

**THE RELATIONSHIP BETWEEN SKIN
CONDUCTANCE AND EYE CONTACT OF SPOUSES IN
COUPLE THERAPY**

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The connection between eye contact and skin conductance has been studied to some extent earlier, but not in a multiactor therapy setting. The aim of this study was to examine whether there was a connection between skin conductance and eye contact in couple therapy. It was studied by examining the synchrony between spouses, their eye contact and also how the spouses' skin conductance changes in the different moments of eye contact: before it starts, at the starting time, and after the starting time. The hypothesis was that the peak of SCR would be in the starting time of the eye contact. Another goal was to determine if there was a difference between men and women in their skin conductance responses (SCRs). The population of this study consisted of 11 couples of which eight had two measurement sessions and three had one. The mutual eye contacts between each couple were analyzed with Observer XT by Noldus. The concordance indexes were calculated for each couple for the whole session and represent the amount of synchrony between the couple. To study the SCR changes during eye contact, the phasic SCRs were standardized for each participant over the whole session to make them comparable between participants. To carry out the qualitative analysis the histograms of SCRs were computed in one second bins for the time of eye contacts and three seconds before and after it. It was discovered that the eye contact duration mean and the skin conductance concordance were related to each other in the first measurement sessions, indicating that when the couple's skin conductance synchrony was higher, they also had longer mutual eye contacts. When examining how SCRs change in different moments of eye contact the result was that some cases supported our hypothesis, but it seemed that the topic of conversation had a bigger effect on SCRs than eye contact. The results concerning gender differences indicated that there were no differences between men and women in their SCRs. Lastly, we were interested to see how was the situation in the therapy session and what was the topic of conversation when eye contact and a statistically significant SCR occurred at the same time. The co-occurrence of eye contact and SCR seemed to be connected with topics that induce arousal, such as talking about intimacy problems or getting offended by the other party. The results of this study can improve the understanding of the nonverbal interaction of spouses in couple therapy and how the couple attunes to each other.

Keywords: Couple therapy, eye contact, skin conductance, electrodermal activity, autonomic nervous system, embodied synchrony

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Katsekontaktin ja ihon sähkönjohtavuuden välistä yhteyttä on tutkittu aiemminkin, mutta tutkimusta ei ole tehty monitoimijaisessa terapiatilanteessa. Tämän tutkimuksen tarkoituksena oli tarkastella ihon sähkönjohtavuuden ja katsekontaktin välistä yhteyttä pariterapiassa pariskunnan välisen synkronian kautta, ja lisäksi selvittää, kuinka ihon sähkönjohtavuus muuttuu katsekontaktin eri hetkinä: ennen kuin katsekontakti alkaa, sen alkamishetkellä, ja alkamishetken jälkeen. Oletuksena oli, että ihon sähkönjohtavuuden vasteet nousevat katsekontaktin alkuhetkellä. Lisäksi tarkasteltiin, onko miehillä ja naisilla eroa ihon sähkönjohtavuuden vasteissa. Tutkimuksen otos koostui 11 pariskunnasta, joista kahdeksalla oli kaksi mittausistuntoa ja kolmella yksi. Katsekontaktit pariskuntien välillä analysoitiin Nolduksen Observer XT -ohjelmalla. Konkordanssi-indeksit laskettiin jokaiselle parille koko istuntoa varten ja ne edustavat synkronian määrää pariskunnan välillä. Jokaisen osallistujan ihon sähkönjohtavuuden vasteet standardoitiin koko istunnon ajalta, jotta ne olivat keskenään vertailukelpoisia. Kuvioissa, joita käytettiin laadulliseen analyysiin, ihon sähkönjohtavuuden vasteet sijoitettiin sekunnin pituisiin luokkiin janalle, jossa oli katseen alkamishetki ja kolme sekuntia sitä ennen ja sen jälkeen. Katsekontaktin pituuksien keskiarvo ja ihon sähkönjohtavuuden synkronian konkordanssi-indeksi olivat yhteydessä toisiinsa ensimmäisellä mittausistunnolla siten, että pariskunnan välistä ihon sähkönjohtavuuden synkroniaa havaittiin enemmän, mitä pidempiä katseet istunnon aikana olivat. Ihon sähkönjohtavuuden vasteiden muuttuminen katsekontaktin alkuhetken aikana tuki osassa tapauksista hypoteesia, mutta vaikutti siltä, että keskustelun aiheilla oli suurempi vaikutus ihon sähkönjohtavuuden vasteisiin kuin katsekontaktilla. Naisilla ja miehillä ei havaittu tilastollisesti merkitsevää eroavaisuutta ihon sähkönjohtavuuden vasteissa, kun tutkittiin vasteita ennen katsekontaktia, sen alkuhetkellä ja alkuhetken jälkeen. Tutkimuksessa selvitettiin myös, millainen terapiatilanne oli ja mikä oli keskustelun aiheena silloin, kun havaittiin tilastollisesti merkitsevä ihon sähkönjohtavuuden huippuarvo, ja samaan aikaan pariskunnan välinen katsekontakti. Katseen ja ihon sähkönjohtavuuden huippuarvon samanaikaisuus vaikutti liittyvän virittäviin aiheisiin, kuten kumppanille suuttumiseen tai läheisyyteen liittyvistä ongelmista puhumiseen. Tämän tutkimuksen tulokset auttavat ymmärtämään paremmin pariskuntien välistä nonverbaalista vuorovaikutusta pariterapiassa sekä sitä, millä tavoin pariskunta virittyy keskenään.

Avainsanat: pariterapia, katsekontakti, ihon sähkönjohtavuus, autonominen hermosto, kehollinen synkronia

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1. INTRODUCTION

Eye contact is an essential part of every situation that requires social interaction. Through eye contact it is possible to show the willingness to approach and communicate and it is also linked to emotions (Kellerman, Lewis, & Laid, 1989). However, there are only a few studies that examine the role of eye contact in couple therapy although it is an important aspect in every interaction, including therapy. To our best knowledge, skin conductance combined with mutual eye contact of spouses has never been studied before even though there is evidence that eye contact is linked with skin conductance, thus this study provides important information.

The aim of this study is to investigate the relationship between skin conductance and eye contact of spouses. The objective is to gain more information about the mutual eye contact between spouses in therapy situations and to investigate if their skin conductance responses (SCRs) change as a result of mutual eye contact. Unique in this study is that the SCR changes are examined at the starting time of eye contact as well as before and after it. The population in this study consists of 11 couples and their therapy sessions. The setting of this couple therapy project was natural and authentic and therefore this study creates unique and rare information compared to studies with experimental settings.

1.1 Eye contact

According to Baron-Cohen (1997), we all have an inner-built module that is related to our social cognition, eye direction detector (EDD). Even the human babies have an innate tendency to turn their eyes towards their caretaker. EDD serves several functions: it observes eyes and eye-like symbols, estimates the direction of the gaze and points other person's mental states to the observing person. It is also the reason why we tend to see eye-like stimuli in inorganic objects, such as mountains and trees. Cultural norms among other reasons affect how much people look at each other (McCarthy, Lee, Itakura, & Muir, 2006). Also, how the gazer and the target of the gaze interpret the situation is an important part for the meaning of a gaze (Watson, 1970). McCarthy et al. (2006) compared one's propensity of looking at other people's faces and took into account their cultural background. They showed that the Canadians watched a researcher longer than the Japanese people did. In addition, culture has an effect how eye contact is understood: in the eastern culture, avoiding eye contact can

indicate respect to the other party whereas in the western culture it can be interpreted as dishonest (Argyle, Henderson, Bond, Iizuka, & Contarello, 1986).

According to Patterson (1982), gaze has several purposes: it conducts interaction, provides information, expresses affection, uses social control and directs actions or aims. Eye contact can be the quickest way to start communication and it creates the base of the communication between humans (Csibra & Gergely, 2006). If there is no eye contact at all, people do not feel like they are completely interacting with each other. Therefore it is usual in social interaction that people tend to look at each other repeatedly. In addition, successful communication and understanding someone's mental state usually requires eye contact (Baron-Cohen, 1997). Certain areas of the human and monkey brain have neurons that react selectively to bodies, faces and gaze (Emery, 2000). However, some psychopathological illnesses, especially autism, can cause difficulties in social communication and interaction (Lord, Cook, Leventhal, & Amaral, 2000) and abnormalities in the ability of following others' gaze directions (Emery, 2000).

Gaze is decoded by taking into account the social context and also other aspects of the face (George & Conty, 2008). The direction of the gaze shows us the target of the attention. The perception of another person's direct gaze toward some object can also influence the evaluation we make of that object. By widening and narrowing the eyelids or moving or tilting the head one can modify the message and meaning of a gaze (Ekman & Friesen, 1975). With eyebrow positions a gaze can send many different meanings: lowered brows indicate for example aggression, anger and disgust, whereas raised eyebrows demonstrate surprise, fear or happy expressions among other things.

It has been found that processing of a direct versus averted gaze is not symmetrical and that perception of a direct gaze evokes certain processes that have a connection with face and eye movement encoding (George & Conty, 2008). In addition, these processes seem to have a link with emotions and theory of mind as well. According to Harper et al. (1978), there are several different gazes. The face-gaze means that a person looks at another person's face area. The eye-gaze, in turn, happens when the gaze is directed to someone's eyes. Mutual gaze requires that both persons look at each other's faces. In contrast, eye contact requires that the gaze is shared and the both look into each other's eyes. However, eye contact can be avoided either on purpose or unintendedly. According to study by Hietanen, Leppänen, Peltola, Linna-Aho, and Ruuhiala (2008), gaze direction is the one of the strongest social cues that controls the whole communication. Gazing is discovered to be related to nervous system's mechanisms that regulate approach and avoidance behaviour: seeing a person with a direct gaze prepares us to approach and turned gaze to avoid the target. According to Gallagher (2014), a direct gaze is a clear sign of willingness to communicate and there can also be a request to

respond to the gaze. In addition, the lack of eye contact is sometimes related to indifference and scarcity of empathy (Marci & Orr, 2006).

Eye contact lasts usually 3-10 seconds (Argyle & Dean, 1965). According to study by Binetti, Harrison, Coutrot, Johnston, and Mareschal (2016), preferred duration of eye contact is 3.3 seconds. Binetti et al. (2016) also suggest that the preferred length of gaze is connected with changes in pupils which indicate physiological arousal. The amount of arousal correlates with the length of eye contact that is regarded convenient. When the duration of eye contact is prolonged, it can be interpreted as staring, which continues despite the acts of the person being stared at (Ellsworth, Carlsmith, & Henson, 1972). Usually a stare is defined as a self-confident or even aggressive sign (Watson, 1970) and can cause the subject of the stare to escape from the situation, indicating that being stared at is often uncomfortable (Ellsworth et al., 1972). Staring at a person in silence can also be understood as a sign of dominance (Thayer, 1969). On the other hand, staring can have also positive meanings: it can evoke warm feelings and indicate intimate connection between people. In specific situations staring can also be seen as a signal of distress or call for aid and it can evoke approach instead of avoidance (Ellsworth & Langer, 1976; Langer & Abelson, 1972).

Kellerman, Lewis, & Laid (1989) found that gaze is also related to emotions. There are several studies where people were noticed to look longer at the persons they care of. Kellerman et al. (1989) showed in their study that eye contact makes us feel more love towards the person we are looking at. They discovered that subjects who had eye contact for two minutes reported to feel significant attraction, interest and warm feelings towards each other. However, it turned out that this effect concerned only those persons whose feelings are usually based on their behaviour. Also, increased feelings of attraction and love required that the gaze had to be shared, it was not sufficient only to look the other person at the eye area. Hills and Lewis (2011) found that people who felt happy and cheerful sought others' eye contact automatically and in contrast people who were sad avoided the eye contact and did not seek it. Perhaps this also explains why a client might avoid eye contact when discussing difficult subjects.

1.1.2 Eye contact in couple therapy

Eye contact is an important part of every interaction, but there is not much research about it in the aspect of couple therapy. Couples come to therapy usually because of several reasons. For example, unsuccessful communication can either be cause or consequence of conflicts between the couple. In

this study it was possible to study interaction between couples in an authentic situation, which is very unique. Couples discussed exactly the themes they wished to: no specific tasks were given to perform. Sometimes the issues couples talked about were very serious or challenging, for example problems with intimacy, commitment issues, suicide plans, eating disorders or other mental disorders. The general aim in couple therapy is to try and resolve disagreements and communication issues (Pan, Neidig, & O'Leary, 1994). As a consequence, the relationship between partners improves and the couple develops better communication skills.

According to Argyle and Cook (1976) and Kendon (1967), people commonly direct their gaze to their partner not only to observe their state of mind but also to express their own emotions. The emotionality of situation can be controlled through the amount of mutual gaze: looking at one's own partner or breaking the eye contact can help to regulate one's state of mind and emotions (Kendon, 1967). In addition, the eye contact can also help to share the opportunities to talk and lead the roles of discussion and as a result, directing the gaze makes the conversation more fluent. However, there can be situations where looking at each other may not be beneficial. For example, if the couple is arguing heatedly, it could be better to block their eye contact with each other in order to improve the quality of conversation (Scheinkman & DeKoven, 2004).

According to Foley and Gentile (2010), eye contact is generally avoided when client is anxious. Therefore, when feeling distressed, a client may avoid eye contact in couple therapy as well, both with their partner and therapist. The topic of conversation naturally affects the eye contact in therapy (Kendon, 1967). When the client is speaking for a long time, it is common to look away once in a while, especially if the topic in question requires a lot of reflecting. Taking turns in talking and listening also has an effect in eye contact in therapy. For example, when the client is speaking, the therapist usually watches and observes them often for the whole time for they are speaking, whereas the client alternately looks at the therapist and away. A lack of eye contact may also indicate that client is lost in their own thoughts and may not be focusing on the topic of conversation (de Roten, Fivaz-Depeursinge, Stern, Darwish, & Corboz-Warnery, 2000). However, lack of eye contact in couple therapy could also suggest that one is reflecting or contemplating what their partner or the therapist is saying, and does not mean they are not concentrating.

According to Horvath and Greenberg (1989), eye contact in therapy is discovered to be connected with a good therapeutic alliance. Eye contact among other therapist's nonverbal signals are linked with the successful therapeutic alliance in the beginning of therapy. Therapeutic alliance is one of the most important factors that gives indications of the outcome of therapy (Krupnick et al., 1996) and for this reason eye contact is such a significant part of interaction in all therapies.

1.2 Couple therapy

There are several reasons why couples seek therapy. Usually it is because couple is having problems for example with expressing their emotions or difficulties in communication (Doss, Simpson, & Christensen, 2004). Also decrease in devotion and fondness is common and if the couple has children, they may wish to ameliorate their relationship because of them. The general goal in couple therapy is to improve the state of the relationship and to investigate and resolve disputes and disagreements (Pan et al., 1994). It is common that there are two therapists in couple therapy, but there can also be only one therapist (Mehlman, Baucom, & Anderson, 1983). Doss et al. (2004) also found that usually wives list more reasons than husbands why the couple sought therapy in the first place. According to Delaney (2006), in most cases it is a woman who suggests to her partner that the couple should seek therapy.

Studies show that conflicts in marriage often predict intimate partner violence (IPV) and therefore marital problems should be taken care of as early as possible (Pan et al., 1994). There have been various opinions on the suitability of couple therapy when treating IPV, but nowadays it is believed that couple therapy can be an appropriate treatment for the couples with IPV (Stith, McCollum, & Rosen, 2011). There were three couples in this research, in which there had been an occurrence of IPV in the current relationship. Thus the data represents the situation faced by practitioners in the field (Holtzworth-Munroe, Meehan, Herron, Rehman, & Stuart, 2003). However, if the violence has been severe or the either one of partners feels it is not safe for them to speak honestly and freely, couple therapy is not a convenient choice of treatment (Stith et al., 2011).

According to Gurman (2011), as much as two thirds of couples benefit from therapy, thus it can be said that couple therapy is generally successful. In addition, it has been shown that therapy is always better than no treatment at all, therefore therapy is always effective to some degree (Dunn & Schwebel, 1995). It has also been found that in couple therapy all theoretical approaches are equally effective considering the outcome of therapy. Even though couple therapy is proven to be successful, the outcome depends on the quality of couple's problems. Furthermore, the reciprocal trust of the couple and their shared opinion on the therapeutic alliance has an effect on the successfulness of therapy (Symonds & Horvath, 2004). Therapeutic alliance can be described as a conscious relationship between clients and therapist and it is a central factor in couple therapy (Rait, 2000).

The challenge in couple therapy is that the therapist should be able to establish and maintain the therapeutic alliance with couple as a unit and also with both partners of the couple (Bourgeois, Sabourin, & Wright, 1990). Usually the therapeutic alliance develops slowly in couple therapy,

slower than in individual therapies (Rait, 2000). In multiactor therapy settings problems may arise if the both parties of couple are not motivated for therapy and sometimes couples end the treatment before they have had a proper chance to resolve their issues (Allgood & Crane, 1991).

1.3 Autonomic nervous system

Autonomic nervous system is a system that regulates many involuntary functions of the body, for example heart rate, blood pressure, thermoregulation and digestion (Porges, 2003). It functions principally at a subconscious level, hence the involuntary nature of the system. Autonomic nervous system is also responsible for maintaining the internal homeostasis and reducing damages around the body (Levenson, 2014).

Autonomic nervous system can be divided into two divisions: the sympathetic and parasympathetic (Porges, 2003). In a stressful situation sympathetic nervous system is activated by hypothalamus and as a result heart rate, blood pressure and circulation of blood increase. The activation of the sympathetic nervous system helps us to react to challenging or potentially threatening situations and improve the probability of survival (fight-or flight-response) (Smith, 1999; McCorry, 2007). In contrast, the parasympathetic nervous system is activated when the arousing or dangerous situation is over and when it is possible to feel relaxed again (McCorry, 2007). The parasympathetic nervous system is responsible for sensations associated with relaxing, enjoyment and repair (rest-and-digest) (Andreassi, 2007; McCorry, 2007). Even though these two systems are sometimes seen as opposing, both the sympathetic and the parasympathetic systems control the same, dually innervated organs, for example the heart (Andreassi, 2007).

Vagal tone, the activity of vagus nerve, is a part of autonomic nervous system (Porges, 1998). Polyvagal theory is linked with expressing several features of behavioral, psychological and physiological social behaviour and is also connected to Social Engagement System that controls looking, listening, vocalizing and facial gesturing (Porges, 2003). It gives a different aspect: range of social behavior is limited by physiological state. It emphasizes that mobilization and immobilization are adaptive strategies for individual who is for example frightened. Polyvagal theory provides a neurobiological model of how struggling with social behaviour can be related to facial expressivity and visceral state regulation or how social behaviour may be a regulator of physiological activity. Psychiatric disorders can have a base in the polyvagal theory, explaining some deficits like poor gaze

or low facial affect. The polyvagal theory may also explain the difficulties with social behaviour in autism. In his study, Porges found compromised cardiac vagal regulation in autistic individuals. Physiological state has a great significance also with the subjects that we are investigating in this research, such as head turning muscles (social gesture and orientation) and eyelid opening control (looking). Together, many physiological subjects function like filters to limit the social stimuli and also determinate of the engagement with the environment. Neural pathway which functions as raising the eyelids also tenses the stapedius muscle in the middle ear, that is for hearing human voice.

1.3.1 Electrodermal activity and skin conductance

There are various ways to measure the functioning of autonomic nervous system. By examining electrodermal activity (EDA) it is easy to study the activation of the sympathetic nervous system and therefore it has been a popular choice in psychophysiological research (Dawson, Schell, & Filion, 2007). EDA refers to the ability of skin to conduct electricity (Hugdahl, 1995). It is believed that measuring SCRs offers a more exact representation of the activation of sympathetic nervous system than any other psychophysiological measure (Shields, MacDowell, Fairchild, & Campbell, 1987). The human electrodermal system includes the sympathetic innervation of the autonomic nervous system, the basal-ganglia-limbic-cortical control circuitry and the eccrine sweat glands (Hugdahl, 1995). The SCRs can be observed via activation of the sweat glands, especially in palms.

There are three different types of EDA (Andreassi 2007; Hugdahl 1995). Tonic level of EDA refers to stable activity also known as skin conductance level (Andreassi, 2007). Phasic activity refers to temporary fluctuations of EDA called skin conductance responses. Spontaneous fluctuations are nonspecific responses which can occur even though there is no stimulus, although it is believed that they are sensitive to arousal and anxiety (Hugdahl, 1995). The three forms of EDA represent different psychological processes and are also measured in different periods of time. SCRs appear in seconds after stimulus whereas skin conductance level is measured in minutes. Spontaneous fluctuations, in turn, are counted for ten or twenty seconds.

According to Kreibig (2010), there is evidence that EDA is related to emotions, although there is no clear scientific consensus about the nature of the relation. For example, decreases in EDA were observed when test subject experienced relief, non-crying sadness and contentment. Almost all other emotions were present when EDA increased. Therefore, it is not clear which specific emotion is responsible when EDA increases: it could as well as be anxiety as happiness. In addition, it has been

found that skin conductance is linked to physiological arousal and concentration. To summarise, it is believed that increases in skin conductance is the result of arousal of sympathetic nervous system (Dawson et al., 2007; Kreibig, 2010). EDA is also related to stress: Reinhardt, Schmahl, Wüst, & Bohus (2012) found that EDA increases in situations that were considered to be stressful. However, there are also individual differences in skin conductance. These differences can be explained by personality traits (Mardaga, Laloyaux, & Hansenne, 2006) and expressiveness of emotions (Gross & Levenson, 1997). In addition certain illnesses, such as schizophrenia and psychotic periods, can affect skin conductance (Bernstein et al., 1982). Furthermore, it has been found that brain structures responsible for SCRs have been linked to mechanisms involved in emotional processing (Büchel, Morris, Dolan, & Friston, 1998).

1.3.2 Skin conductance and eye contact

There is some earlier research investigating the relationship between skin conductance and eye contact. According to Mazur et al. (1980), some nonverbal communication theories suggest that mutual gaze may be physiologically arousing. As early as in 1965, McBride, King, and James found that the skin conductance was higher when subject was looking at eyes and lower when looking at mouths. However, in their study, the difference between these two conditions was not significant. Nichols and Champness (1971) and Mazur et al. (1980) found that the skin conductance is significantly higher in a mutual gaze than when the eye contact is not reciprocal. Similarly, SCR has been shown to increase when there is a direct gaze in comparison to averted gaze and closed eyes (Conty et al., 2010; Helminen, Kaasinen, & Hietanen, 2011). Helminen et al. (2011) also found that the skin conductance was even higher in a situation where the subject themselves defined the duration of the stimulus, eye contact. Also Soussignan et al. (2013) obtained similar results in their study, reinforcing the evidence for the connection between skin conductance and eye contact.

Hietanen et al. (2008) found that the skin conductance was significantly higher in the situations where subject was viewing living human faces compared to the situations where there was a picture of a face or some other object. In addition, when looking at a real living face, a direct gaze induced higher skin conductance than avoided gaze. When subject was looking at pictures of faces, skin conductance did not increase similarly. There was also higher arousal levels and valence with the living face than the pictures and they were even higher when the gaze was direct. Also Pönkänen and Hietanen (2012) found that skin conductance increased in direct gaze compared to averted gaze.

Moreover, the facial expression had an effect on the skin conductance: when the subject was looking directly at a smiling face, SCRs were higher than when looking at a neutral face.

Marci and Orr (2006) studied interaction between patient and interviewer and found that when the interviewer intentionally decreased eye contact and other nonverbal responses, the physiological synchrony was lower. In contrast, normal interaction with ordinary amount of eye contact and nonverbal behaviour resulted in higher synchrony. Also Ramseyer and Tschacher (2011) studied nonverbal synchrony between clients and therapists and according to them, the synchrony can predict the quality of the relationship and also have an effect on the outcome of therapy.

Senju and Johnson (2009) have also discovered that children suffering from autism look less at others' eyes and rarely make eye contact. The tendency to avoid others' eyes could be because of the psychological arousal that occurs in eye contact (Dalton et al., 2005). There is some evidence that children with autism spectrum disorder have higher SCRs when they observe eyes (Kylliäinen et al., 2012). Children suffering from autism seemed to be hypo-aroused to faces without open eyes, but when seeing face with a direct gaze, the arousal increased.

1.3.3 Electrodermal activity and synchrony

Electrodermal activity (EDA) synchrony between people can be connected to many variables, for example emotional reactivity, discussion of difficult issues and empathy. It can also be seen as a factor that represents mutual engagement and arousal (Karvonen, Kykyri, Kaartinen, Penttonen, & Seikkula, 2016). Levenson and Gottman (1983) found that during the marital conflict discussions the skin conductance synchrony between a couple was higher than it was during neutral discussions. Slovak, Tennent, Reeves, and Fitzpatrick (2014) were interested in EDA synchrony between friends in a natural setting and they suggested that the synchrony demonstrates emotional reactivity between friends and ongoing high synchrony indicates mutual engagement. There was a setting where one participant was asked to ignore their friend when they were communicating. The synchrony increased if the active friend tried to get answers from their passive friend or became irritated.

In their study Karvonen et al. (2016) assumed that the highest attunement with EDA synchrony in couple therapy session would be between the couple, but surprisingly it was between the therapists. They suggest that this happened because the two therapists concentrated on the same clients at the same time, not on each other. Nummenmaa et al. (2012) noticed a similar finding: in their study the brain area networks were synchronized between people who were watching alike

emotive events. Karvonen et al. (2016) make a point that the synchrony is not always positive or beneficial. If the couple is arguing, sometimes it is the best option that the arousal of the couple is different if one acts very aroused and the other calms the situation by staying neutral.

1.4 The aim of the study

This study is a part of research project called “Relational Mind in Events of Change in Multiactor Therapeutic Dialogues”, which was financed by Academy of Finland and conducted in the University of Jyväskylä 2013-2016. The Relational Mind research project is interested in “embodied synchrony”. By that term Seikkula, Karvonen, Kykyri, Kaartinen, and Penttonen (2015) refer that people tend to attune with others, often unconsciously. We can be in synchrony with the world around us by our talk, body movements, facial expressions and physiology. In order to the embodied synchrony to happen the bodily reactions do not have to occur at the exact same time or even the reactions do not have to be purely similar. The synchrony can be complementary or have a lag and it may be affected by cognitive endeavor. The project is interested in the synchrony of clients’ and therapists’ sympathetic nervous system activity, but our study concentrates only in clients. The aim is to study the attunement between spouses in couple therapy session in order to gain better understanding of the embodied features of therapeutic dialogues. According to Hugdahl (1995), some bodily reactions are not observable in talking or acting, but can still tell of person’s psychological state. The use of psychophysiological recordings in therapy can make it possible to perceive bodily reactions and help to understand the state of mind better.

The main objective of this study was to examine the connection between skin conductance and eye contact through both skin conductance synchrony between spouses and their individual SCRs. As far as we know, skin conductance combined with eye contacts of couple therapy has never been studied before, thus it is an important and reasonable subject to study. In addition, it is considerable that in our current study the gaze was studied in a natural therapy session which is quite unique for an eye contact study. It is also exceptional that in this study it was possible to study problems in interaction and behavior during conflicts in a natural situation. Also even though the clients knew that they were filmed and their bodily reactions are measured, they did not know that their gaze is going to be studied.

1.5 Research questions

First and foremost, the main interest in this study was to find what is the relationship between skin conductance synchrony of spouses and their mutual eye contact. Second goal was to discover if there was any change in the individual SCRs, comparing the responses before the eye contact started, at the starting time of it and after that. We were also interested to investigate is there a difference by gender when examining the SCRs before eye contact, when it began, and after the starting time of eye contact and to find whether there is a change of arousal among women or men when investigating their SCRs of both sessions. Another objective was to examine how was the situation and what was the topic of conversation when SCRs were high during mutual eye contact. Finally, we were interested to explore what is the function of the mutual eye contact between spouses in couple therapy sessions and how long are the eye contacts in general. Our hypothesis of the arousing effect of eye contact is based on studies by Hietanen et al. (2008), who found that direct gaze compared to averted gazes caused significantly higher skin conductance. Also Nichols & Champness (1971), Mazur et al. (1980) and Soussignan et al. (2013) obtained corresponding results: the skin conductance was significantly higher in a mutual gaze than when the eye contact was not shared. Additionally, we supposed that the SCR would be the highest at the starting time of eye contact. We assumed that the beginning of eye contact is the most arousing moment of it since it creates a deeper connection between spouses and demands the both parties to focus on each other.

2. METHODS

2.1 The cases and design

In this study the population consisted of 11 couples of which 10 were opposite-sex couples and in one couple both spouses were women. All of them had participated voluntarily in this study and sought therapy either on their own or by the recommendation of a professional. There were two therapists working with each couple and depending on couple there were one or two measurement sessions with autonomic nervous system recording. These measurement sessions did not differ from

the other sessions besides that the couple had to wear equipment that recorded their bodily reactions: heart rate, breathing and skin conductance. Clients had put on heart rate monitors which recorded their heart rate one or two days before the first session so they had become used to it. During the sessions there were also electrodes measuring skin conductance in the palm of nondominant hand and elastic belts around the lower chest to measure breathing. All the sessions were videotaped and recorded with six cameras. All of the participants had given a written consent to researchers.

Clients were on average 42 years old (range 27–61) and therapists 54 years old (range 31–64) at the time of the study. Most participants had children. Some of the clients had medication for example for allergy, high blood pressure or mental health issues. The reason why couples had sought therapy were problems either with relationship or personal life or both. Three out of 11 couples had experienced intimate partner violence in their current relationship.

2.2 Quantitative analysis

2.2.1 Eye contact between the couple

The analysis of mutual eye contact was carried out by watching therapy videos. Observer XT by Noldus was used to watch the videos and to examine the eye contact. All of the sessions were coded together by the authors of this thesis. The video had been built from four videos, capturing each participant's face, including the therapists, from the front so it was possible to watch both clients' faces during the whole session. The main interest was to focus on the amount and the duration of eye contacts between the couple. When the couple had a mutual eye contact, it was registered in Observer by pressing the key M (mutual gaze) and when the gaze was over, we pressed the key N (no gaze). It was possible to speed up or slow down the video, and to make it stop, and also to make a visualization of the coding (figure 1). Even though Harper (1978) defined that mutual gaze is when we look at each other's face area, it was decided that in this study only the eye contacts were examined and it was required that the couple looked into each other's eyes. The reliability of this analysis was studied in our Bachelor's Thesis in which we also studied the eye contact of spouses in couple therapy. The reliability was investigated with duration/sequence -measure since the events examined were state events and the target of examination was the length of coding per episode. Latency was determined

to be 1 s. Because all of the sessions were coded together by the authors of this thesis, we decided to examine the reliability of sessions coded together by coding one session twice. The reliability with duration/sequence -measure was 96,41 %.

With Observer it was possible to examine different features of eye contact of the session, such as total number of eye contacts, maximum and minimum duration of eye contact and mean duration of eye contact. It was decided that during a mutual eye contact it was possible to break the eye contact for a very short moment, ca. one second, and still treat the eye contact as a continuous. This is because it is normal to look away for milliseconds and still have a continuing eye contact. In normal communication eye contact lasts usually 3-10 seconds (Argyle & Dean, 1965). Overly long incessant gaze can be disturbing and is defined as staring, which can be uncomfortable and may cause the person being stared at to leave the situation (Ellsworth et al., 1972). Also, when the information about skin conductance was combined with eye contact, it was beneficial to treat the eye contacts as continuous regardless the short pauses, because it is more likely that the skin conductance will not react to a pause of milliseconds in a long eye contact. Other criterion was that the client should not look at any other person than their spouse: if the client paused eye contact with their spouse even for a millisecond and had a new eye contact with therapists, the former eye contact was interrupted.

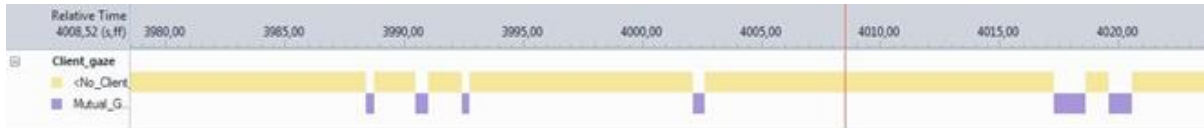


FIGURE 1. Visualization from Observer XT. Violet color means that couple is having eye contact and yellow color means no eye contact.

2.2.2 Skin conductance synchrony and eye contact

One aim of this study was to investigate the relationship between eye contact and skin conductance synchrony. For this purpose the electrodermal activity (EDA) concordance index was used as a measure of the synchrony between spouses (Karvonen, Kykyri, Kaartinen, Penttonen, & Seikkula, 2016). The indexes had already been calculated for the study mentioned above. Briefly, the EDA was downsampled to 1 Hz, differences were calculated between consecutive samples representing SCRs and averaged over 5 second moving windows. Subsequently cross correlations were computed in 15

second windows for each time point of the session, a ratio of the sum of all positive correlations and the absolute value of all negative correlations was computed and a natural logarithm of this ratio was taken to correct for the skewness of the ratios. A value of 1 represents a high positive synchrony and a value of 0 represents an equal amount of positive and negative correlations during the session. The concordance indexes were calculated for the time lags from 7 seconds before and 7 seconds after the zero lag and the largest positive concordance index was used for further analysis. To examine the relations between skin conductance and eye contact the correlations between them were calculated using SPSS v. 22.

2.2.3 SCRs before eye contact, at the starting time of it, and after the starting time

In this study EDA was recorded using two Ambu Neuroline 710 electrodes attached to the palms of the participant's nondominant hand close the first and fourth digits. Skin conductance was obtained with a GSR sensor, an amplifier and data acquisition unit (ExG 16) and data acquisition program (all from Brain Products, Germany). The signal was recorded in DC mode and low-pass filtered at 250 Hz before digitizing it at 1000 Hz.

To calculate the distribution of the lengths of the eye contacts the values of each participant of the first session were exported to the Neuroexplorer program (www.neuroexplores.com). The relative distributions of the lengths of the eye contacts were computed in one second bins with center frequencies from 0 to 20 seconds. Eye contacts longer than 20 seconds were excluded since they were observed in one couple only representing 3 % of all their eye contacts. The distributions were averaged over participants and multiplied with 100 to represent the percentage of eye contacts in each 1 second time bin.

Another aim of this study was to find out how skin conductance changes before the eye contact occurs, at the starting time of eye contact, and after that. For this purpose the signal was resampled to 10 Hz to adequately represent SCRs during their extraction and to reduce computation time. The SCRs, representing phasic changes of EDA related to sympathetic nervous system activation, were extracted with the LEDALAB program package written in Matlab (Benedek & Kaernbach, 2010). Subsequently, the signal was resampled to 1 Hz, standardized with the whole session mean and standard deviation for each participant and session separately to make the signals comparable over participants. Because the values are normally distributed, standardized values larger than 2 represents statistically significant increases in SCRs at the $p < 0,05$ level and values equal to 0 represent the

average of the SCRs over the whole session. To examine the relationship between the eye contacts and the statistically significant peaks of SCRs the SCRs with values larger than 2 SD were detected during eye contacts.

To obtain histograms for each participant and averages over men and women of the SCRs before the eye contact started, at the starting time of it, and after the starting time, the times of eye contacts and the standardized SCRs were exported to the Neuroexplorer. The program extracted a time period from 10 seconds before the eye contact to 10 seconds after the eye contact and averaged them over the whole session thus producing 21 averaged values.

2.2.4 Gender differences

Another interest in this study was to explore if there was a difference between men and women in the SCRs during the eye contact. To complete the analysis, the models of skin conductance and eye contact were created. In these models the zero point was the starting point of eye contact. Averaged SCRs of each person were calculated and after that two models of each couple were created: 3 and 5 seconds before and after the start of eye contact. Also one model with 10 seconds before and after the eye contact was created to examine the differences of all men and women in general. The spouses in one couple were both women and that couple was left out of this analysis. A paired samples t-test was performed to investigate the differences between genders. To determine if the SCRs were larger at the time of the eye contact than the average SCRs during the whole session for women and smaller 4 seconds after the eye contact for men a one sample t-test was performed. The last objective was to see if there was a change of arousal among women or men when examining the SCRs of the first and the second measurement session. For that paired samples t-tests were performed. All of the statistical tests were performed with SPSS v. 22.

2.3 Qualitative analysis

Another objective was to study the skin conductance peaks and what was the topic of conversation when SCRs were high. We were also curious to see if there was a mutual eye contact at the same

time. These skin conductance peaks were the highest SCRs during the session and we decided to examine especially the peaks where the skin conductance was clearly lower before and after the peak. This was because there were some sessions where the SCRs were quite high during the whole session and none of the skin conductance peaks were prominent.

To carry out the qualitative analysis we examined the models of mutual eye contact and skin conductance and the models of the skin conductance peaks and investigated the highest peaks. First, we decided to examine if there were skin conductance peaks of both spouses occurring simultaneously. Soon it became obvious that there was no mutual eye contact present when these peaks occurred and we chose to investigate the individual skin conductance peaks of both spouses. We decided to study closer two individual skin conductance peaks where there was also a mutual eye contact present. To examine the topic of conversation of the moment concerned we watched the video of therapy session in question around the skin conductance peak for 5 minutes. From the video it was possible to observe both clients' and therapists' faces simultaneously. To investigate the skin conductance peaks we focused on observing the topic of conversation, the atmosphere of the session, tones of voice and facial expressions. To understand better the conversation we also used the transcription of that therapy session.

3. RESULTS

3.1 The relationship between skin conductance synchrony and eye contact

Skin conductance synchrony between spouses measured in the first session correlated positively with the mean of the eye contacts' durations in the session ($r = .613$, $p = .045$). When the eye contacts were longer, the skin conductance synchrony represented as the concordance index was higher. There was no statistically significant correlation between skin conductance synchrony and eye contact duration in the second measurement session.

3.2 SCR changes before eye contact, at the starting time of it and after the starting time

One of the main goals of this study was to investigate how skin conductance changes before the eye contact starts, at the starting time and after the starting time. This analysis was performed by examining the levels of SCRs before and after the starting time of eye contact. To study the changes, the models of skin conductance combined with eye contact were created. In these models there were 3 and 5 seconds before and after the starting time of eye contact. The changes of SCRs were possible to compare and examine qualitatively in relation to the beginning of the eye contact and to see if and when the client's SCRs increased indicating sympathetic nervous system activation and to see if their spouse had also activated. The responses over zero tell how much higher the SCR was than the person's average level during the session, and responses below zero indicate how much lower the response was than the average level.

From the figures we created it was possible to see how the couple activated and which one of them activated first at the starting time of eye contact. It was obvious that the SCRs before the eye contact started, at the starting time and after it were very diverse. Only 21,1 % of the cases supported our hypothesis, that the start of eye contact increases skin conductance level (shown in figure 2). It also must be noted that in all these cases only either one of the spouses, not both of them, had a high SCR at the starting time of eye contact.

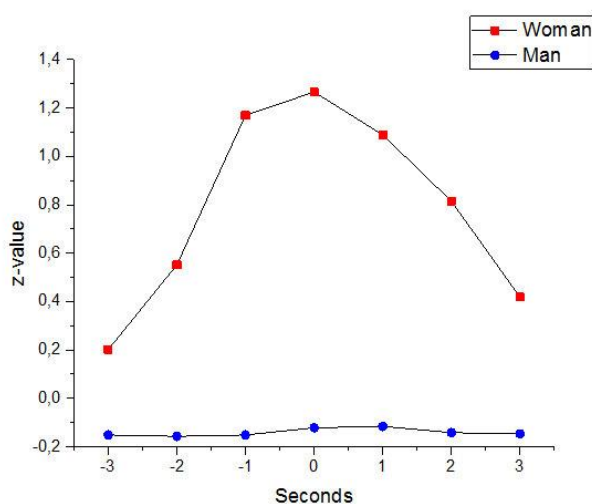


FIGURE 2. Example of SCR activity in mutual eye contact. The female client's SCR is highest when the mutual eye contact begins (0 s), but her spouse's SCR is very stable. In this and all subsequent

figures, point 0 is a zero point where the eye contact begins. In x-axis there are seconds during eye contact and in y-axis there are the values of skin conductance.

As mentioned, most of the cases did not support our hypothesis. There were also cases when SCRs increased right before the gaze occurred, and then decreased: this is shown in the figure 3.

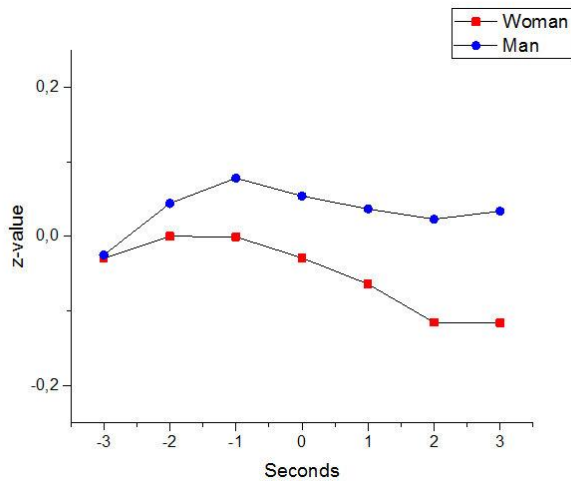


FIGURE 3. Both clients have their highest SCRs right before the mutual eye contact. Then the activation decreases.

Additionally, in some cases SCRs increased after the eye contact occurred: this is shown in figure 4.

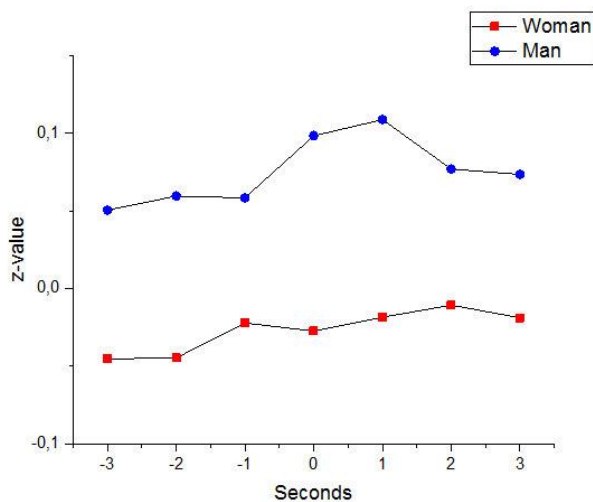


FIGURE 4. Both clients activate after the starting time of mutual eye contact.

3.3 Gender differences and skin conductance

Another interest in this study was to explore if there was a difference between men and women in their SCRs during the start of eye contact. The result in the paired samples t-test in the 3-seconds model was that there was no difference between men and women ($t = 1,150, p = .280$) and this was also the case in the 5-second model ($t = 1,134, p = .286$). Therefore there was no common way to react according to gender.

The averaged standardized SCRs of the first measurement session are shown in the figure 5. The figure shows 10 seconds before and after the starting point of the eye contact, for both women (black line) and men (red line). The averages are shown for the first session since the number of participants was larger in the first than in the second session and no differences were found between the two sessions. Time 0 represents the start of the eye contact. According to the figure, the SCRs decreased for men after the mutual eye contact until four seconds, and increased after that. In this averaged picture it seems that eye contact did not have arousal effect at all for men. For women the changes of skin conductance in the different moments of eye contact were more in line with our hypothesis. The SCR increased the most at the starting time of a mutual eye contact. It decreased after the starting time and then increased again. One goal was to discover if the SCRs of women were bigger than the average SCRs during the entire session at the starting time of the eye contact and if the SCRs of men were smaller than the average 4 seconds after the starting time of eye contact. For this purpose a one sample t-test was performed. Neither the average of women was larger than 0 at time 0 seconds ($t = 1,8, p = 0.1$) nor the average of men was smaller than 0 at time 4 seconds ($t = -1,4, p = 0.19$).

The final aim was to find if there was a change of arousal among women or men when investigating the SCRs of both measurement sessions. For that paired samples t-tests were performed and the result was that there was no change within men either in 3-second model ($t = -.104, p = .920$) or in 5-second model ($t = -.686, p = .518$). Results were similar for women: there was no change either in 3-second model ($t = .182, p = .862$) or in 5-second model ($t = .024, p = .982$). Hence the arousal of men and women was similar in both measurement sessions 10 seconds before and after the starting time of eye contact.

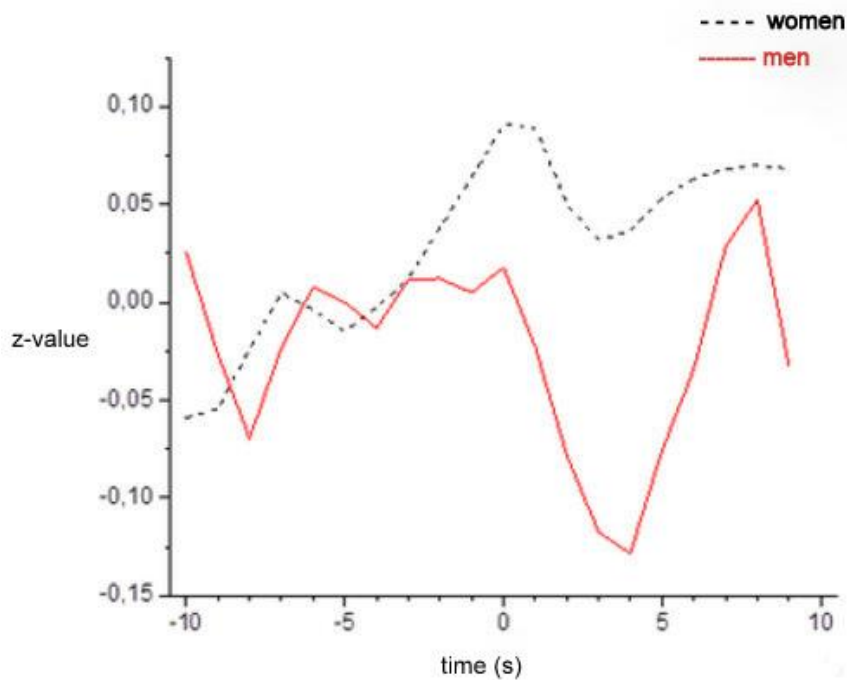


FIGURE 5. Averaged standardized SCRs for the first session averaged separately for women and men.

3.4 The durations of eye contacts between spouses

The examination of the distribution of the durations of the eye contacts was restricted to those lasting not longer than 20 seconds since longer ones were very rare. Figure 6 shows that 95% of the eye contacts in the first session among all couples were shorter than 8 seconds. The most typical eye contacts were very short: 33,8 % of all eye contacts lasted less than 0.5 second and 74,4 % of all eye contacts lasted less than 2.5 seconds.

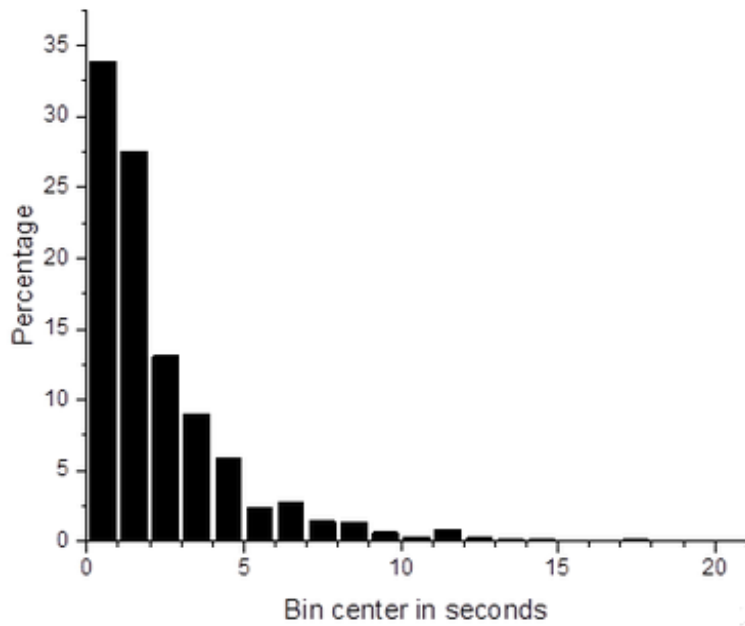


FIGURE 6. The distribution of the durations of the eye contacts as percentages.

3.5 The qualitative analysis: what was the topic of conversation when the spouses had eye contact and their skin conductance was high

Another objective was to study the skin conductance peaks. We assumed that when skin conductance increased suddenly, there would be something significant happening. There were only a few clear skin conductance peaks in the session where the spouses had reacted at the same time (figure 7). After investigating them it was clear that there was no mutual eye contact in couples' shared skin conductance peaks so we were not interested in them in this study. The personal peaks were also much higher than the few shared peaks. It was visible that the high skin conductance peaks were connected with difficult topics such as a recalling old suicide plans, discussing intimacy problems, describing a rage attack or talking about commitment with spouse. Moreover, emotions were strongly present during the highest skin conductance peaks, such as being annoyed or satisfied. SCRs also increased during physical behaviors such as laughing and blowing one's nose. There were only a few personal skin conductance peaks where there was also eye contact with spouse at the same time. There were also many cases where the eye contact occurred simultaneously with a high skin

conductance peak but the eye contact was between a patient and therapist. Since in this study the eye contacts were studied only when they were between spouses, we decided to leave client-therapist eye contact moments out. For closer investigation two examples of high personal skin conductance peaks with mutual eye contact between spouses were chosen. In both examples, the topic of discussion was meaningful for couples' relationship.

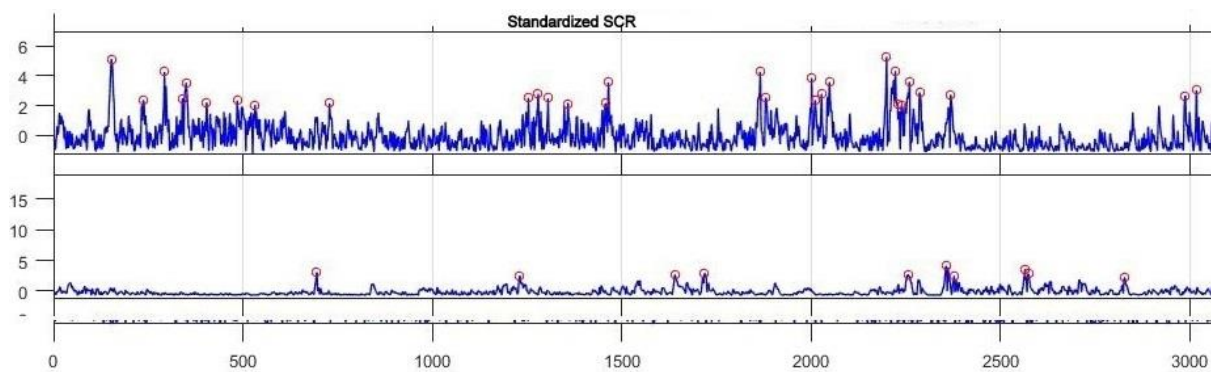


FIGURE 7. The figure shows statistically significant skin conductance peaks (marked with red circles, note the difference in y-axis scales) during the whole therapy session. The upper peaks which show more reactivity are female client's and the lower ones are male client's. Figure shows clear difference between the occurrences of significant increases in the skin conductance between the spouses in the session concerned. The atmosphere between the couple was quarrelsome and tense: they talked about the contrary responsibilities with children since the male client had many hobbies whereas the female client had to be with the children and she expressed anger and frustration towards her spouse. There was also discussion on possibility of breaking up.

Example 1.

This statistically significant peak was the female client's. The mutual eye contact lasted for 5,76 seconds. The atmosphere in the moment was calm but during the whole session the male client's style of talking about his wife was a little dismissive and condescending and the praises the male client said about his wife were simultaneously accusations. Judging by the look on the female client's face we could tell that she seemed to be a little annoyed by the things her husband had said and she defended herself.

The moment when the skin conductance peak and mutual eye contact occur simultaneously is written in bold text. F is the female client and M is the male client. Carl is their son. All names and other identity information have been changed.

Extract of the transcription of the session

M: yes and well I and Carl maybe we say that you wait for afterlife and after then [everything gets better

F: [so that I don't live in the present

M: [so I think=]

F: =yea

M: I think you're kind of a person, maybe I could say something like that you really don't live your life, you just kind of deliver things (looks at C17) and by this I mean that that kind of elements that you associate with good life are just that you bring good those near to you

C: [you mean my son (sneers)

M: maybe it- [yea

F: [or what

M: maybe through that child, through the son but probably a lot something else, you have a lot of these so called "doing good" hobbies that we others really don't practice **at all**

F: you mean that school[thing

M: [charity, growth, anything related to children and mother it supports and you name it you have had these kind of things throughout our life

F: mm:: but you gain something to yourself too

M: right

F: so not very altruistic

M: yea but I mean that they are exactly that you feel that you can do good through them and it is exactly that supports your own thing, there they know how to respect in those mother circles

Example 2.

This statistically significant peak was the male client's. The mutual eye contact lasted for 4,96 seconds. The couple was discussing their problems with intimacy and how challenging it had been for them to talk about these problems. The situation had improved but the topic was still sensitive. Male client had had a habit to relieve his anxiety and stress with sex and he had also struggled with

showing intimacy without having sex linked to it. For the female client it had been sometimes difficult to receive touching and loving.

The moment when the skin conductance peak and mutual eye contact occur simultaneously is written in bold. F is the female client and M is the male client. T1 and T2 are therapists. All names and other identity information have been changed.

Extract of the transcription of the session

F: [mm (.) I feel like closer] to him (her partner) of course

T1: yes

F: mm ((nods her head))

T1: and it is easier (.) to receive [and give cherishing and]

F: [((nods)) yes (.) yes]

F: yea yea but it has been that kind of thing that I mean I have (looks at M).. I have even with

T1: [yea]

F: with you it's been difficult to talk about this, isn't it, and I'm very surprised that now I have talked about it ((F and T1 smile)) ((laughs nervously))

T2: what did you say

F: that it's been kind of a thing that ((gesturing with her hand)) that has been a difficult thing for me to express myself about it and it's been difficult to talk about it even with Arthur and I am surprised about this and proud that I have been able to talk about this

T2: [right (1.) yes]

T2: [that is great]

T1: [earlier you said] that you don't have anything to talk about [but then you started to talk about this, the most]

F: [yea yea. Well yea, you always come up with something]

T1: the most difficult thing at the moment

F: [yea yea]

F: I just had to warm up a little

T2: mm

T1: mm yea

M: yea and I am then some kind of (T2 smiles) well maybe I am the other side **of this thing I (.) have maybe nowadays slightly relaxed about talking about this** and anything related

T1: (coughs)
F: [that is true]

4. DISCUSSION

The goal of this study was to explore mutual eye contacts of spouses in couple therapy and relate this information to their skin conductance synchrony as well as to their individual SCRs. The main aim was to observe how eye contact and skin conductance synchrony are connected and how does the skin conductance change before eye contact, at the starting time of eye contact and after the starting time. Also gender differences connected to SCRs were investigated. Finally, we were also interested to discover what was the topic of conversation when the skin conductance was high and there was a mutual eye contact between spouses. With the results of this study our goal is to understand better the function of eye contact in therapy situations. Cases of this study consisted of 11 couples and their therapy sessions, 19 sessions in total.

In this study it was discovered that skin conductance synchrony between the couple in the first therapy session was connected to the mean duration of mutual eye contact during that session. The results we obtained are similar to Nichols & Champness (1971), Mazur et al. (1980), Pönkänen and Hietanen (2012) and Soussignan et al. (2013). The longer the gazes were, the higher skin conductance synchrony between spouses was. However, the correlations between the mean duration of mutual eye contact and skin conductance synchrony were not statistically significant in the second measurement session. We believe that this is a result of a small population: only eight couples had a second measurement session.

Eye contact and skin conductance were clearly linked with the topic of conversation. It seemed that the longer eye contacts were linked with topics that required recollection together or seeking acceptance or safety from the other party and this possibly caused the spouses to attune similarly. There is also a possibility that longer eye contacts resulted in more fluent communication between the spouses. It is possible that skin conductance was higher when there were strong emotions present and the situation was stressful and the eye contact was experienced as more arousing. Perhaps high synchrony between spouses might have been caused by a similar emotional state, and they looked at each other for a longer time in order to express themselves accurately or maybe to help their partner to understand what they mean. However, it is not possible to make any final conclusions since the

correlation does not tell the causation. Another explanation is that because the first measurement session was the second or third session of the whole therapy and the clients were not very familiar with the therapists and the whole situation yet. Maybe the nervousness of the first session increased the significance of gazes: perhaps the couple was trying to comfort each other with eye contacts. It is also possible that clients were nervous because of the measurement equipment. On the other hand, they had had the heart rate monitors two days before the session but in the session they also had belt that recorded their breathing and electrodes in their palm to measure the skin conductance. Also it could be that they had quite lot of issues and disagreements yet to resolve and therefore the atmosphere was tense. Levenson and Gottman (1983, 1985) had similar findings in their study: the synchrony between couple was higher when discussing conflicts than it was when discussing neutral topics.

When interpreting these results about skin conductance and eye contact, it must be noted that there is some evidence that face familiarity has an effect on skin conductance. This could obviously also affect participants of our current study. For example, Kylliäinen et al. (2012) discovered that skin conductance was higher when a subject was looking at familiar faces. There are also previous studies with similar results (Tranel, Fowles, & Damasio, 1985), and it has been suggested that familiar faces evoke stronger SCRs than unfamiliar faces.

One objective in this study was to examine how SCRs change before eye contact, at the starting time of eye contact and after the starting time. Our hypothesis was that the SCR would be the highest at the starting time of eye contact. Our results confirm this hypothesis only to some extent: SCR was the highest at the starting time of eye contact only in 21,1 % of cases. However, in this study the clients were talking when their SCRs were measured. Furthermore, we noticed that in some cases clients were talking about sensitive or anxiety-inducing subjects when their skin conductance increased. It is understandable that eye contact may be avoided when discussing challenging issues. It has been proven that eye contact does increase the skin conductance (Hietanen et al., 2008; Nichols & Champness, 1971; Soussignan et al., 2013), but also different emotions such as anxiety, anger or embarrassment increase skin conductance (Kreibig, 2010), and in our study these emotions that clients experienced and the issues they discussed during therapy sessions resulted in less eye contact between them. We believe this is the reason why the highest SCR did not usually occur simultaneously with mutual eye contact.

Results of this study showed also quite a lot individual differences in SCRs. Some clients had practically no skin conductance activation during the whole session, meaning that the sympathetic activation was virtually nonexistent. Some clients' SCRs increased right before the mutual eye contact occurred whereas some clients' responses increased right after the mutual eye contact. There

was plenty of variety and from time to time it seemed like some clients' SCRs had no specific pattern at all. It has been discovered that personality traits explain differences in skin conductance (Mardaga et al., 2006). Also individual differences in expressiveness of emotions can have an influence on SCRs (Gross & Levenson, 1997).

One interest in this study was to examine is there a difference by gender when examining the SCRs at the different moments of eye contact: before it starts, at the starting time, and after the starting time. The result indicated that there was no difference between men and women. If the sample had been larger, there might have been statistically significant differences between genders because when examining SCRs visually, the responses were different between men and women. The SCRs of women changed in line with our hypothesis: SCRs increased when the eye contact started whereas for men eye contact did not seem to cause arousal effect almost at all and they activated four seconds after eye contact. This was not, however, statistically significant, possibly because of the amount of individual variability observed between spouses and the small size of sample. Generally for women the eye contact with their spouse seemed to be linked with arousing elements. It is not possible to know for sure what caused the arousal but the factors that increased women's arousal could possibly be emotions and certain topics of conversation such as difficult, personal and happy ones. However, the SCRs of men decreased when the eye contact started. Men may have been using the eye contact in order to calm themselves or to make sure that they were remembering some things correctly. Also, men may have avoided the eye contact more than women when there has been a discussion on personal or difficult subject. Second goal was to find whether there was a change of arousal among women or men when investigating their SCRs of both sessions. The results we obtained showed that there was no change in either group, indicating that situations where there was a mutual gaze resulted in similar SCRs in the both sessions.

In this study it seemed that women were the first to seek and start the eye contact even when it was unrequited. The SCRs of women were also higher when the eye contact began. Perhaps this could explain why the eye contact of men was not linked to the increase in their SCRs. Another possible explanation is that men are more withdrawn when it comes to difficult topics and it is more challenging for them to show their sensitive side and they rather try to cope without help - even the eye contact. Additionally, according to the study of Kring and Gordon (1998), women both experience and express emotions more than men. It has also been found that women generally regard eye contact as more comfortable than men (Ellsworth & Ross, 1975; Mehrabian, 1969). Women consider even great amounts of eye contact more convenient than men do. However, Binetti et al. (2016) found that the preferred duration of eye contact was not connected with factors such as personality traits or gender but they discovered it was connected with physiological arousal. In

conclusion, it could be that the one who tries to make eye contact first is more aroused and this explains the activation of the sympathetic nervous system and skin conductance better than gender. Situation, topic of conversation and own core emotions seemed to have more influence on the interaction and reacting than gender did.

One of main interests was to discover what is the function of eye contact in couple therapy. Is it perhaps to seek comfort from one's spouse? Is it to regulate one's own emotions? It has been suggested that by directing one's gaze to their partner it is easier to monitor the partner's state of mind and also to express own emotions (Argyle & Cook, 1976; Kendon, 1967). In this study, mutual eye contact between spouses seemed to have multiple purposes and functions. It seemed to be connected with the personality of participants. It could be that when a person is more of an extrovert and open, they have more eye contact than they would if they happened to be really shy and introverted. It has been suggested that when person feels more positive and confident, it is more probable that they make eye contact (Brooks, Church, & Fraser, 1986). Some clients had a tendency to turn their body and face towards their spouse more easily while talking or listening. For some clients it did not seem to be as natural to look so much at their spouse as it was for others. There are also a lot of other factors that have an influence on eye contact. These are for example mood of the moment, how energetic one is, how familiar is the person one is looking at, disagreements and the topic of conversation. If the topic of conversation induces anxiety or sadness, it is possible that eye contact is avoided (Hills & Lewis, 2011; Foley & Gentile, 2010). In some cases it seemed like some clients wanted to make eye contact with their spouses in order to have them participate in the conversation if they had been quiet for some time. From time to time it was also obvious that eye contact was made in order to regulate one's own emotions. Seeking and maintaining eye contact could also be interpreted as asking for validation.

As mentioned earlier, in communication a typical eye contact is not very long, otherwise it may feel uncomfortable. In this study, 95% of the eye contacts in the first session among all couples were shorter than 8 seconds. A typical eye contact was quite short: 33,8 % of all eye contacts between couples lasted less than 0.5 seconds and 74,4 % less than 2.5 seconds. According to study by Binetti et al. (2016), the preferred gaze duration was 3.3 seconds, and according to Argyle and Dean (1965), eye contact usually lasts as long as 3-10 seconds. It is possible that in this study the eye contacts were shorter because in a therapy situation there were 4 persons: the couple and two therapists. The client might have targeted their gaze alternately to their spouse and both therapists. In addition, we assume that the length of eye contact was related to the topic of conversation but also to the personality of both participants and their habit to seek and answer to eye contact.

The final objective in this study was to examine the highest skin conductance peaks during the session and to see if couple activated at the same time and if there was mutual eye contact present. We were also interested to investigate what was the topic of conversation and how was the situation during skin conductance peaks. However, there was no mutual eye contact between the couple during the highest shared skin conductance peaks. High skin conductance peaks happened regardless of eye contact and as it was already shown, skin conductance was connected with emotional subjects which in this study seemed to have a more significant connection with the SCRs than eye contact did. Also these results are consistent with earlier studies of skin conductance and stress: it has been found that when a situation is considered to be stressful, EDA increases (Reinhardt et al., 2012). We assume that the reason why there was no mutual eye contact is that the highest skin conductance peaks seemed to happen when there was discussion of difficult topics, such as problems with sex and intimacy, one's own violent behaviour and plans to commit a suicide. It can also be easier to not look at one's spouse in the eye while talking about them. Also, often there was eye contact with therapist, which was not our interest in this study. Often the topics discussed were familiar to the other party of the couple so it is natural that the person talking targets their attention to therapists.

Interesting observation was that the SCRs during the session seemed to be very different between spouses. The highest skin conductance peaks did not happen simultaneously and it was obvious that in some cases the other party was very aroused whereas the other had lower SCR. We believe that the meaning of this is to keep balance in the conversation: when other party is for example angry, confused or otherwise aroused, their partner tries to calm down the situation. Also Karvonen et al. (2016) speculate that sometimes it is beneficial not to synchronise with one's partner. There were also couples whose skin conductance seemed to be very steady, either high or low, but there were no clear deviant peaks in skin conductance. Because it seemed that there were no shared skin conductance peaks combined with mutual eye contact at all, we decided to investigate clients' personal skin conductance peaks, and there were only a few situations when there was a mutual eye contact. It is possible that clients were trying to suppress their emotions when discussing difficult subjects and this is why they were not willing to make eye contact. Suppressing one's emotions may also lead to increased SCRs (Hughes, Uhlmann, & Pennebaker, 1994). To this study two examples of high SCRs combined with mutual eye contact were chosen. In the first example skin conductance and eye contact were linked with frustration and ambivalent speech since there was as well as praises but also a dismissive style of speaking. In the study of Voutilainen et al. (2014), the ambivalent storytelling evoked more arousal in the listener compared to happy or sad stories: ambivalent stories increased the listener's heart rate and EDA, possibly caused by the fact that the situation demanded more cognitive effort. In the second example skin conductance was clearly connected to talking about

challenging issues. The female client was talking about how hard it had been to speak about the intimacy problems of the couple in the past and now told the therapists that she was proud that she was able to discuss these problems. She also told the therapists that she felt closer to her spouse. Interesting observation was that the skin conductance peak was the male client's even though his spouse was talking almost the whole time before the peak. The skin conductance peak occurred right after he started speaking, and we suppose that it was a result of activation after his silent moment. He started talking about a personal and difficult subject which possibly led to strong emotions and memories. The connection between skin conductance and emotions has also been discovered in earlier studies (Kreibig, 2010).

4.1 Strengths and limitations

This study provided new valuable information about communication between spouses in couple therapy and the ways that eye contact and skin conductance are linked with it. The strength of this study was that the situation was natural and authentic and clients did not know that their eye contacts were going to be investigated. However, the therapy sessions of this project are not exactly like normal therapy situations since the clients knew they were participating to study. They were videotaped and recorded during the therapy sessions and in some sessions they also had the measuring equipment on in order to record the activity of the autonomic nervous system. It is possible that this all caused some nervousness and anxiety and it could have had an effect to eye contact, skin conductance and also to social interaction. The client could be nervous and seek comfort from their spouse by looking at them a lot or be so nervous they were not able to communicate normally. On the other hand, clients had worn some of the equipment such as heart rate monitors for a few days before the session and they had had a chance to get used to it, which is unique compared to many experimental studies.

Another strength was that the therapy session was very unique in design. Clients went through a real therapy with personal goals, and the measurement sessions were only a small part of their therapy. Also therapy session was not a structured situation, as mentioned earlier. This is sort of a limitation at the same time. It is challenging to examine which factors had an influence on for example the skin conductance when there were such different topics and emotions between the couples.

In this study the sample was quite small, only 11 couples and 19 therapy sessions. There were only eight second measurement sessions since there was a little drop out and three couples did not have their second measurement session. Additionally, when we wanted to examine the gender and the changes of skin conductance in the different moments of eye contact, we had to drop out the couple with two women. Other limitation of this study concerns the short duration of all eye contacts. All the gazes were put in the model where there was a zero point, meaning the moment when the gaze started. Some eye contacts were very short and the pause between them was only milliseconds. This means that there is possibly eye contact before the zero point, and there can be a long eye contact, or many short eye contacts in the model after the zero point within the model. This could certainly cause changes in SCRs.

As mentioned earlier, some clients were on medication during the sessions. This could obviously affect their SCRs and their presence in therapy sessions. The medication they used were for example for allergy or high blood pressure and some clients also used antidepressants or antianxiety medication. However, it is not ethically possible to deny the client not to use their medication during the study. We also were not willing to drop these individuals out from our study since the sample was already small. On the other hand, it is very common in developed Western countries that participants in scientific studies use different kinds of medications (Boucsein, 2012). It has also been discovered that people volunteering as participants may have used stimulating drinks such as alcohol or coffee or even drugs before the study begins.

It has to be noted that there were a lot of cases when the other side of the couple tried to establish eye contact but their spouse did not turn to look at them. This kind of eye contacts were not coded. There were also some technical problems when the video stopped working for some seconds. Due to this it is possible that some eye contacts were not coded.

4.2 Future research

In this study only the mutual eye contacts were coded and analyzed. It would be interesting to investigate one-sided eye contacts and how skin conductance changes when eye contact is unrequited. This study concentrated only in clients but it might be fascinating to study also the eye contacts of clients and therapists and combine it to the reactions of their autonomic nervous system.

If this study would have focused on one couple instead of many, it would have been possible to observe how spouses' mutual eye contacts and SCRs change from session to another and how couple develops their communication skills and resolves their problems. Another interest concerns the intrusiveness of this project. It is possible that the non-measurement sessions differed from measurement sessions and there might have been more or less eye contact when the clients did not have measuring equipment on.

It would be intriguing to compare if there are changes in the amount of eye contact or in SCRs when some participants know that their gaze is studied and some do not. Another interest would be to study more the gender combined with eye contact and to see if the eye contact is linked with different factors among men and women since in this study women were more aroused than men when eye contact began.

This study created new and relevant information about the relationship between eye contact and skin conductance in couple therapy. It is essential to study the nonverbal interaction in therapy in order to understand better how spouses attune to each other. With this information it could be possible to improve the outcome of therapy. Because of the small size of our sample it is not possible to make conclusions to clinical practice and therefore more research is needed.

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