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Emotion dynamics in Tibetan monks and healthy Westerners

Bachelor's Project Thesis

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Abstract: In recent years, studying the interactions between emotions using a network approach has gotten more popular. Studies using this method are offering more tools for studying emotion dynamics within individuals. These studies are mostly made up of Western participant and comparing emotional processes using the network approach between different cultures has yet to be investigated. Tibetan monks train for many years to be skilled in the art of monastic debate. This type of debate has been correlated with an increased ability to regulate emotions, since emotions are being provoked while debating, which makes for an interesting comparison with what is already known about Western cultures. Using the experience sampling method, where a questionnaire about the experience of certain emotions is answered each day for 7 days, emotions of the monks are measured. These measurements are compared to existing literature of Western cultures and a data-set using the same experience sampling method. Results show that, for the monks, the guilty emotion was found to be of more importance compared to the Western data-set, having a greater effect on other emotions. Furthermore, the monks showed higher reported values of both negative and positive emotions compared to healthy Westerners. These results indicate differences can be pointed out and may help further increase understanding of emotions and especially emotion regulation, but research with more comparable data is necessary to investigate such conclusions in further detail.

1 Introduction

Emotions can be very turbulent and are constantly changing. Alternatively, when these emotions are not changing, remaining within the same negative emotional state can lead to the feeling of being in a downward spiral of emotions, which can eventually cause emotional dysregulation (Kuppens and Verduyn, 2017). Thus, one can easily see why the regulation of these emotions can be so important. This is what emotion regulation, or ER, is all about. ER is the attempt to influence emotions in ourselves or others. In this paper, the focus will be on the attempt to influence one's own emotions through emotion regulation.

In some situations, emotion regulation is more important than in others. Especially when engaging in logical thinking, ER can be extremely beneficial, since emotions (both positive and negative) can negatively influence logical reasoning (Jung, Wranke, Hamburger, and Knauff, 2014). When engaging in a debate, for example, regulating emotions can have a big impact on the outcome, since failing to do so could impair the ability to derive at logical consequences needed to participate with success. This example is where it especially gets interesting to look at the life of Tibetan monks, since logical reasoning can be impaired by emotions Blanchette and Richards (2004). On a daily basis, these monks take part in the art of monastic debate, which has a different structure to debate most Western societies are used to. This form of debate mainly has two participants, an attacker and a defender. The defender (usually in sitting position) has to defend certain statements s/he regards as true. The challenger (usually in standing position) makes statements to find inconsistencies in the defender's logic. The goal of the challenger is not to necessarily "win"

as is the case in many Western forms of debate, but it is to make the defender evaluate his or her own statements and find out if there are any illogical consequences following these statements. The defender only has four possible responses to the statements of the challenger: (1) I agree, (2) please state a reason why, (3) the reason is not established, or (4) no pervasion, meaning that the statement does not apply to this class (van Vugt, Moye, Pollock, Johnson, Bonn-Miller, Gyatso, Thakchoe, Phuntsok, Norbu, Tenzin, and et al., 2019). Since monastic debate is based on logical reasoning and finding inconsistencies in this reasoning, emotional responses must be regulated as much as possible. The likelihood of making invalid inferences increases when there is an emotional connection to the statement (Blanchette and Richards, 2004). With such statements, the defender therefore has to regulate his or her emotions in order to avoid making invalid inferences. Even when the defender does not feel an emotional connection to the statement, the challenger tries to tease the defender as much as possible to provoke feelings of anger or frustration (van Vugt et al., 2019), which the defender has to suppress in order to prevent the emotions from taking the upper hand and making invalid statements.

Now that it is clear what emotion regulation entails and what the advantages are, the question of how to analyze ER and emotion in general still remains. The field of emotion dynamics mainly concerns itself with finding patterns and regularities with which emotions change over time, as well as the underlying processes of emotions (Kuppens and Verduyn, 2017). One of these patterns is emotional inertia. Emotional inertia is the resistance to change. It is measured by the degree to which someone's previous emotional state influences the current emotional state (Kuppens, Allen, and Sheeber, 2010). Specific emotional patterns, like emotional inertia, can be indicators of emotional dysregulation, an emotional response which falls outside of the accepted range. High emotional inertia means that previous emotions influence current emotions more, which could lead to a downward spiral of negative emotions and ultimately emotional dysregulation (Kuppens and Verduyn, 2017). As can be concluded from this example, certain emotional patterns can influence well-being. These patterns are changing over time and, therefore, when analyzing emotions, it is important to not only look at individual emotions, but model the interactions emotions have on each other, accounting for time. This can be accomplished using emotion networks.

An emotion network consists of nodes, connected by directed edges (Bringmann, Pe, Vissers, Ceulemans, Borsboom, Vanpaemel, Tuerlinckx, and Kuppens, 2016). The nodes contain emotions. The edges show the connection between these emotions and have a certain weight to them, indicating the strength of the connections between the emotions. The connections can be positive or negative. Bringmann et al. (2016) give an example of this in figure 1.1. In figure 1.1 the weights are

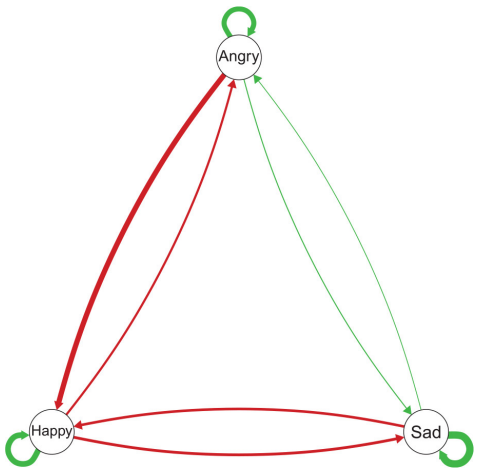

Figure 1.1: Example emotion network showcasing the nodes and edges and how they could be connected (Bringmann et al., 2016). Red edges show negative connections, while green edges show positive connections. Thicker edges indicate stronger connections between the nodes (emotions).

displayed using the thickness of the lines. A thicker line means a stronger connection between the nodes (or emotions), while a thinner line means that the connection is weaker. Furthermore, a red line demonstrates a negative connection, while a green line demonstrates a positive connection. To give an example using figure 1.1, being sad means a decreased likelihood of being happy at the next point in time, while being sad results in a higher

likelihood to be angry. The figure also shows lines that loop back on the same node. This self-loop is the effect of the emotion on itself. So in this network, being sad at one point of time means a greater chance to also be sad at the next.

Differences in cognition between western and east Asian cultures have already been shown to exist. For example, people in east Asian cultures focus more on relationships and similarities between objects to organize environments, while people in western cultures tend to use rules and categorization (Nisbett and Miyamoto, 2005). Furthermore, in a study comparing attitude towards emotion regulation in Chinese and European American participants found two main differences were found (Deng, An, and Cheng, 2019). Firstly, they concluded that the Chinese implicitly evaluated emotional expression as more negative compared to the European American participants. Secondly, the Chinese participants explicitly valued emotional expression as less important. However, the lifestyle of the monks is different from the average east Asian cultures. The comparison in emotion dynamics of the monks and westerners has not yet been fully explored. Therefore, the focus of this paper will be on this difference, using emotion networks created from emotion data of Tibetan monks and comparing this to existing data and literature about the emotion dynamics of healthy westerners.

To investigate the difference in emotion dynamics between Tibetan Buddhist monks and healthy westerners, existing research into the emotion dynamics (using emotion networks) with Western participants needs to be analyzed first. Bringmann et al. (2016) compared individuals with high levels of neuroticism, meaning they experience more negative affects, with less neurotic individuals. They found that the emotion networks of the more neurotic individuals were denser, i.e. there were more links between the individual nodes. This was especially apparent in the negative emotion networks, including the emotions with a negative valence. This finding is also in line with other studies, where diagnosed depressed individuals were have denser emotion networks, especially when looking at the negative networks (Pe, Kircanski, Thompson, Bringmann, Tuerlinckx, Mestdagh, Mata, Jaeggi, Buschkuehl, Jonides, et al., 2015; Wigman, Van Os, Borsboom, Wardenaar, Epskamp, Klippel, Viechtbauer, Myin-Germeys, Wichers, et al., 2015). Due to the debates and forms of meditation the monks are exposed to daily, it can be expected that they have an increased ability to regulate their emotions. Therefore, it is expected that the monks show less secondary emotional responses to their emotional experiences. This is called non-acceptance and has been associated with emotion network density, where less dense networks show lower levels of non-acceptance, leading to less secondary emotional responses to emotional experiences.

The applications of emotion dynamics, especially using emotion networks, can thus be of great benefit in understanding the complex behavior of emotions. While the benefits of such methods are being discovered more and more for western societies, using the same methods with Tibetan monks can give us more insights in their methods of dealing with emotions. Comparing these different cultures using the techniques mentioned above can teach both cultures more about the possibilities in dealing with emotions, leading to the question which this paper attempts to answer: What is the difference in emotion dynamics between Tibetan monks and healthy Westerners when comparing emotion questionnaire data and the resulting emotion networks?

2 Methods

2.1 Data

2.1.1 Data of the Tibetan Monks

The data used in this research is collected using the experience sampling method (ESM). ESM is a self-sampling method, meaning that participants reflect on their own emotions. They do this by answering questions about their emotions. The particular questions given to the monks can be seen in the appendix. These questions were translated to the Tibetan language, this is the language used to communicate in the monastery. The monks answered the questionnaire once a day for 7 days in a row either on paper or by using a Google forms form. The response to the questions are given on a five-point Likert scale (Likert, 1932) based on how

much the emotion is felt, where 1 indicates the emotion is present very slightly or not at all and 5 indicates the emotion being extremely present.

Before answering the questions shown in the appendix, the monks were asked to answer questions about how much attention they were currently paying towards their emotions and how clear they felt about their emotions. After the questions about how much the emotions are felt, they had to answer questions about how they controlled their emotions during the day and how much they debated. The 13 emotions as seen in the appendix can be divided into two categories, positive affect (PA) and negative affect (NA). The emotions excited, proud, determined, happy, cheerful, and relaxed belong to the PA category and the emotions afraid, ashamed, angry, sad, guilty, worried, disgusted belong to the NA category. These emotions are derived from the PANAS scale. This is a standardized list of positive and negative affect emotions, shown to be highly internally consistent and largely uncorrelated (Watson, Clark, and Tellegen, 1988).

Looking at all of the first day responses, the data of the monks consisted of 193 males between the ages of 17 and 51 (M=30.6, SD=7.8). However, some data was not reliable or sufficient to use. 17 entries were removed due to duplicate participant IDs. These duplicate IDs could be coming from the same person, implied from the same answers to the demographic questions (e.g. age, education, etc.), most likely caused by the bad internet connection of the monks. They can also come from different individuals, which made the data entries impossible to separate from one another. Furthermore, to account for the bad internet connection and multiple fast, subsequent responses, all responses of the same person within 60 seconds of the initial response on that day were deleted as well. This was duplicate data which was accidentally sent twice. Lastly, since most of the monks were not successful in filling out the questionnaire each day, the decision was made to only include the participants that filled out the questionnaire for at least five days. This then leaves 32 male monks between the ages of 17 and 42 (M=28.7, SD=7.6). This data can then be divided into two groups, looking at experience. Monks with more than 15 years of experience debating are considered to be experienced, while monks with less than or equal to 15 years of experience are considered to be novice monks. This leads to 16 monks, between the ages of 28 and 42 (M=34.8, SD=5.0) being considered experienced and 16 monks, between the ages of 17 and 34 (M=22.6, SD=4.0) considered as novice.

2.1.2 Data of the Westerners

When looking for a data-set for this research, three key criteria were checked. First, the data had to consist of participants from a country considered to be Western. Second, the data-set needed to consist of healthy participants. Last, the data-set needed to include overlapping PANAS emotions compared to the data gathered from the monks. These criteria are all met in the data-set used, which is taken from Ruan (2019). The study associated with the data (Ruan, Reis, Zareba, and Lane, 2020), included 468 participants in total. These participants were divided in five research groups, two of these are particularly useful: The healthy control groups. These include a younger group of 52 participants (M=34.9; SD=10.4) and an older group of 50 participants (M=59.5; SD=10.4). These groups also consisted of female participants. Since the data of the monks only consists of male participants, only including the male participants of the study leaves 61 males. In the data, ages are not reported. Therefore, the exact mean age of this group is not known. All participants resided in the Tucson, Arizona, and Rochester, New York, metropolitan areas (Ruan et al., 2020) in the United States, which means the participants can be considered to be Western. In the study, the experienced sampling method is used to record self-reported emotions 10 times a day for three days in a row. The questionnaire had to be answered on a smartphone which alarmed the participant at semi-randomized times during the day from 8AM to 10PM with a minimum gap between two beeps of 30mins. The emotions were taken from the PANAS scale and were reported on a seven-point Likert scale (Likert, 1932). To accurately compare the two data-sets, the answers to the questions should be converted to the five-point Likert scale, which is done using formula 2.1.

$$x_5 = (x_7 - 1)(4/6) + 1 \tag{2.1}$$

Of the PANAS emotions used in this research, five emotions were overlapping with the questionnaire

of the monks, namely the negative affect emotions guilty, angry, and afraid and the positive affect emotions excited and relaxed. The reported values of these emotions were compared to the reported values of the same emotions of the monks and were also used to create the emotion networks, which can also be compared to the monks.

Furthermore, to not only compare the PANAS scores of the monks to one particular data-set, the general PANAS scores reported in Crawford and Henry (2004) are used. Here, the PANAS questionnaire was answered by a non-clinical sample representative of the UK population. The male participants of this group consist of 466 males. Since this group is broadly representative of the UK population, a western country, the average reported PA and NA values can accurately be used to compare to the data of the monks.

2.2 The Network

Using the data described in the previous section, we can start building emotion networks of both Tibetan monks and healthy Westerners and compare these. These emotion networks will show what emotions are important within the groups and how the emotions are connected. When those differences are found, they can be compared with existing research about emotion networks show what the differences indicate. These networks need to show within-person effects of emotions. For this, a multilevel VAR model can be used (Bringmann et al., 2016) to obtain the edges and links of the network. This model possesses key features and advantages which are useful compared to other possible options. When groups of individuals share similar dynamics, as is the case in the data-sets presented, multilevel VAR models have been shown to perform better at predictions of data than person-specific VAR models (Lafit, Meers, and Ceulemans, 2022). Furthermore, Lafit et al. (2022) show that the use of multilevel techniques prevent over-fitting of the data.

The multilevel VAR model consists of two components working together to create the model. To model time dynamics within an individual, the VAR method can be used. In a VAR model, the variables at a certain time-point t are regressed to the previous time point $t-1$ of that variable and all other variables (Bringmann, Vissers, Wichers, Geschwind, Kuppens, Peeters, Borsboom, and Tuerlinckx, 2013). This is important, since the purpose of the emotion networks is to show the effects of changes in one of the emotions on the other emotions at the next point of time (i.e. the next measurement). In this research, the different variables consist of the Likert-scale answers given to the PANAS items, ranging from one to five. Since, for the monks, these questions were only asked once a day, the difference between t and $t-1$ is approximately on day. For the Westerner data this difference was randomized to 10 times within 14 hours, with a minimum of 30 minutes. The VAR model is then combined with a multilevel model in order to model the emotion dynamics on a group level instead of an individual level, since "the multilevel model allows the VAR coefficients to differ across individuals" Bringmann et al. (2013). To realise this approach with the datasets used in this research, the R-package mlVAR is used (Epskamp, Deserno, and Bringmann, 2021), which uses the qgraph R package (Epskamp, Cramer, Waldorp, Schmittmann, and Borsboom, 2012).

2.3 Analysis

Once the emotion network models of the monks and westerners are created using the multilevel VAR method, they can be analyzed to find differences between the two participant groups. Firstly, visual differences between the networks can be compared by looking at the directed edges between the nodes, as explained in the introduction. Secondly, the centrality of the nodes can be analyzed. The centrality of a node indicates its importance within the network (Hevey, 2018). Centrality consists of three different measures, namely strength, closeness, and betweenness. These measures all give information about the role of the emotion within the network, and thus within the participants. The three measures are described below.

Each edge connected to a node has a certain value, or weight, associated with it. Since the network is a directed graph, these edges consist of incoming and outgoing edges, or in- and out-strengths. In-strength indicates how much the node

is influenced by other nodes, while out-strength indicates the importance of the node on other nodes that are directly connected. For each node, the sum of the absolute values of the in- and outgoing edges can be calculated and investigated (De Vos, Wardenaar, Bos, Wit, Bouwmans, and De Jonge, 2017). The resulting value is the strength measure, split in in- and out-strength. The closeness measure of centrality represents how close a node is to the other nodes in the network. It is measured by how fast a particular node can be reached from the other nodes in the network using the shortest paths possible (Borgatti, 2005). This shortest path is based on the weights between the edges, which can be thought of as the distances between the nodes. High closeness means the node is influenced quickly by changes in the network and can also affect changes quickly if it is changed. When calculating all these shortest paths, the path will, more often than not, pass through other nodes. How often a node is found on a shortest path between two nodes is the measure of betweenness centrality. So, the betweenness of a node is high if it often appears on the shortest path between two nodes. Conceptually, it can be imagined that information is being passed on through the nodes in these shortest paths. A node with a high betweenness centrality is thus seen as important, since it is often found in this flow of information (Bringmann et al., 2016).

3 results

3.1 Comparing PANAS values

First, the general reported positive and negative affect values between monks and Western populations are compared. For this comparison, the values reported in Crawford and Henry (2004) are used. A two-sample t-test showed no significant difference ($t(36.1)=1.83$; $p=0.075$) in the PA scores for the monks (M=2.98; SD=0.68) compared to the reported score of the westerners (M=3.21; SD=0.73). The mean NA value of the monks (M=1.99; SD=0.59) was higher than that of the westerners (M=1.52; SD=0.52), which was found to be significant ($t(37.8)=-4.30$; $p<.001$).

To investigate the effect of the lifestyle of Tibetan monks on their emotion dynamics, we can also look at the differences in the data gathered from the monks, without comparing this to Westerners. For this, the group is divided into two groups: novice (<=15 years of experience) and experienced monks (>15 years of experience), as explained in the previous section. Experienced monks had a higher PA (M=3.09, SD=0.60) than novice monks (M=2.87. SD=0.61), this was, however, not found to be significant ($t(187.17)=1.67$, $p=0.09$). Experienced monks had a lower NA score (M=1.36, SD=0.31) than novice monks (M=2.18, SD=0.80), which was found to be significant ($t(134.13)=-7.7$, $p<.001$).

Before looking at the networks generated using the data of the data-set from Ruan (2019) and comparing this to the monks, t-tests can be performed comparing the average reported scores of all emotions to investigate whether there are differences between these values.

For the emotion guilty, the monks (M=1.38, SD=0.65) reported higher values than the westerners(M=1.11, SD=0.43, which is a significant difference ($t(302.99)=-6.47$, $p<.001$).

For the emotion angry, the monks (M=1.52, SD=0.87) reported higher values than the westerners (M=1.15, SD=0.52), which is a significant difference $t(295.24)=-6.74$, $p<.001$).

For the emotion afraid, the monks (M=1.52, SD=0.92) reported higher values than the westerners (M= 1.08, SD=0.37), which is a significant difference $t(278.32)=-7.74$, $p<.001$).

For the emotion excited, the monks (M=3.02, SD=1.12) reported higher values than the westerners (M=2.30, SD=1.03), which is a significant difference ($t(339.99)=-9.90$, $p<.001$).

For the emotion relaxed, the monks (M=2.82, SD=1.00) reported lower values than the westerners (M=2.90, SD=0.93), which is, however, not a significant difference ($t(342.72)=1.06$, $p=0.289$). A Bayes Factor Analysis showed that there is moderate evidence (BF=0.14) in favour of there being no difference for this emotion between the two groups.

Preferably, supplementary demographic variables such as age and education would also be analyzed in addition to the reported questionnaire values. These variables are, however, not available in the data-set from Ruan (2019), although the paper does include an analysis of the main affect of

age on reported NA and PA scores. In the paper, the NA and PA emotions are subdivided in high arousal and low arousal. Of the overlapping emotions with the data of the monks, only the excited emotion is considered to be low arousal. For the high arousal emotions, the main effect of age on reported PANAS values for both the positive affect ($t(162.59) = 2.90$, $p = .004$) and negative affect emotions ($t(160.12) = -1.99$, $p = .048$) is significant. For the low arousal emotions, this main effect is not significant for both the positive affect ($t(131.22) = .50$, $p = .620$) and negative affect emotions ($t(120.79) = -1.78$, $p = .078$). This therefore suggests that the main effect of age on reported PANAS values is significant for all overlapping emotions, except for the emotion excited, although the reported effect does also include other emotions than only the overlapping emotions (Ruan et al., 2020). Note that this main effect of age ($M = 47.0$, $SD = 10.4$) is reported including female participants. The main effect of age on the reported PANAS values for the overlapping negative affect emotions of the monks is significant ($F(1,30) = 19.04$, p¡.001) while this main effect is not significant for the overlapping positive affect emotions ($F(1,30) = 0.569$, $p = .456$).

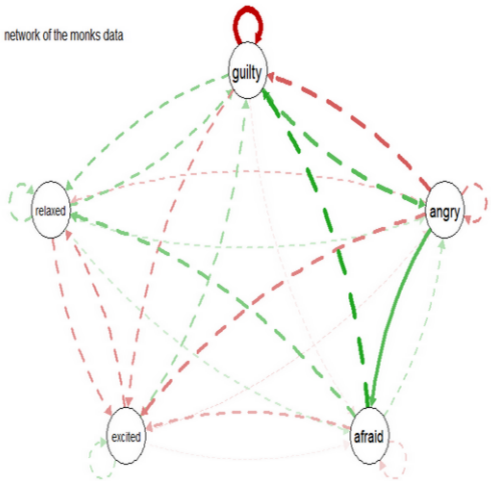

Figure 3.1: Network using selected emotions from the monks data-set. Green lines show negative connections, red lines show positive connections. Dotted lines are non-significant edges, while unbroken lines show significant connections $\alpha = 0.05$. Thicker edges indicate stronger connections between the nodes.

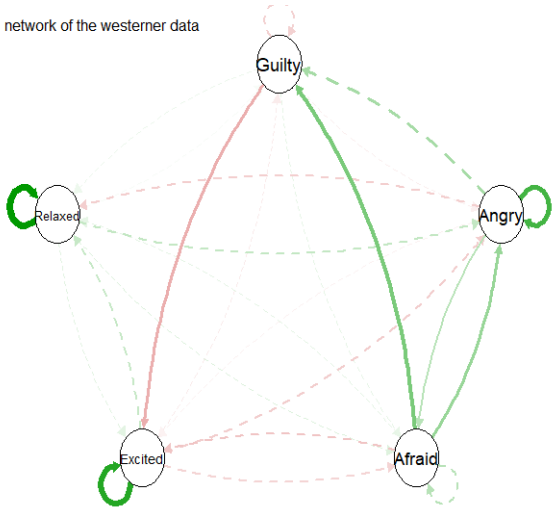

Figure 3.2: Network using selected emotions from the westerners data-set. Green lines show negative connections, red lines show positive connections. Dotted lines are non-significant edges, while unbroken lines show significant connections $\alpha = 0.05$. Thicker edges indicate stronger connections between the nodes.

3.2 Networks

The five different emotions that are the same in both data-sets can be used to generate emotion networks. These networks can be seen in figure 3.1 and figure 3.2 for the monks and westerners respectively. The networks show how the different emotions influence each other and themselves over time. The thickness of the edges indicate the degree to which the emotions influences the emotion the edge is pointed to. This influence can be thought of as a prediction of what would most likely happen at the next time-point when there are changes to particular nodes in the network. Green edges show positive connections, while red edges show negative connections. Solid edges (not dotted) indicate a significant effect between the emotions ($\alpha = 0.5$). The network which was created using the data gathered from the monks (figure 3.1) shows two significant edges. A negative self-loop at the guilty emotion and a positive connection from the angry to the afraid emotions. The positive connection between the negative emotions angry and afraid is to be expected, since negative emotions can often lead to more negative emotions. The self-loop for the guilty

emotion, however, is more noteworthy since negative emotions often show positive self-loops, perceived as the feeling of a downward spiral of negative emotions (Kuppens and Verduyn, 2017). The network created using the westerner data (figure 3.2 has more significant edges. The emotions relaxed, excited, and angry show significant positive self-loops, which is in line with expectations. Moreover, the edges within the positive affect and negative affect emotions are positive, meaning these emotions amplify one another, while the significant edges between the two groups are negative. For example, higher reported values of the emotion afraid at one measurement lead to decreased reported values of the emotion relaxed at the next measurement.

3.3 Centrality

For both data-sets, four different plots are created, giving information about the centrality of the networks. These show the in- and out-strength of the nodes, the closeness of the nodes, and the betweenness of the nodes. The side-by-side in- and out-strength plots of the monks and westerners can be seen in figures 3.3 and 3.4 respectively. The compared closeness measure can be seen in figure 3.5 and the betweenness measure in figure 3.6. For all figures, the plot of the monks is on the left, while the plot of the westerners is on the right. Note that the scales of the plots shown at the bottom of the plots are not exactly the same. The feature to adjust this scale was not present in the *centralityPlot* function of the *qgraph* package (Epskamp et al., 2012).

3.3.1 In- and Out-strengths

The first measure of centrality is the strength of the nodes. The strength of a node is an indicator of the importance of the node within the network (Hevey, 2018). In-strength indicates how much the node is influenced by other nodes, while out-strength indicates the importance of the node on other nodes that are directly connected. The in- and out-strength plots of the data-sets show multiple differences between the data-sets. The in-strength displays the biggest differences in the emotions angry, afraid, and relaxed. For the emotions angry and afraid, the in-strength of the network of the westerners is higher, while the in-strength for the emotion relaxed is higher for the monks. This thus indicates that the emotions angry and afraid (both NA) are influenced by other emotions more for westerners than monks, while this is the other way around for the emotion relaxed. Comparing the out-strength of the individual nodes in the two networks, the main differences can be found with the emotions guilty and angry (both NA). The out-strength of both emotions is higher for the networks of the monks compared to that of Westerners. This indicates that both emotions are influenced by changes of directly connected nodes more for the monks than the Westerners.

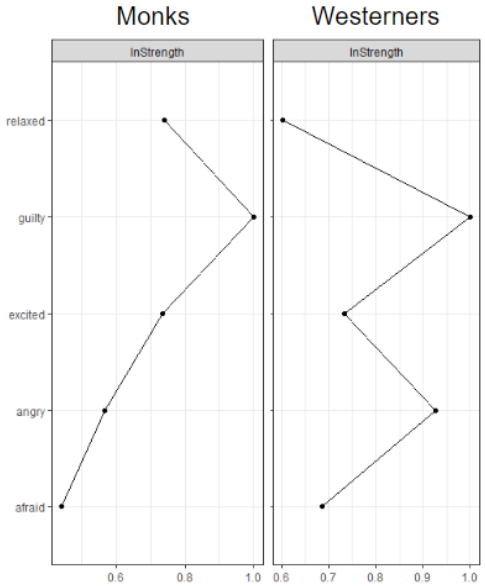

Figure 3.3: Plot of the in-strength per node of both networks (monks and westerners). The in-strength for the monk network is on the left, while the in-strength for the westerner network is on the right.

3.3.2 Closeness

While the strength of a node indicates its importance within the network, it can be misleading to only look at this property, since it does not account for the number of nodes the particular node is connected to (Opsahl, Agneessens, and Skvoretz, 2010). Therefore, it is important to also look at the degree of the node when investigating the centrality. For this, closeness and betweenness are used.

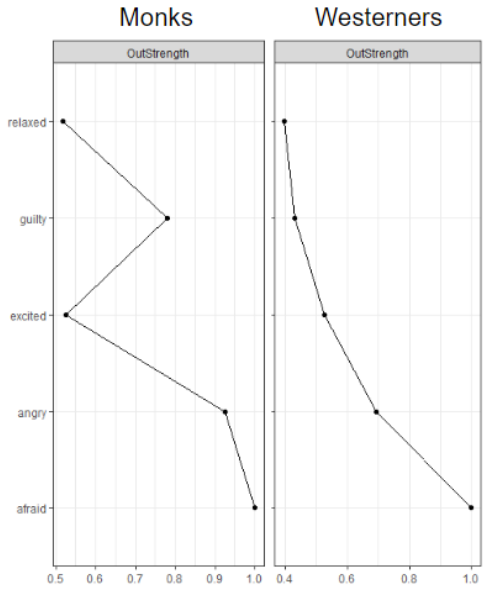

Figure 3.4: Plot of the out-strength per node of both networks (monks and westerners). The out-strength for the monk network is on the left, while the out-strength for the westerner network is on the right.

The closeness indicates the shortest distance from one node to the next, while taking the weights of the graph into account. High closeness means the node is influenced quickly by changes in the network and can also affect changes quickly if it is changed (Borgatti, 2005). The main differences in the closeness between the westerners and monks can be found in the emotions guilty and excited. The closeness for guilty is higher for the monks, while the closeness for excited is higher for the westerners. This indicates that the emotion guilty changes quicker with any changes in the network for the monks. The same applies for the emotion excited for the westerner data.

3.3.3 Betweenness

Betweenness is the measure of how often a node lies on the shortest path between two other nodes (Saramäki, Kivelä, Onnela, Kaski, and Kertesz, 2007). In this case, this would mean that the node is a strong connector between two emotions, making this node more central in the network. This indicates a stronger importance of the emotion.

The most noteworthy differences in betweenness between the two data-sets are for the nodes guilty and excited. The guilty emotion has a higher betweenness in the monks data, while the betweenness for the emotion excited is higher in the data of the westerners, signaling more importance of the node within the network.

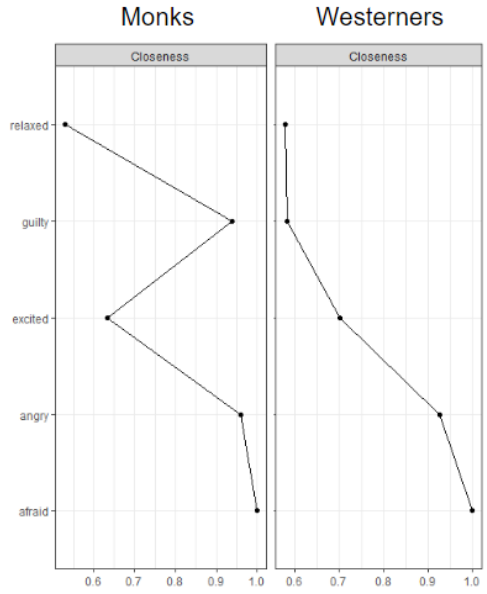

Figure 3.5: Plot of the closeness per node of both networks (monks and westerners). The closeness for the monk network is on the left, while the closeness for the westerner network is on the right.

4 Discussion

This study focused on finding the differences in emotion dynamics between Tibetan monks and healthy Westerners. Because of the lifestyle of the monks, consisting of many hours of meditation and monastic debate each day, it could be hypothesized that they have an increased ability to regulate their emotions, both positive and negative. However, comparing their overall reported scores showed either no significant difference or higher reported scores for both the PA and NA emotions for the monks. After discussing these results with the monks that helped facilitate this research, they offered one possible explanation. They explained

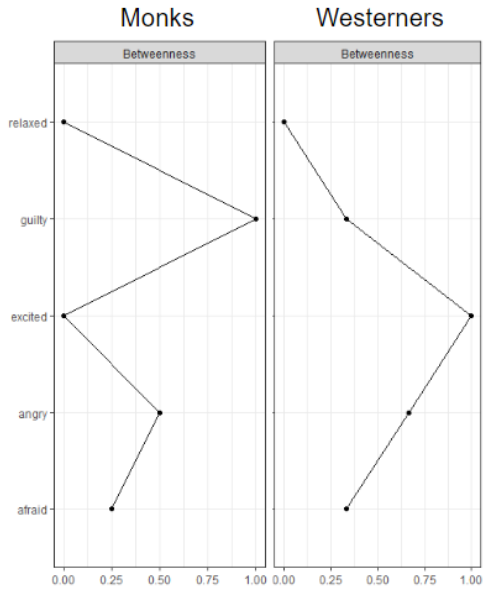

Figure 3.6: Plot of the betweenness per node of both networks (monks and westerners). The betweenness for the monk network is on the left, while the betweenness for the westerner network is on the right.

that they constantly perceive all emotions as being present. Although the emotions may not be felt and acted on at the present time, according to them it is still there in the background. Therefore, the monks may not often report the lowest possible value of an emotion. This recognizing of emotions while not reacting to them is also an important part of mindfulness meditation performed by Tibetan Buddhist Monks (Dingfelder, 2003), indicating that the explanation offered by the monks is not purely personal. Another explanation for the higher reported scores of the monks is the humility integrated in their culture, since a lack of humility is considered to impair the ability to engage in effective argumentation (Kidd, 2016). Because of this humility, the monks may have a bias towards higher reporting lower scores, even if they objectively have the same experience as westerners, because their society strongly encourages the monks to be humble about their realization.

The differences found between the emotion dynamics of Tibetan monks and healthy Westerners can be attributed to multiple factors. Since the differences in culture and especially lifestyle are so substantial, it is difficult to control for all these factors. The living in a monastery alone can already influence the results, since it is a partly isolated living. Therefore, it is also interesting to look at the effect of experience in debating on both the negative affect and positive affect. Experienced monks reported a significantly lower NA score than novice monks, indicating an effect of practicing debate on the ability to regulate negative emotions. Experienced monks are, however, usually also older since experience is based on the number of years of practicing debate. Increasing age has been associated with a greater access to emotion regulation strategies (Orgeta, 2009), which may thus be an influencing factor as well. This influence of age on NA and PA values has also been shown, where increased age was associated with lower levels of NA and higher levels of PA (Soubelet and Salthouse, 2011). Additionally, because of the influence of living in a monastery, comparing emotion dynamics between Buddhist and, for example, christian monks could be interesting to further isolate the effect of monastic debate on emotion dynamics and, in particular, emotion regulation. Furthermore, the main effect of age on the reported NA emotions was significant for the Westerners as well as the monks. Therefore, the age could also play a role in the observed difference. Since the data of the Westerners does not include the ages, the differences in age between the two groups including only male participants cannot be known. However, comparing the mean age including both male and female participants reported in Ruan (2019), the mean age of the Westerners is higher than that of the monks, which could play a role in the difference between the two groups.

While the overall values of the reported PA and NA values give a good indication of differences between Tibetan monks and healthy Westerners, it does not take into account important properties of emotions. Emotions are continuous, they change over time, and dependent on one another, meaning one emotion influences the other. To keep these properties into account, emotion networks were created. A visual comparison of these networks particularly showed one unexpected difference between the networks, the negative self-loop for the guilty emotion in the network using the monks

data-set. Positive self-loops, as can be seen for the networks of the Westerners, would be expected. Feeling one emotion at a certain time-point increases the chance that this emotion will also be present at the next time point Kuppens et al. (2010). This could indicate that the monks have a high ability to regulate this particular emotion. All other in both data-sets edges are within what would be expected; positive connections within the NA or PA emotions and negative connections between the two groups, meaning that feeling negative emotions leads to feeling less positive emotions at the next time point, for example. Notable are the many strong positive self-loops for the Westerners. These positive self-loops, indicating higher emotional inertia, have been linked to more neurotic individuals (Bringmann et al., 2016), especially for negative affect emotions (Suls and Martin, 2005).
Another notable difference is the number of significant edges the two networks exhibit, where the Westerner network shows more. This can be attributed to the different intervals between two measuring points. The data for the Westerners was collected 10 times a day, with intervals of approximately 1.5 hours between two measuring moments. Since emotions change over time, the longer the interval between two measuring points, the more chance there is of the measurements showing a correlation, because the emotions have been changing for a longer period of time. Therefore, the network for the Westerner participants show more significant edges than that of the monks, which could also be a possible explanation for the number of strong self-loops in the Westerner network. For future studies investigating the differences between the two groups, the time-intervals between two moments of filling in the questionnaire would ideally be identical.

Apart from the visual observations, the centrality of the networks can show more differences, especially for the individual emotions. To reiterate, centrality refers to the importance or how focal one specific emotion or node is in the network (Freeman, 1978). The most notable difference was again for the emotion guilty. This node has higher closeness and betweenness values in the network of the monks compared to the Westerners. This means that, if this emotion changes from one time-point to the next, the change is more quickly propagated through the rest of the network. Another notable difference can be found for the positive affect emotion excited, which shows differences in both the closeness and betweenness values. Both of these values are lower for monks compared to the Westerners for the excited emotion, indicating more importance of the emotion for Westerners. The closeness mainly indicates that the emotion excited is more quickly influenced in the Westerners network when there are changes in the network compared to the monks, while the betweenness indicates that the node excited is a strong connector, propagating changes through the network.

While the differences presented above are promising and do indicate that differences in emotion dynamics may differ between Tibetan monks and healthy Westerners, there are some limitations to the results. A side-note that remains is the translation which had to be done for the PANAS items and other questions for the Tibetan monks. For both data-sets, the questions were presented in the native language of the participants (Tibetan and English). For the monks, this meant that the PANAS items and the questions in the questionnaire had to be translated from English to Tibetan. Tibetan is a highly complex language in both syllable structure, as well as verb morphology (Zeisler, 2009), which makes translating more difficult. Furthermore, the monk that translated the questionnaire, informed us of this difficulty as well. The main problem, he said, was that some emotions in English have multiple possible translations in Tibetan, all matching the emotion in some way. Choosing one of these translations or another could thus influence the resulting response to the questionnaire.

The problem of translation is a problem that will unfortunately always be present in future research. Other limitations can, however, be overcome. With data-sets with measurements in the same timeframe, the emotion networks will be more comparable. Furthermore, the influence of monastic debate on emotion regulation could be measured by doing a comparison with other monasteries, countering the other factors of this different lifestyle. Increasing ones ability to regulate emotions can be highly

beneficial to the well-being of that person in general (Kuppens and Verduyn, 2017). Therefore, finding out whether Tibetan monks are indeed better at emotion regulation and, if so, why this is, can help teach other cultures and help increase well-being. As seen in this paper, some promising differences can be pointed out. Future research accounting for the limitations could expand on these differences and increase our knowledge of emotion dynamics, and in particular emotion regulation.

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Appendix

		Very slightly or not all	A little	Moderately	Quite a bit	Extremely
3.	Excited	---------- 1 ----------	------- 2 -------	------- 3 -------	------- 4 -------	------ 5 ------
4.	Afraid	---------- 1 ----------	------- 2 -------	------- 3 -------	------- 4 -------	------ 5 ------
5.	Proud	---------- 1 ----------	------- 2 -------	------- 3 -------	------- 4 -------	------ 5 ------
6.	Ashamed	---------- 1 ----------	------- 2 -------	------- 3 -------	------- 4 -------	------ 5 ------
7.	Determined	---------- 1 ----------	------- 2 -------	------- 3 -------	------- 4 -------	------ 5 ------
8.	Angry	---------- 1 ----------	------- 2 -------	------- 3 -------	------- 4 -------	------ 5 ------
9.	Happy	---------- 1 ----------	------- 2 -------	------- 3 -------	------- 4 -------	------ 5 ------
10.	Sad	---------- 1 ----------	------- 2 -------	------- 3 -------	------- 4 -------	------ 5 ------
11.	Cheerful	---------- 1 ----------	------- 2 -------	------- 3 -------	------- 4 -------	------ 5 ------
12.	Guilty	---------- 1 ----------	------- 2 -------	------- 3 -------	------- 4 -------	------ 5 ------
13.	Relaxed	---------- 1 ----------	------- 2 -------	------- 3 -------	------- 4 -------	------ 5 ------
14.	Worried	---------- 1 ----------	------- 2 -------	------- 3 -------	------- 4 -------	------ 5 ------
15.	Disgusted	---------- 1 ----------	------- 2 -------	------- 3 -------	------- 4 -------	------ 5 ------

Figure 4.1: ESM questionnaire questions given to the monks.