of hypnosis (Bányai, 2018).

Indicators of interactional synchrony as shown by our results show differences when compared to those measured during traditional hypnosis, this difference may be the due to the fact, that there were only female participants in Study 1 and 2 and that may have influenced the hypnosis style (E. Kasos et al., 2018). At the same time, traditional and AAH is characterized by different hypnosis styles as well. Bányai at al. (1990) described two distinct hypnosis styles – physical-organic (maternal style) and analytic-cognitive (paternal style), observed during traditional hypnosis (Bányai et al., 1990). During AAH, there seem to be a more equal relationship, a friend-like style (Bányai, 2008a, 2018) or a sibling-like style (Varga & Kekecs, 2015). It is possible, that for those low hypnotizables, who have a harder time being absorbed in the hypnotic experience, and who may even resist allowing the hypnotist to take control, have an easier time experiencing hypnosis when they feel more equal to the hypnotist. Future research may focus on the influence of hypnosis style on the different physiological and phenomenological indicators.

During AAH negative correlation was discovered between the father protectiveness subscale of subjects' s-EMBU, and the hypnotists' OT change (E. Kasos et al., 2018). Based on the results from the traditional hypnosis we expected a negative correlation between the subjects' emotional warmth toward their parents expressed on the s-EMBU and the increase of the hypnotists' OT (Varga & Kekecs, 2014). This result is maybe one of the strongest from an interactional standpoint. It could be construed that hypnosis is an explanatory model for the regulation of social connections, subjects bring their more formative relationship representations into the hypnosis situation and the hypnotist seem to react on a hormonal level.

Another interesting interactional result is that the level of cortisol in the hypnotist post-hypnosis showed a positive correlation with the subject result on the *rationality* dimension of the PCI. As if the hypnotists found the subjects' lack of absorption stressful. Sachar et al. (1966) also found that hypnotists showed decreased cortisol level when the subjects found their archaic involvement positive, while perception of conflicted involvement was not linked with such an alteration(Sachar et al., 1966).

As per the social-psychobiological theory, hypnosis is a bidirectional, dynamic relationship, where both participants, subject and hypnotists are equally important and create the hypnosis experience together (Bányai, 1991, 1998). Still, in most hypnosis studies (often conducted by hypnotherapists) the hypnotist is often ignored. Based on results from the study by Varga at al. (2014) and similarities between active-alert and traditional hypnosis (during AAH there is no eye contact and the while the subject is active, pedalling on the ergometer the hypnotists is standing in one spot (Bányai & Hilgard, 1976)), we expected similar but not correlating subjective experiences from our participants.

Developed specifically for situations where altered state of consciousness is present the PCI is a great measure to compare subjective experiences. Hypnotists often describe experiencing a trance state while they are hypnotizing another person (Diamond, 1980; Scagnelli, 1980; Tart, 1967), and this seem to be supported by results during traditional hypnosis. We expected the phenomenological experiences of subjects and hypnotists to be similar but independent from each other. During both active-alert and traditional hypnosis subjects scored lower on positive affect, which may be because of the subjects' effort to be "good experimental subjects" while the hypnotists is trying the establish a positive rapport (E. Kasos et al., 2020; Varga et al., 2014). *(Figure 1*) Both studies found that hypnotists maintained more outward attention, but while during traditional hypnosis subjects were more relaxed during AAH they were more aroused, which is probably the result of the relaxed situation vs pedalling. Interestingly while both studies found that on the concentration and *imagery* dimension subjects and hypnotists scored similarly, during AAH on dimensions associated with altered state of consciousness – *altered state of awareness, altered experience,* (Farthing, 2008)- subjects scored higher while hypnotists did on *self-awareness, rationality, volitional control*, and *memory*. In the active-alert situation, hypnotists seem to experience consciousness similar to alert state. While lack of correlation was expected these differences may originate from the very dissimilar body position and activity level of hypnotists and subjects (E. Kasos et al., 2020).

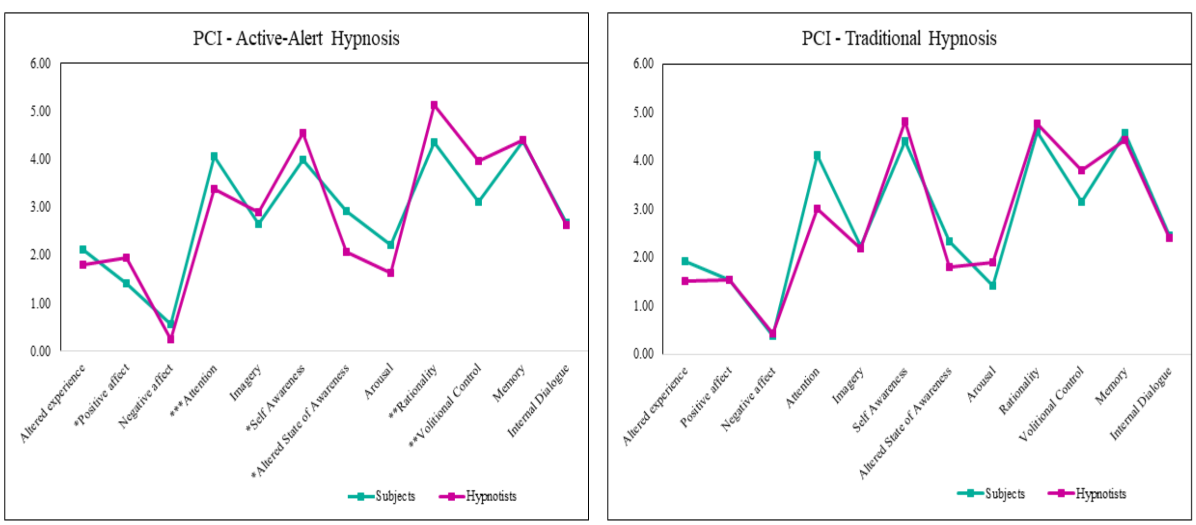

*Figure 1. Hypnotist and Subject results on PCI test during Active-Alert and Traditional Hypnosis (*p<.05, **p<.01, ***p<.001)*

The Dyadic Interactional Harmony (DIH) questioner helps participants to appraise the connection between them, it was developed for the interactional framework (Varga & Józsa, 2013). In traditional hypnosis, subjects' experiences were more intense, probably because of the novelty of the situation (Józsa, 2012), while during AAH there were no significant differences. This remarkable result may be due to the fact that while for hypnotists the hypnosis situation is familiar territory, AAH is not practiced as often as traditional, so they experienced a certain amount of novelty as well (Józsa, 2012; E. Kasos et al., 2020). *(Figure 2)*

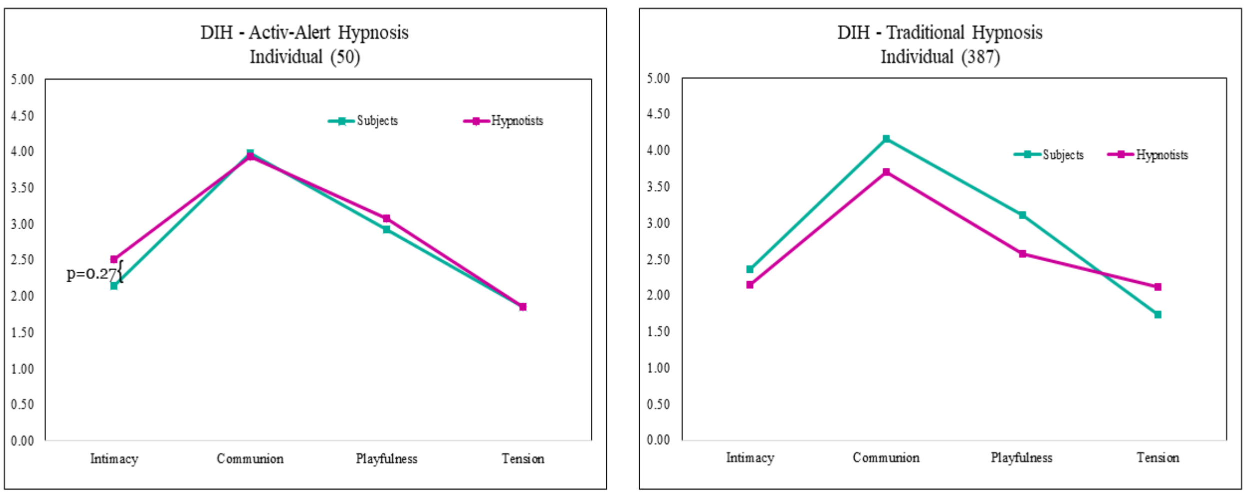

Figure 2. Hypnotist and Subject results on the DIH questioner during Active-Alert and Traditional Hypnosis

Results from Study 2 showed no difference as well as no correlation between the scores of subjects and hypnotists on the Archaic Involvement Measure (AIM), suggesting a similar archaic involvement between the two groups, which is interesting because of the differences in altered state of consciousness (E. Kasos et al., 2020). During individual traditional hypnosis subjects experienced more intense positive archaic involvement while during group hypnosis the negative involvement was more intense (Józsa, 2012).

3.1.1. Interactionality vs. Hypnotizability

Hypnotizability was an important individual factor that we hoped will help explain the differences in participants' responses.

In the 1. Study, there was no significant correlation between hypnotizability and hormonal changes during traditional hypnosis in either the hypnotists or the subjects (Varga & Kekecs, 2014), an interesting pattern emerged during AAH. Based on changes we discovered three distinct group of subjects, who showed significant difference in their susceptibility to hypnosis. The OT levels of high hypnotizables decreased, while low hypnotizables showed increase and the OT level of the third -medium hypnotizable- group showed no change pre- to post hypnosis (E. Kasos et al., 2018). This pattern was further highlighted when we found that increased OT showed correlation with lower scores on the *altered state of awareness* dimension of the PCI, with higher scores on *self-awarenes*s, less distorted time sense and perception, and less concentration and vividness of *imagery*. Those who showed less behavioural and phenomenological involvement in hypnosis, show participation in a less conscious or implicit way. This may be an explanation of why in some clinical settings, hypnotic susceptibility is not really a predictor of clinical effectiveness (Barabasz et al., 2010). Besides the motivation of the client, the interaction, the rapport that develops between client and hypnotists may be a stronger factor.

This surprising result was the first throughout my PhD research that seem to highlight the role hypnotizability plays in how participants respond to hypnosis. Hypnotizability is an important tool during hypnosis research, a way to categorize participants, and based on previous studies it is generally a predictor of how "well" or how strong participants react to suggestions after induction (Bryant et al., 2012; Költő et al., 2014; Milling et al., 2010; Piccione et al., 1989; Szekely et al., 2010; Weitzenhoffer & Hilgard, 1959, 1962) and often under non-hypnotic circumstances (Kihlstrom, 2016) . While the predictive effect of hypnotizability in case of certain medical conditions has been proven (De Pascalis et al., 1999; Ewin, 1986; Hammond, 2010; Hilgard & Hilgard, 1975; Margolis & De Clement, 1980; Olmsted et al., 1982; Smith et al., 1996), most clinical hypnotherapists do not pay much heed to hypnotizability, as measured by hypnotizability scales, often skipping any kind of measurement all together (Varga, 2008).

Some theorists argue that a certain intervention can only be considered the result of hypnosis if the therapeutic outcome shows positive correlation with the subjects' hypnotizability (Frankel, 1987; Hilgard, 1987; Spinhoven, 1987). It is often questioned whether the medical benefits are really the effect of hypnosis, or "only" the relaxational effect of hypnosis. There are several studies that showed a strong correlation between hypnotizability and therapeutic outcome: like pain management (De Pascalis et al., 1999; Hilgard & Hilgard, 1975; Smith et al., 1996), treatment of migraine (Hammond, 2007), burn injuries (Ewin, 1986; Margolis & De Clement, 1980), organic brain injuries (Barabasz & Barabasz, 2012; Fromm et al., 1964), and asthma (Hackman et al., 2000). At the same time in clinical psychology more importance is placed on the imagination (Baker, 1987; Fromm, 1977), and the perception of the client regarding her/his absorption may form the basis of a successful therapy (Jupp et al., 1985; Pekala et al., 1985).

Connections between hormonal changes and the phenomenological results gave us a more complex picture. Higher cortisol increase was connected to higher score on the PCI *imagery* dimension. *Imagery* is considered an important element in hypnosis (Landry et al., 2017), and participants more adept at mental *imagery* find hypnosis easier and have more positive experiences (Gregerson et al., 1996; Kwekkeboom et al., 1998; Sohn et al., 2001; T. Thompson et al., 2009). Our results may indicate that this inner work requires effort, serves as a stressor. Studies using virtual *imagery* for subjects with low trait absorption, found improved engagement compared with traditional methods (T. Thompson et al., 2011). In order to improve subjects' engagement, hypnosis with a virtual reality element, maybe helpful with inner work for subjects who struggle with engagement in hypnosis may be helpful in increasing the beneficial effects of hypnosis (R. W. Thompson et al., 2011; T. Thompson et al., 2011).

Research conducted in our Laboratory using traditional hypnosis and measuring EDA only on the non-dominant hand of subjects found higher SCL, the tonic component of EDA, during the musical condition than during hypnosis. This indicates a decrease in activity of the SNS during hypnosis but interestingly this was not influenced by the hypnotizability of the subjects (Kekecs et al., 2016). In Study 4 we explored the effects of *permitting* vs. *excluding* suggestions on electrodermal laterality differences on the skin conductance orienting response during AAH. The 32 participants experienced either *permitting* or *excluding* suggestions regarding "distractions" during the dream task, in AAH and a musical control condition. The order of the conditions (hypnosis and music) was also randomized. The dream task adhered to the standardized text but was followed by the suggestion: *permitting*: "*Although you are in a deep relaxed sleep, you are aware of your surroundings and any distractions that might disturb your dream. When you hear me speak again, you will pay attention to me once more.*" or *excluding* suggestion: "*You are in such deep and relaxed sleep, that no outside stimulus will disturb your sleep. Only when* *you hear me speak again, will you be awake once more*." These couple of words were the only difference between the conditions, and these were tolt to participants only once.

In response to the first standard tone skin conductance orienting response on the right side was higher independent of condition, hypnotizability or suggestion (E. Kasos et al., 2022). Another study conducted by our Laboratory using AAH found similar right-dominant lateral asymmetry during induction but only in high hypnotizable subjects. Low hypnotizables showed a left dominant shift (K. Kasos, Kekecs, et al., 2018). Our results also showed that during hypnosis high hypnotizables experienced higher skin conductance orienting responses in response to *permissive* as opposed to *excluding* suggestions while low hypnotizables showed similar pattern during the musical control condition (E. Kasos et al., 2022). These results seem to confirm physiological responses produced by hypnosis. Contemporary studies also found connection between hypnotizability and neurological changes during hypnosis, increased theta and alpha power in the frontal-parietal areas of the brain, indicating a more intense attentional process (Jamieson & Burgess, 2014; Sabourin et al., 1990; Terhune et al., 2011). Increased activity in the prefrontal area coupled with decreased activity in the default mode network (cortical areas activated when there is no goal directed activity) area as well as in the anterior cingulate cortex (Deeley et al., 2012; McGeown et al., 2009). The induction theory of Gruzelier is also based on correlation between hypnotizability and higher amplitude right side response (Gruzelier & Brow, 1985). While the previous studies (except for Kekecs et al. 2016) have showed correlation between hypnotizability and EDA but our results also demonstrated that low hypnotizables showed suggestion specific responses but during the control condition. Kasos et al (2018) also found that the EDA of low hypnotizables changed opposite to high hypnotizables (K. Kasos, Zimonyi, et al., 2018). Our hormonal results also showed that low hypnotizables also react to hypnosis, even if it is not on a behavioural level (E. Kasos et al., 2018). There is also anecdotal evidence, that some low hypnotizables besides not responding behaviourally to suggestion, show signs of resistance and several studies have demonstrated that hypnosis was helpful in the pain management of low hypnotizables as well (T. Thompson et al., 2019).

These results seem to highlight the pattern that appears throughout these studies. While low hypnotizables may not give overt behavioural response to suggestions, it does not mean they do not respond to in some way. While hypnotizability is a good predictor of responsiveness to hypnosis under some circumstances, it may not be true all the time. Under some circumstances building positive rapport, trust in the hypnotist, trust in the hypnosis situation may play a role as well. Low hypnotizables in the control condition may have reacted to suggestions similarly than high hypnotizables under hypnosis because they did not feel they had resisted anymore, since it was not "hypnosis".

3.2 Hypnotic Processes

Examining hormonal changes, especially changes in OT and cortisol during AAH, following similar studies conducted with traditional hypnosis was very interesting and it supported the difference between the effect of hypnosis as opposed to other process, like relaxation or movement. Hypnosis being a model social situation, it is a natural step to consider its effect on OT, the regulating hormone of affective and social processes.

Both traditional and AAH studies found an increase in the hypnotists' OT levels but only during AAH was the change significant. At the same time, subjects' OT level showed no change during active-alert and a not significant decrease during traditional hypnosis (E. Kasos et al., 2018; Varga & Kekecs, 2014).

On the other hand, cortisol levels decreased during both studies, but this change was not significant in the subjects of AAH. While there are only a limited number of studies that measured changes in OT in relation to physical exercise in humans (Altemus et al., 1995, 2001; Hew-Butler et al., 2008), short term exercise (less than 60 min) does not seem result in lower OT levels although these studies used blood samples to measure OT. At the same time, even short periods of physical activity resulted in increased levels of salivary cortisol (Kirschbaum & Hellhammer, 1994). The cortisol decreasing effect of exercise seem to be more associated with prolonged periods of activity and physical fitness (Wood et al., 2018), or exercise with a relaxational aspect like Hatha yoga (West et al., 2004). The same study found that African dance, a more active, aerobic exercise resulted in cortisol increase (West et al., 2004). These results seem to indicate, that the cortisol reducing effect can be attributed to hypnosis and not the relaxational effect.

3.4 Practical Application

In Study 4, we compared subjective experiences of individual runners, participants of group spinning class and individual AAH participants. In this study we were interested in how altered state of consciousness experienced by participants and measured by the PCI compares across the different situation, focusing specifically on the PCI dimensions associated with altered state of consciousness *altered experience, altered state of awareness, rationality* and *self-awareness* and *volitional control* (Farthing, 2008; Varga et al., 2014). Our results supported the hypothesis that altered state of consciousness can occur during exercise, similar to that experienced by highly hypnotizable participants of AAH, but there are some differences, and these may be as a result of the circumstances. On the *rationality* dimension spinners and the awake control condition reported similar scores, higher than the AAH condition but solitary runners scored significantly higher than all other groups. We theorized that the difference may be attributed to the fact that runners ran alone, while spinning is a group activity. Maintaining rational thinking as one runs alone, - paying attention to and adapting to the environment - is more important than during a front-lead spinning class. Participants of the AAH group scored lowest on the *volitional control* dimension as expected, since during hypnosis subjects allow the hypnotists to take control (Költő & Polito, 2017), also because of the suggestions regarding directionality of control. While runners scores were similar to those achieved by the AAH group, participants of the spinning group scored significantly higher (similarly to the awake control). As if spinners who were concentrating on the instructor maintained an outward directed attention, while runners were able to direct inward. Regular runners often describe cognitive clarity during exercise, as if running clears their mind (Lambourne & Tomporowski, 2010). *(Figure 3)*

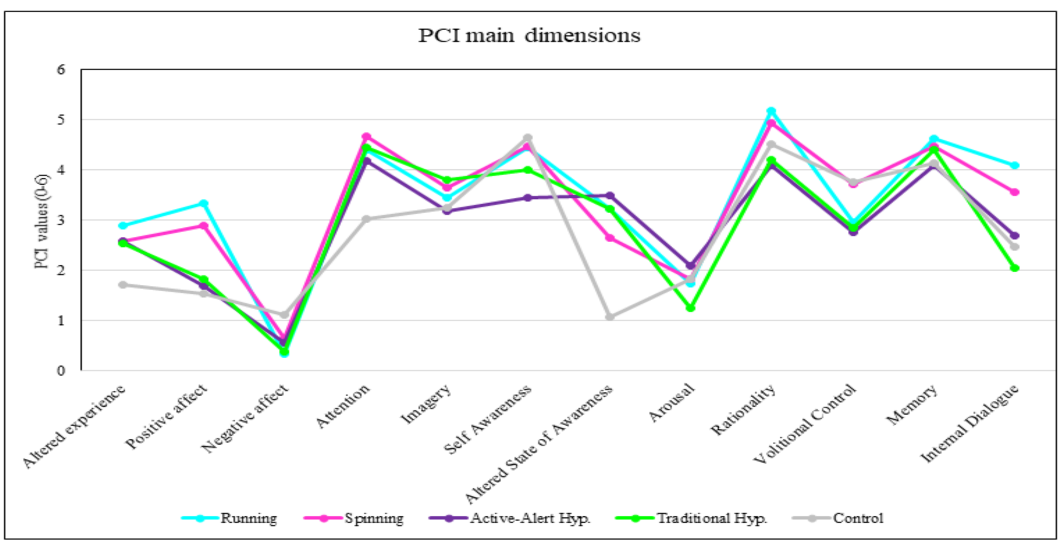

Figure 3. Participants average scores on the PCI main dimensions in the 5 different conditions

ASC during hypnosis is associated with increased suggestibility, which may also be the case in exercise-related ASC (Kihlstrom, 2008). When spontaneous ASC occurs during medical procedures and emergencies, positive suggestions can reduce recovery time and the need for pain medication (Bejenke, 1996; Kekecs & Varga, 2011; Szilágyi et al., 2007; Varga et al., 2013). Similarly, the increased suggestibility of participants in exercise-related ASC might enhance the quality and influence of communication between them and their coaches or their teammates. Because of potentially increased suggestibility, maintaining positive communication and avoiding negative comments is essential as it may influence performance and anxiety. ASC, both in flow states and AAH, has a documented positive effect on sport performance, via reduced anxiety, and enhanced cooperation (Bányai et al., 1993; Chavez, 2008; Robazza & Bortoli, 1994; Stein et al., 1995).

Other possible advantages of ASC during exercise are better focus of attention, decreased anxiety and higher performance. Flow theory posits that certain tasks can be better performed under ASC, which has a performance-enhancing aspect (Bányai, 2008b; Csikszentmihalyi, 1990). Participants of active-alert hypnosis reported reduced anxiety, effortless movements, increased speed of pedalling without feelings of tiredness (Bányai et al., 1993; Bányai & Hilgard, 1976) and hypnosis showed positive effects on sport performance (Liggett, 2000; Robazza & Bortoli, 1994, 1995).

During group activities there can be a strong affective contagion among members (Zumeta et al., 2016), which leads to a collective attunement to each other's mental states. Emotional and interactional synchrony is also observed during hypnosis (Bányai, 1998; Bernieri & Rosenthal, 1991; Jensen et al., 2015). According to Bányai's social-psychobiological theory, the evolutionary adaptive aspect of ASC is enhanced synchrony that promotes cooperation, faster understanding, and harmonious behavioural, physiological and emotional patterns (Bányai, 1991, 2008a). Interpersonal synchrony is also associated with higher self-esteem (Lumsden et al., 2014). When associated with positive emotions, it can increase performance, reduce stress

3.5 Limitations

One of the major limitations of all 4 Studies is the homogeneity of race and age, socioeconomic status and education. Participants were all white, middle class, mostly university students with stable financial background. Also, the mean age of the participants was low, since most of them were university students. We know from hypnosis research that hypnotizability stabilizes around age 14-16 and remains stable during early and middle adulthood (Rhue, 2004; Varga, 2008) and hypnotizability and suggestibility during hypnosis shows a strong correlation. During adulthood, age do not seem to effect suggestibility (Barber & Calverley, 1963; Deckert & West, 1963). In future studies, beside suggestibility, a focus on more balance among age groups as well race and education level may help generalization.

In Studies 1,2,3 that participants were all physically and mentally healthy so results may vary when it comes to clinical population.

Participants in Study 1 and 2 were all female, influencing the style of hypnosis. Also, the small number of participants increased the possibility of Type I and II errors.

In Study 4, the hypnotizability of the exercisers and the awake control was not assessed and this may have influenced our results. Each of the exercise groups (runners and spinners) included participants who exercised regularly and some who exercised only occasionally. While achieving ASC should not be dependent on how much one exercises but on how willing one is to be drawn into the experience (Chavez, 2008), a more systematic approach would have been beneficial.

As participation was voluntary, subjects in the three experimental conditions of Study 4, were “self-selected” in the sense that they decided to exercise or to participate in the hypnosis session. This implies they might have had specific motivation to experience the given situation. In contrast, for subjects in the everyday waking state condition it was part of their academic duties to attend the classes.

At the same time ASC, whether we are talking about hypnosis, or the flow experience is very hard to achieve when one is assigned to a particular condition they would not have chosen, and they may not enjoy. Thus, while being conscious of possible bias, we argue that even using a non-randomized design can render relevant results. Also, online and paper and pencil methods used differentially by exercisers versus hypnosis and control groups while warranted may have influenced our findings, although there is evidence that results of paper-based and online assessments of hypnosis-related constructs lead to comparable results (Költő et al., 2015) While we believe, thoughtful communication is beneficial under all circumstances, more controlled selection of participants would have been advantageous.

3.6 General Conclusion

The present PhD dissertation consists of 4 studies, examining different aspects of the AAH, within the interactional framework. Studies 1,2 and 3 examined AAH from an endocrinological, a phenomenological and electrodermal perspective following the study

Prof Katalin Varga and dr. Zoltan Kekecs (2014) conducted using traditional relaxational hypnosis and all male participants. Study 4 explored whether there is altered state of consciousness during solitary running and group spinning exercise, and if the altered state is comparable to the one high hypnotizables experience during AAH.

Few studies have been published on the subject of AAH. The studies presented here are important in that they examine the effects of AAH using subjective and neurophysiological indicators, in addition to the experience, analysing changes in the autonomic nervous system and the neuroendocrine system.

Another unique feature is that in connection with physiological, "hard" indicators we analyse and present subjective data. A further important feature is that, in line with the social-psychobiological approach to hypnosis, we are the first hypnosis research group in the world to investigate both participants of the active-alert hypnotic interaction.

The most important results of the presented studies are that the beneficial effect of hypnosis can be accessible for low hypnotizable subjects as well and that interactional synchrony, the social connection achieved during hypnosis may be the driving factor behind the corrective effects of hypnosis.

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