

The effect of showing emotional regulation on skin conductance responses during regular team meetings

Author: Lianne Anna Maria Groothuis
University of Twente
P.O. Box 217, 7500AE Enschede
The Netherlands

ABSTRACT,

This thesis aims to explore the relationship between Emotion Regulation (ER) and arousal. Regularly held team meeting of several teams were videotaped. The videotapes of 6 teams were observed and verbal behaviours related to Emotional Intelligence (EI) were coded, using a detailed verbal codebook for EI. The arousal data is measured through extensive EDA-analysis, which is compared to the observational data from the videotapes. The Skin Conductance Responses (SCR) that follow from this comparing are later on checked for correlation with both the frequency and duration of behaviours related to ER. Different demographic groups and the differences between these groups for ER and SCR's are also assessed. The present study found a negative significant correlation between ER related behaviours and SCR's. There were no significant differences found between the demographic groups. Further research possibilities include the development of a non-verbal codebook for EI, meaning more behaviours can be analyzed in future research. Lastly, a recommendation would be to repeat this same research with a larger sample size.

Graduation Committee members:

1st supervisor: R. Kortekaas

2nd supervisor: C.P.M Wilderom

Keywords

Emotional Intelligence, Emotion Regulation, Arousal, Skin Conductance Responses, video-based behavioural coding, verbal behaviour, team meetings.

1. INTRODUCTION

Before Emotional Intelligence (EI) was introduced, emotions were seen as acute disturbances, and disorganized responses resulting from the lack of effective adjustment, instead of a factor that can be used to one's advantage. However, as of today, EI is an emerging topic for researchers and consultants in fields such as psychology, education and management (Wong & Law, 2002). Various organizations are increasing the amount of EI trainings their employees have to follow, due to the idea that EI does not only affect an individual's physical and mental health, but also their career achievements (Wong & Law, 2002, p. 243).

Emotional Intelligence was first defined as "the subset of social intelligence that involves the ability to monitor one's own and others' feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions" (Salovey & Mayer, 1990, p. 189). Later on, this was broken down into four subdomains: emotion perception, emotion understanding, emotion facilitation and emotion regulation (Mayer & Salovey, 1997). Within Emotional Intelligence, a difference between mixed-EI and ability-based EI can be distinguished. The mixed-EI concept uses EI as "an umbrella term that encompasses a constellation of personality traits, affect and self-perceived abilities, rather than actual aptitude" (Joseph, Jin, Newman & O'Boyle, 2014). Ability-based EI on the other hand, is built on the four branches of Mayer and Salovey (emotion perception, emotion understanding, emotion facilitation and emotion regulation). Of these four branches, emotion facilitation is usually left out of the model, since research has proven this to deliver more accurate models (Joseph & Newman, 2010).

It is also believed that EI positively affects employee engagement (Barreiro & Treglown, 2020). Results revealed that employees with a higher dispositional *happiness*, and who are good at influencing emotions of others, are more likely to be motivated by an internal need for achievement. It was also proven that individuals who experience greater ability in dealing with fluctuations in emotion (emotional regulation) experience higher levels of engagement in their work (Barreiro & Treglown, 2020).

Being better at dealing with fluctuations in one's emotion, will cause a high level of work engagement (Barreiro & Treglown 2020). This may lead to more alertness during meetings, which is important because more alertness would mean more effective meetings. The alertness during meetings can also be seen as an individual's arousal. Arousal is most commonly conceptualized as the experience of excitation and agitation. Arousal manifests itself through enhanced overt and covert bodily reactions, getting ready for action (Zillmann, 2008). This arousal is most accurately measured by electrodermal activity (EDA), or skin conductance (Marci, Ham, Moran, & Orr, 2007). EDA recording is considered a common form of research, however little research is available on EDA and Emotion Regulation.

This would be very interesting to investigate, since this focuses on the dimension *emotional regulation*, which can be perceived as the most important one of the four related to EI. This is considered the key dimension, as emotional regulation is used to create and maintain positive affective emotional states, which is believed to be beneficial for work behaviour (George, 1991). The hypothesis would then be, that individuals with a better emotion regulation, are also showing more alertness during team meetings, which might lead to more effective team meetings or better team effectiveness in general.

In 2017, the article "Emotional intelligence buffers the effect of physiological arousal on dishonesty" by Pittarello et al. (2017) was published. Data on the arousal was collected through skin conductance and heart rate, in which skin conductance proved to be the more efficient way of measuring (as heart rate changed barely to nothing). From their findings, it was suggested that individuals with high EI are able to distance themselves from their emotions while also suppressing them. This made the individuals feel licensed to do wrong, resulting in them showing dishonesty more often (Pittarello et al., p. 443, 2017). Relating back to this thesis, this indicates that EI as a whole does have a connection to arousal. This specific statement also suggests that the connection might be caused by the dimension of Emotion Regulation within EI, as the emphasis is put on controlling emotions. However, the environment for this study was more of a general environment, leaving the business team meeting environment unexplored.

1.1 Research objective & research question

This paper aims to build further upon the suspicions that Emotion Regulation and arousal are interrelated. This is done through identifying and observing individuals' behaviours that are related to Emotion Regulation, and analyzing the frequency and duration of these behaviours. After this, arousal data of these individuals is linked to see whether these behaviours have a relationship with the arousal. Different demographic groups were also established and compared, in order to see whether there are any differences within these groups. The purpose is to find a relationship between these two elements, and to see how these two might affect each other. Another possible outcome might also be that there is no relationship at all, which will then also be clear for other researchers.

The research question that follows from this objective is as follows:

"To what extent is there a relationship between individuals showing Emotion Regulation and their Skin Conductance Response during regular team meetings?"

1.2 Practical and academic relevance

In this paragraph the relevance of this specific paper will be discussed. Starting with the academic relevance, followed by the practical relevance.

Emotional Intelligence is usually measured through self-reported surveys, meaning that the data from these surveys is not always objectively measured. The possible bias that follows is that individuals are not completely honest in these surveys. For this study, behaviours regarding EI and Emotion Regulation are observed and studied from previously gathered video data. This means that the data will be more objectively measured than in different studies. On the other hand, there is the measurement of arousal in an organizational context, which is also relatively new. This paper combines these two elements with a focus on Emotion Regulation, which is a subdimension of EI. Research on EI and arousal has been done, but not yet in the business team meeting setting. Therefore, there is a gap in the literature that will be reduced by this paper, as regular business team meetings are observed.

This paper also provides new knowledge on the alleged connection between Emotion Regulation and arousal. This knowledge might be useful for e.g. team leaders wanting to enhance team members' arousal during team meetings, as this indicates that their team members are more alert. The research provides a specific set of behaviours that can be observed and

recognized, meaning that it can contribute to creating a better understanding of what to focus on when enhancing individual arousal during meetings. Altogether, this paper provides a better understanding of the connection between ER and arousal, which can be used to enhance individual arousal when the specific behaviours that are addressed are encouraged.

1.3 Outline of this report

In the upcoming section a comprehensive literature review is provided. This will include several theories concerning emotional regulation and arousal, while also giving a description of these concepts. This is followed by an explanation on the data collection and the analysis of this data. After this, the results of the analysis will be presented. Lastly, there will be a discussion, followed by a short conclusion.

2. LITERATURE REVIEW

In this section, several theories are presented and reviewed. First of all, theories relating to Emotion Regulation are discussed. These theories focus on the different factors that cause certain behaviours that are related to ER. Next to be defined is the concept of arousal and EDA. The process of measuring EDA will be assessed, while also addressing some points of attention during the measurement. This research provides insights on the link between EI and arousal that is useful for conducting this thesis.

2.1 Emotional regulation

Emotion regulation refers to changes associated with activated emotions (Cole et al, 2004). These include changes in the emotion itself or in other psychological processes. The term emotion regulation can denote two types of regulatory phenomena: emotion as regulating and emotion as regulated. Emotion as regulating refers to changes that appear to result from the activated emotion. Emotion as regulated refers to changes in the activated emotion (Cole et al, 2004).

Another definition of Emotion Regulation (ER) is that ER involves several aspects such as maintaining and enhancing emotional arousal, as well as inhibiting or subduing emotional arousal (Masters, 1991). This means that ER already shares a connection to emotional arousal, but it leaves physiological arousal unexplored, which is exactly what this paper aims to explore.

According to Gross (1998), ER can be divided into three dimensions: (1) overt vs covert, (2) explicit vs. implicit or (3) voluntary vs. automatic. The first dimension, overt vs. covert, distinguishes ER behaviours that are perceivable by others and the behaviours that are internal. Overt behaviours are most likely verbal, while covert behaviours are more likely to relate to the suppression of emotions.

The dimension explicit vs. implicit highlights the difference between behaviour that is consciously shown and behaviour that is unconsciously shown. Individuals are more likely to be aware of their behaviour when they express it verbally, as they are thinking about what they are saying first, making it explicit. Behaviours that people tend to be less aware of are controlling of emotions within or body language, causing it to be implicit.

The last dimension, voluntary vs. automatic, indicates whether an individual puts effort into the expression of the behaviour. Whereas voluntary responses mainly consist of behaviours that take effort to perform, automatic responses can be seen as a reflex like behaviour.

Of these dimensions, the one that is easiest to assess is whether it is overt or not. This is due to the fact that the data that is available is video data, meaning that it is only possible to see Emotion Regulation when it is perceivable by others. This will remain a limitation of this study. These verbal behaviours were conducted by van Gorp (2018), and provide a clear framework for what is to be considered as Emotion Regulation. Included in this framework are examples of behaviour, leaving a clear indication and better understanding of different ways these behaviours can be shown.

Now that it is clear which dimension is to be assessed in this thesis, it is important to understand where specific behaviours regarding ER originate from. Within ER, there are two main types which explain why people react a certain way, the first one being the antecedent-focused ER (Gross, 1998). This type of ER concerns the way individuals appraise an event that potentially evokes emotions (Gross, 1998). A simple example of this would be that a situation that is perceived as dangerous, will most likely evoke the emotion of fear. On the other hand, there is the response-focused ER. This type of ER involves behaviour that is shown once the emotion process has already started and responses have already been generated (Gross, 1998). A common form of this type is emotion suppression, which decreases the behavioural expression of emotions (Nyklicek, Vingerhoets, & Zeelenberg, 2011). These two types are also incorporated in the codebook by van Gorp (2018). The antecedent-focused ER can be found within the category of "Mentioning the influence of expressing emotions", in which contagion by either other emotions or the environment may lead to specific behaviours and emotions. The response-focused ER is to be found in the category of "Moderating emotions", where negative emotions are suppressed, and the positive emotions are enhanced and/or maintained.

Eisenberg and Spinrad (2004) elaborated on the antecedent-focused ER and conducted a new working definition. This definition is based on the idea that antecedent-focused ER often involves preventing the occurrence of a certain situation, if doing so avoids emotional events that can be perceived as unpleasant. The example that is given for this statement is that shy people can avoid attending a large party or any new anxiety-provoking activity in order to regulate their emotions. This means that ER can occur by either preventing the occurrence from happening or by creating circumstances that lead to different emotional experiences. In a business setting, an example could be that someone is too shy to share their ideas, and therefore keep quiet during the meeting. However, this might be more of an elaboration rather than an actual new working definition, as most other factors are left undiscussed.

Several researches have shown that the way people deal with emotions can differ per demographic group they belong in. When taking gender into account, women are expected to express their emotions more overtly and also experience them more intensely than men. Men however, are more expected to bury and/or deny their emotions, meaning they do not express them as overtly as women would (Nyklicek, Vingerhoets, Zeelenberg, 2011; Fischer & Manstead, 2000).

Age has also proven to be a considerable factor when it comes to emotional regulation. Different studies have stated that older adults show better regulation over their emotions than young adults (Gross et al., 1997). The following hypothesis would then be that these adults show less behaviour related to ER, as they are better at regulating their emotions.

2.2 Arousal and EDA

As mentioned before, arousal tends to manifest itself through enhanced overt and covert bodily reactions, getting ready for action (Zillmann, 2008). Relating to the manifesting of arousal, the eccrine sweat glands play a major role. These sweat glands are mostly involved with emotional responses, due to the fact that these are accompanied by psychological processes like emotional arousal, which is most accurately measured through EDA or skin conductance.

Skin conductance refers to “the varying electrical properties of the skin in response to sweat secretion by sweat glands” (van Dooren, de Vries & Janssen, 2012). Through the application of a constant low voltage, the change in skin conductance becomes measurable (Fowles et al., 1981). This is also referred to as exosomatic EDA, which relates to electrodermal responses with external current (Boucsein, 2012). The peaks and dips of skin conductance can be explained by tonic and phasic phenomena. These phenomena, respectively, are related to the baseline level of skin conductance, and the increases or decreases in electrical activity (Boucsein, 2012; Benedek & Kaernbach, 2010). These increases or decreases in activity can also be called ‘Skin Conductance Responses’ (SCR), suggesting that there is a relationship between a stimulus and these responses. However, these are also often responses that cannot be traced to any specific stimulus or behaviour, and are to be smoothened out of the dataset (Boucsein, 2012).

2.3 ER and arousal

Conscious regulation of negative emotion is known to affect human eyeblink responses, but it is not yet known whether these eyeblink responses can be linked to arousal-based processes (Dillon & LaBar, 2005). However, results of the same study by Dillon & LaBar (2005) indicate that arousal may be critical to startle modulation via conscious ER. This indicates that there is a link between ER and arousal, which is expressed through physical movement (such as eyeblink responses).

The study of Mella, Conthy & Pouthas (2011) elaborates on Dillon & LaBar (2005), by adding time perception. Their hypothesis was that emotion regulation combined with arousal has an effect on how individuals perceive time. According to this study, individuals who put their focus on the emotions, perception of time seemed stretched out. Highly arousing sounds were perceived to last longer, accompanied by higher physiological arousal and higher SCR amplitudes. On the contrary, individuals who put their focus on the actual time, perception of time was equal to the duration of arousal. This also means that perceived time of stimuli of different emotional intensities was the same, accompanied by moderate SCR's. These interesting results would suggest that whenever there is a high intensity of emotion during team meetings, physiological arousal has a longer duration. As a result of this, team members can become more aroused when emotional intensity is high, meaning they are also more alert at these times.

ER is not only related to physiological arousal, but also emotional arousal. One's ability to attenuate emotional arousal through directing attention and awareness to actual emotions and bodily feelings might also cause ER without a conscious intention to do so (Herwig et al., 2010). This means that the connection between ER and emotional arousal works the other way around compared to the connection between ER and physiological arousal. This might be caused by the fact that the emotion arouses individuals first, before the individual has time to regulate this emotion, meaning emotional arousal happens before ER. When it comes to physiological arousal, the emotion

is regulated before or during the physiological arousal activity (Herwig et al., 2010). This means that physiological arousal needs to be measured in the activity of ER.

3. METHODOLOGY

In this section the methodology of the research is discussed. The research is conducted as a descriptive research. Firstly the method of data collection is assessed. The sample and demographics are discussed second. This is followed by an explanation on the coding of behaviours, and the codebook that is used. After this the processing of arousal data and the software used are explained. Lastly, statistics of the data is assessed through a quantitative analysis.

3.1 Data collection

Data on emotional regulation is collected through videotapes of team meetings, and survey data. The survey data will be used to collect the data to conduct the different demographic groups. From these surveys, the answers respondents gave to the questions relating to gender, job specialization and age will be categorized and analyzed in demographic groups. Data on the actual behaviours that are shown by the individuals in the videotapes are collected via observing and coding the behaviours shown in the videotapes.

Arousal will be measured through BIOPAC bracelets, which measure the Electrodermal Activity. This is done non-invasively through applying a constant low voltage (Fowles et al., 1981), during these team meetings. All individuals present during the meetings will wear one of these BIOPAC bracelets, which were attached before the start of every meeting. This data will be shown through tonic and phasic phenomena, meaning that there is a baseline level of arousal followed by peaks and dips, or so called Skin Conductance Responses (SCR) (Boucsein, 2012). After this data is collected, the data that will be taken into account will be the frequency of the peaks and dips in skin conductance, since the baseline level of skin conductance of an individual might differ per meeting.

3.2 Sample

As the data on EI (and ER) for teams as a whole was still to be gathered, it was not feasible to observe all the teams. Therefore the choice was made to observe 6 teams, consisting of 46 team members in total. All the teams in this sample are part of a large Dutch public sector instance.

Of these 6 teams, 17 meetings were observed and assessed, in which each team will be observed three times. A total of 18 meetings was recorded, but one of these meetings was excluded due to audio problems. This means that one team only has been observed twice instead of three times, resulting in the team members of this team only being incorporated in the analysis twice.

To ensure that this research is as elaborate as possible, several demographic groups are established. This is done by distinguishing different categories that will consist of different groups within. This provides better insight on the individuals, meaning that specific correlation patterns can be identified. The data on these different demographics is collected from the surveys.

The first category that is established is gender, as men and women are expected to regulate emotions differently. Out of the total of 46 team members, 36 are male (78.3%) and 9 are female (19.5%); one of the team members did not define a

gender. This indicates an imbalance towards males, meaning this might lead to different conclusions for other gender distributions.

The second category is specialization of the team members. Some team members indicated that they are specialized in two sectors, meaning that there is a total of 50 specializations distributed over 46 people. For these people, a code of '999' is assigned in SPSS 24 for 'two or more' specializations. As can be seen in Table 1, the majority of the team members is specialized in IT (45.7%), after this comes data science (10.9%), also followed by both finance (8.7%) and two or more specializations (8.7%) .

Table 1. Frequency analysis job specialization

	N	Percentage
IT	21	45.7
Data science	5	10.9
Finance	4	8.7
Two or more	4	8.7
Marketing	3	6.5
Coaching	3	6.5
Risk	2	4.3
Project management	1	2.2
Interaction design	1	2.2
Modelling	1	2.2
Missing	1	2.2

The last established category is age of the team members. As there is an interesting research possibility on age connecting to both ER and arousal, this category will also be included. For this dimension, three age groups have been conducted. The first age group is the group "<35 years old" , represented by more than half of all team members (60.9%). The second group most represented age group is the group ">46 years old" (21.7%). Lastly, there is the middle age group "36-45 years old", which is the least represented group (17.4%).

3.3 Coding of videotapes

Emotion Regulation will be assessed by using the codebook for verbally emotionally intelligent behaviours by van Gorp (2018). The codebook consists of the four dimensions (emotion perception, emotion understanding, emotion facilitation and emotion regulation) that can be identified within Emotional Intelligence. For these four dimensions, specific sets of behaviour are established and matched to the corresponding dimension. For the dimension of ER, these two sets of behaviours are 'mentioning the influence of expressing emotions' and 'moderating emotions'. Additional examples are provided in the codebook, such as 'giving a compliment' for 'moderating emotions'. The other dimensions that are in this codebook can be found in Appendix A.

This codebook is used by observing the verbal behaviours shown by individuals during team meetings. Two individual coders will observe the video data individually. After this the two coders discussed their codes together and combine these to make a 'golden file' containing all the right observations and codes, to ensure that the coded data is as objective as possible. The 'golden file' is used for all the analyses, as this file is most objective. These observations are done through watching the videotapes of these team meetings and coding the behaviours that are linked to ER as they are described in the EI coding manual. The other dimensions in this codebook will not be taken into account in the

analysis, as this research focuses on the link between emotional regulation and arousal only. This is done because Emotional Intelligence as a whole is a broader concept with subdimensions with their own influences, and to prevent any possible confusion on which subdimension might cause the connection.

Before starting the actual coding activities, both coders using the codebook conducted by van Gorp (2018) have studied this codebook thoroughly. This was done in order to ensure a good understanding of the codes, and to prevent any misconceptions from occurring. On top of that, a lot of practice with The Observer XT 15, the software that was used, preceded the actual coding activities. This leads to concluding that both coders were capable enough in their coding activities, meaning that a reliable observation was given.

3.4 Arousal data

Arousal data is processed in the software program AcqKnowledge 5.0. This program is able to filter peaks and dips from the skin conductance baseline, meaning that these peaks and dips become easily visible in the data.

The AcqKnowledge 5.0 software works with tonic and phasic EDA data. Both have to be present in order for the software to visualize this data in waveforms. When phasic EDA data is not present in the file, AcqKnowledge 5.0 is able to create new phasic EDA data via either baseline smoothing or high pass filtering. This will not be necessary for this study, as the phasic EDA of the subjects is measured by the equipment.

There are two kinds of data sets that can be used when analyzing arousal data. There are 'raw' data sets and there are 'smooth' data sets. The difference between these two kinds of data sets, is that eventual fluctuations in arousal that are not caused by real aroused moments are filtered out of the smooth data set. This provides a more reliable analysis, as this leaves only the real SCR's to be analyzed, meaning that the research will be much more reliable.

Event data from The Observer XT 15 is imported to AcqKnowledge 5.0, as the coded behaviours need to be synchronized to the arousal data. A latency window of 4 seconds is set, to ensure that delays in reaction of subjects are also taken into account, while also making sure that responses with too much delay are not analyzed. This data is later imported to The Observer XT 15 again, as this shows us the exact events that triggered eventual fluctuations in skin conductance.

3.5 Methods

Analysis of this data is performed in two steps. The first step is an analysis on the coded behaviour of observed videotapes and the arousal data. This analysis includes a Pearson correlation test to see whether there is a correlation between the variables. This test was chosen as it not only indicates whether there is a positive or a negative correlation, but also the strength of this correlation. The second step is the analysis of the different demographic groups, which is done via an independent samples t-test and a one-way ANOVA test. These two were chosen, as these tests show whether two means within the groups are significantly different from each other. When this is known, further research responsibilities might be identified.

In order to be able to assess the correlation between the behavioural data and the arousal data, three variables have to be established. These variables will be "total frequency of ER behaviours", "total duration of ER behaviour", "total frequency of SCRs" and a combined variable "frequency of SCRs caused by ER behaviour". These three variables are then tested using a

Pearson correlation test. This test will be executed in SPSS 24, as this program was specifically designed to deal with this kind of data.

For the analysis on the different demographic groups, an independent samples t-test and a one-way ANOVA test are performed. The t-test is deemed most fit for the demographic group 'gender', as this variable only has two independent groups that are taken into account. This variable will also be the independent variable in our test. The test compares the means of the two groups 'male' and 'female' for the chosen variables, and can indicate whether there is a difference between the two groups. Several assumptions are to be met in order to continue the independent samples t-test. These assumptions are as follows: 1. The data must be close to a normal distribution, 2. Samples must be independent, and 3. The population variances must be equal. A Shapiro-Wilk test is performed to see whether the distribution of the population is normal, or close to normal. For each group, the homogeneity of variances is also checked, using Levene's test. When all these assumptions are met, the analyses can be performed via SPSS 24.

The ANOVA test was chosen for the variables 'age' and 'specialization', as there are more than two independent groups which are to be taken into account. Dummy variables were also created for these two demographic groups, as these enable us to only use one single regression, instead of separate equation models per subgroup. The ANOVA test provides the possibility to compare more than two groups, when looking at their mean values. However, the test will only provide insight on whether there is a difference between the groups, and not what the actual difference is. There are several assumptions that are to be fulfilled in order to continue the one-way ANOVA test. These assumptions are the same as for the independent samples t-test. The assumptions will also be checked in the same way as for the independent samples t-test, meaning a Shapiro-Wilk test is performed to check normality and Levene's test for homogeneity. Once these are fulfilled, the ANOVA test can be executed via SPSS 24.

4. RESULTS

In this section, the results from the research are described. First, the correlation analysis between "total frequency of ER behaviours", "total duration of ER behaviours", "total frequency of SCR's" and "frequency of SCR's caused by ER behaviour" are summarized. This is followed by a summary of the independent samples t-test and ANOVA tests performed on the different demographic groups.

4.1 Correlation between variables

In Table 2, the correlation matrix for the analyzed variables is displayed. The correlation between 'total frequency of ER behaviours' and 'total duration of ER behaviours' is a strong positive one. This correlation is also significant on the 0.01 level. This makes sense, since more ER behaviours usually means a longer duration in total. The relation between 'total frequency of ER behaviours' and 'total frequency of SCR's' is a negative one.. This means that the more ER behaviours are present, less SCR's are found. However, this correlation has not proven to be significant on either a 0.05 or a 0.01 level, and is a relatively weak correlation. Between 'total frequency of SCR's' and 'total duration of ER behaviours', a negative relation was found. Meaning that the longer the total duration of ER behaviours are found, the less SCR's are present. This correlation is significant on a 0.05 level, and is of moderate strength. The correlation between 'total frequency of ER behaviours' and 'frequency of

SCR's related to ER behaviours' is also a negative correlation. On top of that, the correlation is significant on the 0.05 level. This seems logical, as the more ER behaviours are shown, more SCR's related to this behaviour might occur. Then, a negative relation is found between 'total duration of ER behaviours' and 'frequency of SCR's related to ER behaviour'. This correlation indicates that the longer the total duration of ER behavior, less SCR's related to ER behaviours will occur. This correlation has also proven to be significant on the 0.01 level. Lastly, the relation between 'total frequency of SCR's' and 'frequency of SCR's related to ER behaviour' is strongly positive, and has proven to be significant on a 0.01 level. This can be explained due to the fact that a higher total frequency of SCR's enhances the possibility of more SCR's related to ER occurring.

Table 2. Correlation matrix

Variables	ERF	ERD	SCR	SCR_ER
Total frequency ER behaviours (ERF)	1			
Total duration ER behaviours (ERD)	.877**	1		
Total frequency SCR's (SCR)	-.266	-.339*	1	
Frequency SCR's related to ER (SCR_ER)	-.353*	-.383**	.817* *	1

*= Significant at the 0.05 level. **= Significant at the 0.01 level.

4.2 Demographics

Before any test was performed, the assumptions were checked. For the variables "total frequency of ER behaviours", "total duration of ER behaviours", "total frequency of SCR's", and "frequency of SCR's related to ER" the first assumption checked was normality. A Shapiro-Wilk test with a confidence interval of 95% was performed, while relating "total frequency of ER behaviours" to each of the demographic groups individually. The α for these tests will be 0.05. The second assumption is independence of samples. This can already be seen as fulfilled, as the values of the samples are not influenced by values of other observations. The last assumption to be fulfilled is homogeneity of variances. demographic groups individually.

4.2.1 Gender

All the assumptions for this group were fulfilled, meaning that the distribution was close to normal and variances can be considered equal. Therefore the independent sample t-test was carried out for all the variables (total frequency of ER behaviours, total

duration of ER behaviours, total frequency of SCR's, and the frequency of SCR's related to ER behaviours). For this test, the hypothesis is that males and females do not show significantly different frequencies of these variables.

Table 3. Independent samples t-test for gender

	Males		Females		t	df	sig.
	M	SD	M	SD			
Total frequency ER behaviours	2.88	3.08	3.14	5.04	1.145	45	.258
Total duration ER behaviours ^a	11.69	12.17	14.58	22.57	-.571	45	.571
Total frequency SCR's	18.42	9.83	14.50	12.72	.375	45	.709
Frequency SCR's related to ER	5.64	3.87	5.14	4.69	-.221	45	.826

^aTotal duration ER behaviours: displayed in minutes

As can be seen in Table 3, for the variable 'total frequency of ER behaviours', there is no evidence of a significant difference between males and females. This can be explained by the fact that both means and standard deviations are relatively close to each other; males (M=2.88, SD=3.08) females (M=3.14, SD=5.04). Secondly, Table 3 does not show a significant difference in 'total duration of ER behaviours' between males and females. Both means are relatively close to each other, but the standard deviations do differ a lot; males (M= 11.69, SD=12.17) females (M=14.58, SD = 22.57). This means that for women there are bigger outliers.

For 'total frequency of SCR's' the independent samples t-test also does not show a significant difference when it comes to gender. Again, the means are relatively close to each other, with males (M=18.42, SD=9.83) and females (M=14.50, SD=12.72). Lastly, for 'frequency of SCR's related to ER', the independent samples t-test shows no significant difference between males and females. Additionally, this variable also shows that the mean and standard deviation for both groups are relatively close to each other; males (M=5.64, SD=3.87) and females (M=5.14, SD=4.69). Considering that there are no significant differences found between males and females, the suspicions that males and females behave differently cannot be confirmed in this paper. Therefore the hypothesis that males and females significantly differ is not rejected.

4.2.2 Job specialization

All the assumptions for this group were fulfilled, meaning that the distribution was close to normal and variances can be considered equal. Therefore the ANOVA test was carried out for all the variables (total frequency of ER behaviours, total duration of ER behaviours, total frequency of SCR's, and the frequency of SCR's related to ER behaviours). The hypothesis for this test is that different job specializations does not differ significantly when comparing the means of the previously mentioned variables.

Table 4. ANOVA analysis for job specialization

	df	F	sig.
Total frequency ER behaviours	8	.791	.614
Total duration ER behaviours	8	.918	.513
Total frequency SCR's	8	.713	.679
Frequency SCR's related to ER	8	1.636	.150

As displayed in Table 4, for none of the variables the ANOVA analysis shows a significant result. This means that between the different groups within job specialization no significant difference was found. Therefore, the hypothesis is that different job specializations do differ significantly from each other is not rejected. Since this is an ANOVA analysis, the exact differences between the two groups are not displayed.

4.2.3 Age

All the assumptions for this group were fulfilled, meaning that the distribution was close to normal and variances can be considered equal. Therefore the ANOVA test was carried out for all the variables (total frequency of ER behaviours, total duration of ER behaviours, total frequency of SCR's, and the frequency of SCR's related to ER behaviours). The hypothesis that is tested is that between the different age groups, there is no significant difference.

Table 5. ANOVA analysis for age

	df	F	sig.
Total frequency ER behaviours	2	.153	.859
Total duration ER behaviours	2	.167	.847
Total frequency SCR's	2	.074	.929
Frequency SCR's related to ER	2	.539	.587

Table 5 shows that there are no variables that are significantly different between the groups within the category 'age'. This means that the hypothesis that there is a significant difference is invalid and thus should not be rejected. The same goes for this category as for the previous one, meaning that the exact differences between all the groups within the age category cannot be displayed, as this is an ANOVA analysis.

5. DISCUSSION

In this section, a discussion of the summarized results is provided. First the correlation between the variables will be discussed, followed by a discussion of the analyses of the different demographic groups.

5.1 Correlation between variables

From the results of this research, it can be concluded that ER behaviours do have a certain connection with SCR's, which was expected. However, the way these variables are connected is not what was expected when looking back at the literature. The literature of Barreiro & Treglown (2020) stated that individuals who have better ER experience greater levels of engagement at

their work. The high level of work engagement also suggests that this might lead to more alertness during team meetings. Therefore, the suspicion was that ER would have a positive on the frequency of SCR's and especially SCR's related to ER. However, the contrary turned out to be true. Both frequency and duration of ER behaviours showed negative correlations with the total frequency of SCR's and the frequency of SCR's related to ER. Of these four correlations, three were significant. This means that there is a considerable likelihood that the correlation is caused by something other than just chance. Additionally, this research confirms that ER and arousal are also connected in other environments than social and psychological (Pittarello et al., 2017), such as the business environment. Knowing this connection between ER and arousal might result in enhancement of arousal, as this provides insights on how ER does not stimulate SCR's in a positive way.

One of the reasons for this unexpected negative correlation, might be caused by the different way of measurement. The study by Føllesdal and Hagtvet (2013) is one of the five studies reported by Kim and Kim (2017) that points out the problem with the validity of EI measurement (and thus ER), as this has mostly been self-reported measurement. For this thesis, an attempt was made to improve validity by using the codebook conducted by van Gorp (2018) in order to measure ER. Since this study did not rely on self-reported measurement of ER, it seems most logical that results are different, simply because this study is more objective.

Another possible reason for this negative correlation can also be found in the literature of Pittarello et al. (2017). This paper described how EI as a whole buffers the effect of physiological arousal. People with better ER would be able to distance themselves from bodily reactions (SCR's) and suppress emotions, which would suggest a negative correlation between ER and SCR's. This might also be the case for this study, as solely negative correlations were found between ER and SCR's.

Lastly, the low sample size of 46 individuals might also have led to the unexpected outcome. The sample was normally distributed according to the Shapiro Wilk-tests, but this does not automatically mean the results are valid for bigger populations. Therefore, the small sample size might also be a reason for the unexpected outcomes.

5.2 Demographic groups

From the results of this research, it cannot be concluded that there are significant differences between different classes within the demographic groups. This was rather unexpected, since the literature suggests otherwise. According to Nykliček et al. (2011), women are expected to express emotions more overtly, while men tend to suppress their emotions. However, results show that there is no significant difference between males and females. The same goes for age, about which Gross et al. (1997) stated that older adults show better regulation over their emotions. Results show that there is no significant difference between the different age classes.

As for the unexpected results for gender, this might be caused by the fact that there are relatively few women in the sample. Only 19.5% of all subjects were female, meaning that there is a major underrepresentation compared to the 78.3% that are male. In the other literature that suggests that males and females regulate their emotions better, there might have been another gender distribution. If this is indeed the case, outcomes most likely are different. Therefore it is not safe to say that for all gender distributions the outcome will be no significant

difference, but that for this specific research there is no evidence of a significant difference between male and female.

A possible explanation for the unexpected results for the age group could maybe be found in the same literature that raised the suspicion for differences in the first place. The fact that these older adults are better at regulating their emotions, suggests that they are better at controlling these emotions internally (Gross et al., 1997). This means that they do not necessarily express these emotions verbally, meaning that this kind of ER is not observed. As a result this might lead to older adults showing relatively the same behaviours as younger adults, meaning the difference might not be significant.

6. CONCLUSION

In the next section the findings from the present study are summarized and concluded. First, the strengths of this study are assessed. Secondly, the limitations and future research possibilities are identified and discussed. After that, some practical implications are presented. Lastly, the conclusion and answer to the research question follows.

6.1 Strengths of this study

This study made use of videotaped meetings, resulting in two strengths to benefit this study. First of all, in most studies EI (and also ER) has been measured through self-reported surveys. This method leaves a lot of room for bias, and is less objective. The observation of behaviour directly related to ER from these videotaped meetings, is a lot more objective. Additionally, these observations were done by two independent coders, to ensure that the observations are as objective as possible.

The second strength that rises from the usage of these videotaped meetings, is that the data collection is as non-intrusive as possible. Apart from the three cameras and a microphone, these team meetings are practically the same as a normal day to day meeting. This means that subjects are more likely to behave like they normally would, resulting in a more reliable research.

6.2 Future research possibilities

This research has several limitations, the first one being the sample size. The sample size of this research only consists of 46 subjects, since it was not feasible to observe all the teams as all data on EI for teams as a whole still had to be gathered. A possibility for future research that arises from this limitation, would be performing the same research with a larger sample size. A larger sample size would make the research more representative of larger populations and therefore results might differ.

Secondly, there is the measurement of EI. The codebook developed by van Gorp (2018) is solely based on measuring verbal EI. The non-verbal emotionally intelligent behaviours are not studied and therefore possible non-verbal ER behaviours might not be taken into account in the analysis. Examples of non-verbal behaviour related to EI would be someone looking angry, or expressing sadness on their face. These behaviours can be very easy to identify, but these do not belong in the verbal EI codebook, meaning that they cannot be coded yet. A future recommendation would be to either elaborate the codebook by van Gorp by adding non-verbal behaviours, or to conduct a whole new codebook for non-verbal EI behaviour and use this in combination with the verbal EI codebook. This would enable researchers to understand and observe the total picture of EI behaviours better and more objectively, while also leaving a lot of room for new research.

As for the representativeness of each of these meetings, some meetings stood out from other meetings, as some people entered later or left early. This led to the fact that these people were observed for a shorter time than the other team members present in that meeting. The possibility that can arise from this, is repeating the present study but including the self-reported surveys to make sure the people that are observed less can be included on more aspects than just observations.

Next, further research is possible on all the dimensions of EI and their correlation with arousal. Since ER is only one of the four dimensions that make up EI, it would be interesting to see whether the rest of these dimensions share a relationship with arousal. This can lead to a better understanding of the EI behaviours that trigger arousal, but also on how to use this to increase arousal during team meetings.

The last future recommendation would be to investigate the separate classes within the demographic groups, and their relationship to ER. This will enhance the understanding of the actual person, instead of just their behaviour. Knowing which demographic groups tend to show more or even less ER behaviour, can lead to better insights on what triggers this specific behaviour.

6.3 Practical implications

The present study provides insights on which behaviours related to EI have an effect on team members' arousal and in which direction it correlates. Since the assessed behaviours in this thesis correlate in a negative direction with arousal, team leaders can use this information to effectively enhance arousal during team meetings. For example, they can discourage behaviours related to ER, as these have proven to result in less arousal according to this study. Having this information can lead to more overall arousal during team meetings, as it is known which behaviours to encourage or discourage.

6.4 Conclusion

The research question that is left to be answered, is as follows:

“To what extent is there a relationship between individuals showing Emotion Regulation and their own Skin Conductance Responses during team meetings?”

The correlation that was found between ER and SCR's turned out to be significant in a negative direction. These relationships however are of moderate strength. Therefore it can be concluded that ER does correlate with SCR's, but not the direction that is generally expected. Additionally, the demographic groups that individuals belong in, did not significantly differ according to the results of this study with this specific sample. This means that for this specific sample, there was no significant difference between the individuals. This means that from this study it cannot be concluded that demographics have an influence on either ER behaviours or SCR's.

7. ACKNOWLEDGEMENTS

First of all, I would like to thank my first supervisor Rianne Kortekaas, for all the guidance and support throughout the process. Even during the global pandemic, there was always time for an extra question or online meeting if necessary. Secondly I would like to thank everyone that has helped me in the process of writing this thesis.

8. REFERENCES

- Barreiro, C. A., & Treglown, L. (2020). What makes an engaged employee? A facet-level approach to trait emotional intelligence as a predictor of employee engagement. *Personality and Individual Differences*, 159, 109892. <https://doi.org/10.1016/j.paid.2020.109892>
- Benedek, M., & Kaernbach, C. (2010). A continuous measure of phasic electrodermal activity. *Journal of Neuroscience Methods*, 190(1), 80–91. <https://doi.org/10.1016/j.jneumeth.2010.04.028>
- Boucsein, W. (2012). Electrodermal Activity. -. <https://doi.org/10.1007/978-1-4614-1126-0>
- Daus, C. S., & Ashkanasy, N. M. (2005). The case for the ability-based model of emotional intelligence in organizational behavior. *Journal of Organizational Behavior*, 26(4), 453–466. <https://doi.org/10.1002/job.321>
- Dillon, D. G., & LaBar, K. S. (2005). Startle modulation during conscious emotion regulation is arousal-dependent. *Behavioral Neuroscience*, 119(4), 1118–1124. <https://doi.org/10.1037/0735-7044.119.4.1118>
- Eisenberg, N., & Spinrad, T. L. (2004). Emotion-Related Regulation: Sharpening the Definition. *Child Development*, 75(2), 334–339. <https://doi.org/10.1111/j.1467-8624.2004.00674.x>
- Fischer, A. H., & Manstead, A. S. R. (2000). The relation between gender and emotion in different cultures. *Gender and Emotion*, 71–94. <https://doi.org/10.1017/cbo9780511628191.005>
- Fowles, D. C., Christie, M. J., Edelberg, R., GRINGS, W. W., Lykken, D. T., & Venables, P. H. (1981). Publication Recommendations for Electrodermal Measurements. *Psychophysiology*, 18(3), 232–239. <https://doi.org/10.1111/j.1469-8986.1981.tb03024.x>
- George, J. M. (1991). State or trait: Effects of positive mood on prosocial behaviors at work. *Journal of Applied Psychology*, 76(2), 299–307. <https://doi.org/10.1037/0021-9010.76.2.299>
- Gross, J. J., Carstensen, L. L., Pasupathi, M., Tsai, J., Götestam Skorpen, C., & Hsu, A. Y. C. (1997). Emotion and aging: Experience, expression, and control. *Psychology and Aging*, 12(4), 590–599. <https://doi.org/10.1037/0882-7974.12.4.590>
- Gross, J. J. (1998b). The Emerging Field of Emotion Regulation: An Integrative Review. *Review of General Psychology*, 2(3), 271–299. <https://doi.org/10.1037/1089-2680.2.3.271>
- Herwig, U., Kaffenberger, T., Jäncke, L., & Brühl, A. B. (2010). Self-related awareness and emotion regulation. *NeuroImage*, 50(2), 734–741. <https://doi.org/10.1016/j.neuroimage.2009.12.089>
- Hoda, R., & Murugesan, L. K. (2016). Multi-level agile project management challenges: A self-organizing team perspective. *Journal of Systems and Software*, 117, 245–257. <https://doi.org/10.1016/j.jss.2016.02.049>
- Jordan, P. J., & Troth, A. C. (2004). Managing Emotions During Team Problem Solving: Emotional Intelligence and Conflict Resolution. *Human Performance*, 17(2), 195–218. https://doi.org/10.1207/s15327043hup1702_4
- Joseph, D. L., Jin, J., Newman, D. A., & O’Boyle, E. H. (2015). Why does self-reported emotional intelligence predict job performance? A meta-analytic investigation of mixed EI. *Journal of Applied Psychology*, 100(2), 298–342. <https://doi.org/10.1037/a0037681>
- Joseph, D. L., & Newman, D. A. (2010). Emotional intelligence: An integrative meta-analysis and cascading model. *Journal of Applied Psychology*, 95(1), 54–78. <https://doi.org/10.1037/a0017286>
- Marci, C. D., Ham, J., Moran, E., & Orr, S. P. (2007). Physiologic Correlates of Perceived Therapist Empathy and Social-Emotional Process During Psychotherapy. *The Journal of Nervous and Mental Disease*, 195(2), 103–111. <https://doi.org/10.1097/01.nmd.0000253731.71025.fc>
- Masters, J. C. (1991). Strategies and mechanisms for the personal and social control of emotion. *The Development of Emotion Regulation and Dysregulation*, 182–207. <https://doi.org/10.1017/cbo9780511663963.010>
- Mayer, J. D., Salovey, P., & Caruso, D. R. (2008). Emotional intelligence: New ability or eclectic traits? *American Psychologist*, 63(6), 503–517. <https://doi.org/10.1037/0003-066x.63.6.503>
- Mella, N., Conty, L., & Pouthas, V. (2011). The role of physiological arousal in time perception: Psychophysiological evidence from an emotion regulation paradigm. *Brain and Cognition*, 75(2), 182–187. <https://doi.org/10.1016/j.bandc.2010.11.012>
- Nyklíček, I., Vingerhoets, A., & Zeelenberg, M. (2010). Emotion Regulation and Well-Being: A View from Different Angles. *Emotion Regulation and Well-Being*, 1–9. https://doi.org/10.1007/978-1-4419-6953-8_1
- Salovey, P., & Mayer, J. D. (1990). Emotional Intelligence. *Imagination, Cognition and Personality*, 9(3), 185–211. <https://doi.org/10.2190/dugg-p24e-52wk-6cdg>
- Timmers, M., Fischer, A. H., & Manstead, A. S. R. (1998). Gender Differences in Motives for Regulating Emotions. *Personality and Social Psychology Bulletin*, 24(9), 974–985. <https://doi.org/10.1177/0146167298249005>
- Van Dooren, M., de Vries, J. J. G. (Gert-J., & Janssen, J. H. (2012). Emotional sweating across the body: Comparing 16 different skin conductance measurement locations. *Physiology & Behavior*, 106(2), 298–304. <https://doi.org/10.1016/j.physbeh.2012.01.020>
- Wong, C.-S., & Law, K. S. (2017). The effects of leader and follower emotional intelligence on performance and attitude: An exploratory study. *Leadership Perspectives*, 97–128. <https://doi.org/10.4324/9781315250601-10>
- Zillmann, D. (2008). Emotional Arousal Theory. *The International Encyclopedia of Communication*. <https://doi.org/10.1002/9781405186407.wbiece022>

Appendix A

Verbal coding scheme for EI (van Gorp, 2018)

Table 6. Verbal coding scheme for EI (van Gorp, 2018)

Categories	Codes & Definitions	Examples
Expressing emotions	A.1. <i>Expressing emotions</i> Mentioning emotions or feelings of oneself, others, situations and things	E.g. mentioning someone sounds, looks or behaves very happy, or discussing that a picture looks really happy E.g. mentioning feeling sad, happy, etc [Note; this is in present tense, for a past tense expression of emotions or feelings, see B.3.]
	A.2. <i>Expressing related needs</i> Mentioning a need related to the expressed emotion of oneself, others, situations and things	E.g. expressing need for encouragement , because of feeling sad E.g. asking if another would need encouragement, because of sadness
	A.3. <i>Empathizing</i> Sharing emotions of others	E.g. reflecting the emotion expressed by another, such as saying I am happy for you E.g. expressing sadness when something bad has happened to someone, such as spilling coffee over his/her hand
Utilizing emotions	B.1. <i>Preventing negative emotions</i> Prioritizing positive emotions and directs attention to tasks endangering positive emotions	E.g. expressing the importance of finishing tasks so that positive emotions keep emerging
	B.2. <i>Considering multiple points of view</i> Expressing a consideration of multiple possible optimistic and pessimistic views	E.g. expressing that an optimistic and pessimistic outcome of events are both likely to happen
	B.3. <i>Expressing emotional memories</i> Past tense expression of own emotions in memory	E.g. expressing an emotion or a feeling that was experienced in the past
Understanding emotions	C.1. <i>Expressing an understanding of complex, ambiguous and/or similar emotions</i> Labelling emotions correctly with the appropriate words that convey an understanding of complex, ambiguous and/or similar emotions	E.g. the leader saying being very surprised, but very happy as well E.g. asking if another likes and hates a colleague at the same time E.g. asking if another is hopeful, despite many issues
	C.2. <i>Expressing the meaning that emotions may convey</i> Mentioning how specific emotions link to specific situations	E.g. asking if another lost something, because sadness is expressed E.g. acknowledging reasonability of a particular emotion in a particular situation, such as saying I understand that you are angry, because it undermines your plans
	C.3. <i>Interpreting the degree of accuracy and/or honesty of emotion related expressions</i> Expressing to what degree an identified emotion is accurate and/or honest	E.g. expressing that another person rightfully said he was stressed in a stressful situation E.g. the leader saying he is serious about being angry, when he/she expresses anger E.g. the leader saying he/she was put in a situation he/she had to convey how he/she really felt E.g. the leader mentioning that another does not look sad, although he/she believed/expressed sadness
	C.4. <i>Describing how emotions evolve over time</i> Predicting a reasonable progression of emotions	E.g. mentioning resistance to a decision, which will expectedly turn into anger or agreeance or adaptation

Regulating emotions	D.1. <i>Mentioning the influence of expressing emotions</i> Mentioning how expressing emotions are influencing oneself and others	E.g. expresses caution for an atmosphere which is not conjunctive to productivity E.g. expresses concern for feeling negative contagion* E.g. expresses wish for positive contagion* * Positive/negative contagion is when positive/negative emotions are copied from or by others or oneself
	D.2. <i>Moderating emotions</i> Making statements to enhance pleasant emotions and diminish unpleasant emotions	E.g. initiating social chit chat E.g. giving compliments E.g. engage in calmness in anxious, frustrating or stressful situations