# THE RELATIONSHIP BETWEEN EMODIVERSITY AND AFFECTIVE FORECASTING

by
ELİF ŞENGÜL

Submitted to the Graduate School of Social Sciences
in partial fulfilment of
the requirements for the degree of Master of Science

Sabancı University
July 2022

**THE RELATIONSHIP BETWEEN EMODIVERSITY AND AFFECTIVE FORECASTING**

Approved by:

Assoc. Prof. Robert W. Booth .....
(Thesis Supervisor)

Asst. Prof. Asuman Büyükcan Tetik .....

Prof. Anthony Ong .....

Date of Approval: July 20, 2022

# ABSTRACT

THE RELATIONSHIP BETWEEN EMODIVERSITY AND AFFECTIVE FORECASTING

ELİF ŞENGÜL

PSYCHOLOGY M.S. THESIS, JULY 2022

Thesis Supervisor: Assoc.Prof. ROBERT W. BOOTH

Keywords: emodiversity, forecasting, depression, anxiety, emotional intelligence

Affective forecasting – the prediction of future emotions – is often inaccurate, and shows individual differences. Since imagining the future depends on present and past experience, we investigated whether individual differences in emotional experience would predict individual differences in affective forecasting (in)accuracy. Specifically, we tested whether affective forecasting was associated with emodiversity, the variety, and evenness of emotional experience. We conducted three studies. In the first one, one hundred and thirty-five students rated their current positive and negative affect on seven consecutive days. On the first day, they also forecast what their affect would be on the seventh day. We estimated their emodiversity from their responses on the first six days; we used their ratings on the seventh day to assess the accuracy of their earlier forecasts. Negative emodiversity was associated with overestimations of future negative affect. In the second study, one hundred thirty-six participants rated how frequently they experienced positive and negative emotions. They received a list of positive and negative events, and forecasted their feelings for each event. We could not observe any significant correlations between emodiversity and affective forecasting biases. The third study was a replication study of the second study, and we did not find any significant association between emodiversity and forecasting variables. These findings suggest that forecasting errors for an ambiguous future are related to current affect, and that it is the variety, not just the extent, of negative affect which predicts such errors. However, emodiversity does not relate to forecasts of general positive and negative feelings caused by specific events.

# ÖZET

DUYGU ÇEŞİTLİLİĞİ VE DUYGUSAL TAHMİN ARASINDAKİ İLİŞKİ

ELİF ŞENGÜL

PSİKOLOJİ YÜKSEK LİSANS TEZİ, TEMMUZ 2022

Tez Danışmanı: Doç. Dr. ROBERT W. BOOTH

Anahtar Kelimeler: duygu çeşitliliği, tahmin, depresyon, anksiyete, duygusal zeka

Duygusal tahminler - gelecekteki duyguların tahmini - genellikle hatalıdır ve bireysel farklılıklar gösterir. Geleceği hayal etmek, şimdiki ve geçmiş deneyime bağlı olduğundan, duygusal deneyimlerdeki bireysel farklılıkların, duygusal tahmin hatalarındaki bireysel farklılıkları tahmin edip etmeyeceğini araştırdık. Bilhassa, duygusal tahminin duygusal çeşitlilikle (duygyların çokluğu ve eşitliği) ile ilişkili olup olmadığını test ettik. Bunu yapabilmek için üç adet anket bazlı çalışma düzenledik. İlkinde, yüz otuz beş öğrenci, art arda yedi gün boyunca mevcut olumlu ve olumsuz duygularını derecelendirdi. İlk gün, yedinci günde nasıl hissediyor olacaklarına dair tahminler yürüttüler. Duygusal çeşitlilik puanlarını ilk altı gündeki yanıtları kullanarak hesapladık; birinci günde yaptıkları tahminlerin doğruluğunu değerlendirmek için de yedinci gün gerçekten nasıl hissetiklerine dair derecelendirmeleri kullandık. Sonuç olarak negatif duygu çeşitliliği gelecekteki negatif duyguların abartılı tahminleriyle ilişkili bulundu. İkinci çalışmada, yüz otuz altı katılımcı, olumlu ve olumsuz duyguları ne sıklıkta deneyimlediklerini derecelendirdi. Ayrıca, olumlu ve olumsuz olaylar içeren bir liste verildi ve her olay için o olay başlarına gelse nasıl hissedeceklerini tahmin etmeleri soruldu. Duygusal tahmin hataları ile duygu çeşitliliği arasında ilişki gözlemleyemedik. Üçüncü çalışma olarak ikinci çalışmayı başka bir grup katılımcı ile tekrarladık ve yine anlamlı bulgular gözlemleyemedik. Bu çalışmaların bulguları, gelecekte belirsiz bir gün için duygusal tahmin hatalarının mevcut duygulanımla ilişkili olduğunu ve bu tür hataları öngören şeyin sadece duygunun kapsamı değil, çeşitliliği de olduğunu göstermektedir. Bununla birlikte, duygusal çeşitlilik belirli olayların neden olduğu genel olumlu ve olumsuz duyguların tahminleriyle ilişkili değildir.

## ACKNOWLEDGEMENTS

I acknowledge that my master's years were full of affective forecasting errors. When I started this program, I expected to feel some happiness but a lot of stress, sadness, regrets, and tears. It is because these were what I have heard from my professors about the challenges of doing a master's and seen from other master's students' lives. However, it was not like that at all. I enjoyed the program, courses, and my thesis. I felt happy and excited in general. I have to admit it sounds like a low positive emodiversity, but it was fine! I believe it would not be the case if Assoc. Prof. Robert W. Booth was not such a supportive and helpful supervisor. Therefore I want to thank him!

I also acknowledge that choosing a subject for a master's thesis which has limited literature was insane. However, thanks to this subject, I learned that creating a small piece of new information is a challenging but rewarding process.

Lastly, I acknowledge that I need to thank my boyfriend and family, who helped and supported me all the time.

*To my family, dearest uncle Metin and darling Halil*
*the most supportive and loving people in my life*

## TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF ABBREVIATIONS

# 1. INTRODUCTION

This study aims to examine a possible correlational relationship between emodiversity, the richness and evenness of individuals' daily emotional experiences, and errors people make when they are asked to forecast their future emotions, which are called affective forecasting errors.

The diversity of experienced emotions, emodiversity, is a construct defined by Quoidbach et al. (2014). Emodiversity considers both variety (richness) and evenness (relative abundance) of the emotions people frequently experience in their lives. The main argument is that emotions create an emotional ecosystem. Like in a biological ecosystem the diversity of species (in the case of emodiversity, the diversity of emotions) might make one healthier since a diverse ecosystem increases resilience and adaptiveness. Also, in the case of emodiversity, individuals need to report the richness of their own emotions, therefore the scores might be an indicator of self-awareness. Emodiversity can be classified as positive emodiversity, negative emodiversity, and global emodiversity, which includes both negative and positive emotions. The relationship between the emodiversity and some aspects of human psychology and physiology is studied and found, but affective forecasting error is not one of them.

Affective forecasting is a form of self-prediction and future-oriented thinking. People make mistakes when they forecast their future emotions. These mistakes are called affective forecasting errors. It is an important topic to investigate since emotions have a role in decisions, choices, and social behaviors (Buehler, McFarland, and Spyropoulos 2007). Nonetheless, the literature shows that forecasts are not often accurate (Ayton, Pott, and Elwakili 2007).

Many studies investigated the underlying reasons of affective forecasting errors and the relationship between these errors and many other psychological phenomena. To the best of our knowledge, there is no study investigating the relationship of diversity in frequently experienced emotions, in other words, emodiversity, with

affective forecasting errors.

In this study, we examined whether there is a correlation between emodiversity and affective forecasting errors, rather than a causational relationship mainly because we were interested in if naturally occuring variations in emodiversity are related to forecasting errors. As a result of this study, an association is expected and found between them.

# 2. LITERATURE REVIEW

## 2.1 Emodiversity

### 2.1.1 What is Emodiversity?

Emodiversity is a construct developed by Quoidbach et al. (2014), that indexes the variety (richness) and relative abundance (evenness) of experienced emotions. Quoidbach et al. (2014) made an analogy between emodiversity and biodiversity and hypothesized that, just as diversity in nature makes an ecosystem more adaptive and resilient, diversity of experienced emotions creates a healthier emotional ecosystem, which results in better mental and physical health. To assess this hypothesis, they asked participants to indicate how frequently they experience given emotions and measured participants' depression levels alongside other predictors such as age, gender, and physical health.

Quoidbach et al. (2014) conceptualized 3 types of emodiversity: positive emodiversity, negative emodiversity, and global emodiversity. Positive emodiversity includes only positive emotions, negative emodiversity includes only negative emotions and global emodiversity contains both positive and negative emotions. Their results indicated that greater positive emodiversity, negative emodiversity, and global emodiversity are negatively associated with depression. This relationship was independent of the mean affect score calculated using the same affect questionnaire. The researchers also examined the emodiversity's relationship with physical health and the results indicated that positive emodiversity, negative emodiversity, and global emodiversity are negatively associated with the number of visits to a doctor.

Quoidbach et al. (2014) argued that there are possible reasons why emodiversity is linked to mental wellbeing. The diversity of experienced emotions in daily life may have an adaptive value. Also, the same mechanism can increase one's resilience to stressors. Moreover, it may indicate a greater self-awareness since emodiversity

scores are based on self-report surveys.

The theoretical analogy and empirical approach of emodiversity were criticized by Brown and Coyne (2017). First, they argued that the analogy of biodiversity does not fit emodiversity since richness and evenness in emodiversity are not correspondents of richness and evenness in biodiversity. Richness is an indicator of the number of different species that can be found in a biological ecosystem. However, in the case of emodiversity, richness depends on self-report and the extent of the number of emotion items that exist in a given questionnaire. Evenness of the experienced emotions again depends on self-report, also the options to indicate the frequency of a felt emotion on a Likert scale are very limited as compared to the natural ecosystem. Also, in the case of emodiversity, it is questionable how well every person performs when it comes to being aware of the frequency of their emotions although there is no place for subjectivity in the calculation of evenness in natural ecosystems. In that regard, Brown and Coyne (2017) suggested using diary or experience sampling methods as better ways of operationalization. Considering these drawbacks altogether, they suggest that Shannon's entropy might not capture all aspects of emodiversity, and be the correct tool to use.

They pointed out some empirical problems involving effect sizes, the possibility of multicollinearity, and suppression of positive affect and emodiversity. They started to question the explanatory power of emodiversity by showing how little $R^2$ increased after positive emodiversity and its interaction with mean positive emotion are entered into the equation. Also, they pointed out a possibility of multicollinearity between positive emodiversity and mean positive emotion since the variance inflation factors (VIFs) increase when the interaction term is entered into the equation. By considering these statistical inconveniences, they concluded that the emodiversity does not have a noticeable impact on depression independent of positive and negative affect. Additionally, they indicated a suppression problem in the study of Quoidbach et al (2014), which is on the relationship between emodiversity and physical health, by comparing the magnitudes of zero-order correlations and standardized regression coefficients. They argued that reported coefficients are mostly due to the suppression effect. They examined positive emodiversity and negative emodiversity in detail and found that results of positive emodiversity are under the influence of negative suppression, which is observed when two predictors are correlated and at least one of them is a little strongly correlated with the outcome as compared to the other predictor, and negative emodiversity is under the influence of reciprocal suppression, which occurs when two predictors are positively correlated with each other and also showing opposite sign correlations with the outcome. They argued that suppression effects are explainable in the case of theoretical background, but

for the emodiversity study, it creates serious problems.

As an answer to these criticisms, Quoidbach et al. (2018) published another paper emphasizing the robustness and theoretical validity of emodiversity. For the criticisms on richness, they said there are many species in the world that we do not know and cannot capture when calculating biological diversity, and emodiversity is robust to the number of items used in the emotion scale. For the arguments on evenness, they agreed that increasing the range might be better. They have highlighted that they do not have hypotheses regarding the individual roles of richness and evenness and added that in this case considering them (richness and evenness) together is enough to see a relationship between emodiversity and better health. They replied to the concerns on the applicability of the used formula by showing examples from the literature in which Shannon's diversity formula is used for different fields in psychology. For the empirical issues that were addressed by Brown and Coyne (2017), they respectively claimed that small effect sizes do not mean that the importance is small and significant $p$ values should be ignored, and refuted multicollinearity claims with additional analysis. Lastly, they mentioned the suppression effects indicated by Brown and Coyne (2017) and tested whether suppression exists with Sobel tests for positive emotion and concluded that there is no suppression effect. On the other hand, they acknowledged that negative emotion displays suppression by making the relationship between negative and global emodiversity and health stronger when the negative mean affect is added to the regression. To make a justification, they highlighted suppression is not necessarily a problematic thing if there is a theoretical rationale behind it, and emodiversity has that solid theoretical background, and the same result is replicated several times, and they showed some evidence for the replication. As a result, Quoidbach et al. (2018) showed that the findings are statistically robust and claims are theoretically grounded.

Although there is not a long literature on emodiversity, there are a couple of studies that investigated the emodiversity's relationship with mental health, physical health, and other daily life events.

#### 2.1.1.1 Emodiversity and mental health

After Quoidbach et al. (2014, 2018), more researchers looked into emodiversity's relationship with mental health.

#### 2.1.1.1.1 Emodiversity and depression

In one study, Urban-Wojcik et al. (2020) examined the relationship between depression and emodiversity by using samples from the Midlife in the United States (MIDUS) study (http://midus.wisc.edu/). They used the dairy part of the MIDUS study including age, sex, emotion (positive and negative), and mental and physical health information. To calculate the emodiversity score, they followed Quoidbach et al. (2014) and used Shannon's entropy formula (Shannon 1948; Quoidbach et al 2014). Their analysis showed that positive emodiversity is negatively correlated with fewer depressive symptoms, while negative emodiversity is correlated with more. Even though positive emodiversity results are in line with Quoidbach et al. (2014), there is an inconsistency between negative emodiversity and its relationship with depression. Their findings on global emodiversity and mental health could not replicate Quoidbach et al. (2014) since they found opposite patterns for negative and positive emodiversity. Importantly, they suggested studying these two (positive and negative emodiversity) as separate variables is more beneficial since when they are together (global emodiversity), they either bias the results in the direction of negative emodiversity or conceal its relationship with other outcome variables.

Another study looked at the association between emodiversity and depression in a clinical sample (Werner-Seidler et al., 2020). The researchers used a different method to calculate and study emodiversity and mental health associations. Instead of measuring the frequency of experienced emotions, they calculated the emodiversity scores by recollections of emotional experiences and used a life structure card sort task to do this. The emodiversity scores of depressed and non-depressed individuals are compared and it is found that collections of depressed individuals show greater negative emodiversity and lower positive emodiversity.

Benson and Ong (2020) used data from an 8 days study (National Study of Daily Experiences) to investigate whether or not the relationship between stress and depressive symptoms is attenuated by positive emodiversity and they also looked at the age-based differences. Their results showed positive emodiversity weakened the association between depressive symptoms and stress, and the extent of this impact was dependent on age. More specifically, younger adults with higher positive emodiversity are influenced by this attenuation more than younger adults with lower positive emodiversity; positive emodiversity did not affect the relationship between depressive symptoms and stress.

#### 2.1.1.1.2 Emodiversity and anxiety

The literature on anxiety and emodiversity is very limited as compared to depression.

Once again, Urban-Wojcik et al. (2020) studied the relationship between anxiety and emodiversity by using the MIDUS dataset. Results showed that there is a negative correlation between anxiety symptoms and greater positive emodiversity, and there is a positive association between anxiety symptoms and greater negative emodiversity.

Bantly (2020) investigated the role of emodiversity in anxiety in older adults for his master's thesis. He found that any of the emodiversity scores (positive, negative, and global) did not remain related to anxiety after the correlations were controlled for mean affect scores. He explained the possible reasons behind discrepancies between the results of Urban-Wojcik (2020) and his study as the differences in sample sizes and age of participants since he had a smaller number of participants from older age groups.

In another study conducted by Urban-Wojcik et al. (2021), the data is collected from the same group of participants pre and during pandemic by using the ecological momentary assessment (EMA) method. They found that negative emodiversity is associated with higher levels of anxiety and depression during the pandemic. The researchers concluded that in the case of long-term major stress, experiencing greater diversity of negative emotions momentarily may become more important for mental wellbeing.

#### 2.1.1.1.3 Emodiversity and post-traumatic stress disorder

There is one study investigating the relationship between emodiversity and PTSD by using two different data sets including the self-concept structure and autobiographical knowledge organization of women who are sexual trauma (abuse and assault) survivors with chronic PTSD (Clifford, Hitchcock and Dalgleish 2020). In the analysis conducted for self-concept structure, they found that the trauma group showed greater negative emodiversity and poorer positive emodiversity as compared to the control group. Then, they analyzed data of life structure tasks for past autobiographical knowledge. They replicated their findings on greater negative emodiversity in the trauma group, but not on positive emodiversity. The overall finding is in line with Werner-Seidler et al. (2020) and opposite of Quoidbach et al. (2014). This discrepancy between these studies' conclusions on negative emodiversity can be explained by the clinical disturbances in the experienced emotions (Clifford, Hitchcock, and Dalgleish 2020).

#### 2.1.1.2 Emodiversity and well-being

Urban-Wojcik (2020) also looked at emodiversity and hedonic and eudaimonic well-being relationships by using the data of the MIDUS study. Hedonic well-being is defined as subjective well-being, state of happiness, and life satisfaction in Urban-Wojcik et al. (2020). To measure hedonic well-being, the Satisfaction with Life Scale (Pavot and Diener 1993) is used. They found that high levels of life satisfaction are associated with less negative and more positive emodiversity. Their results partially supported their hypothesis, which was that greater positive and negative emodiversity are correlated with better well-being. On the other hand, eudaimonic well-being (defined by Urban-Wojcik et al. (2020) as a deeper state and a signal for meaning in life and was measured in the study by a questionnaire including questions such as "I have a sense of direction and purpose in life" (Urban-Wojcik et al. 2020) is not found to be related to emodiversity.

#### 2.1.1.3 Emodiversity and physical health

As previously mentioned, Quoidbach et al. (2014) conducted a second study to assess the role of emodiversity in physical health by measuring doctor visits, the number of days spent in hospital, Defined Daily Dose, and average maintenance dose per day to measure medical consumption and health-related behavior. They found that positive, and global emodiversity are negatively associated with doctor visits. The days spent in hospital and medication usage were independent of mean positive, negative, and mean (positive and negative) affect respectively.

To investigate this relationship from another perspective, Ong et al. (2018) studied the inflammation and emodiversity relationship. Inflammation is known as a key factor for mortality and morbidity and it is shown that it is linked to experiences of negative emotions (Ong et al., 2018). For example, fear and shame are associated with greater inflammation (Dickerson et al. 2004; Moons, Eisenberger, and Taylor, 2010, as cited in Ong et al. 2018). By considering the relationship between health and emodiversity, and the link between inflammation and emotional experiences, they hypothesized that there will be a negative association between global emodiversity and levels of biomarkers of inflammation (e.g. IL-6, CRP, fibrinogen). They also expected to see an independent relationship of negative and positive emodiversity with inflammation markers. They used a data set of another study, which includes daily reports of 32 items PANAS for 30 days, levels of inflammation markers, and covariates such as body mass index, medication usage, health conditions, and

demographics. Different from previous research on emodiversity mentioned above, they used Gini (1912) coefficient index instead of Shannon's entropy to calculate the emodiversity scores. Ong et al. (2018) found that global emodiversity is not linked to biomarkers of inflammation, but positive emodiversity is related to inflammation and this relationship was independent of mean positive affect alongside other variables. However, they could not observe the hypothesized relationship between negative emodiversity and latent inflammation.

Urban-Wojcik et al., (2020) also examined emodiversity and physical health relationship by using MIDUS data. They looked at the daily reported physical symptoms, chronic conditions, and limitations to Instrumental and Basic and Activities of Daily Living which is assessed by the Medical Outcomes Study Short Form - 36 Survey (Ware and Sherbourne 1992). According to the results, fewer reported symptoms and chronic conditions were associated with lower negative emodiversity and greater positive emodiversity. They could not observe any significant relationship between limitations to activities of daily living and emodiversity.

These three studies are indicators of a possible association between the diversity of experienced emotions and physical health, although different variables are measured and calculation techniques are used. More specifically, all of them showed an association between positive emodiversity and physical health measures, which can be an indicator of the adaptiveness value of diversity of experienced positive emotions (Ong et al. 2018; Urban-Wojcik et al. 2020). On the other hand, the findings for negative emodiversity do not match Quoidbach et al. (2014).

#### 2.1.1.4 Emodiversity and cognitive abilities

Beyond the health issues, studies also examined how the cognitive abilities of people relate to the diversity of their emotions. In one study, Grossman (2019) suggested that experiences with a broad range of emotions might play a role in wise reasoning. They conducted a series of studies, hypothesized that wise people will have greater emodiversity as compared to control group participants. They created two groups: wise and control, and compared the emodiversity levels. Findings of five studies indicated a positive correlation between emodiversity and wise reasoning. This was measured by reflections of people considered wise, wisdom-related characteristics, self-reported wise reasoning, and the likelihood of mentioning wisdom-related themes. The researchers pointed out that instead of handling emotions as single items and intensities, using emodiversity's role in decision or judgment making might be helpful to study cognitive processes. They also suggest that there may

be an impact of emodiversity on greater conceptual knowledge.

In another study, cognitive functions' relationship with emodiversity is studied. While Urban-Wojcik et al. (2020) were examining the mental health and emodiversity relationship by using MIDUS data, they also investigated the cognitive functions such as executive function and episodic memory, which was measured by Brief Test of Adult Cognition by Telephone (BTACT; Lachman et al. 2014, Lachman and Tun 2008, as cited in Urban-Wojcik et al. 2020). They found that there is a positive association between better executive functioning and negative emodiversity. By emphasizing that this is a correlational study, they came up with two possible explanations: a possibility of increased mental flexibility as a result of facing diverse negative emotions due to challenging life events or, higher executive functions might create an opportunity for experiencing a more diverse range of negative emotions.

To sum, it can be said that there are two different studies investigating the relationship between emodiversity and cognitive abilities. They looked at different cognitive abilities and found significant relationships. However, more research is needed to understand the role of emodiversity in reasoning and cognitive functioning.

#### 2.1.1.5 Emodiversity and daily activities

Lee et al. (2022) looked at the relationship between emodiversity and daily activities by calculating activity diversity scores. They thought that diversity in participating in activities such as volunteering or spending time with children might be linked to diversity in the experienced emotions since emotions occur with stimulation and activities create a context for emotions. By acknowledging that age differences might have a role in this relationship, they used data of two independent samples from different age groups. They found that there is a positive correlation between positive emodiversity and activity diversity as well as a positive correlation between negative emodiversity and activity diversity, yet, only the first one is affected by age. The relationship becomes stronger for the young group.

Overall, emodiversity as a construct has been used in many studies and has been investigated from different perspectives. By looking at the results of these studies, it can be said that, contrary to the results of Quoidbach et al. (2014), greater positive emodiversity and greater negative emodiversity generally correlate differently with the same outcomes. It can be said that positive emodiversity has a more established relationship with outcomes of better mental health as compared to negative emodiversity. Thus, it makes it easier to link positive emodiversity to adaptiveness;

but, the role of negative emodiversity in well-being should be investigated more. Variances in measurements, participant demographics, and emodiversity calculations might explain the inconsistencies among studies, yet more studies are needed to understand how emodiversity works as a construct in both general and clinical populations.

### 2.1.2 How to Calculate an Emodiversity Score?

There is a formula originally generated by Shannon (1948) to calculate diversity. Quoidbach et al. (2014) adopted the formula to calculate emodiversity.

$$Emodiversity = -\sum_{i=1}^{j}(P_i \times lnP_i)$$

$$j = \text{number of emotions (richness)}$$

$$P_i = \text{ith emotion divided by j}$$

To calculate the emodiversity score, first, for all emotions, the rate of the emotions in the scale is divided by the total number of emotions. After that, the natural logarithm of the obtained score is calculated. Then, the raw score is multiplied by its natural logarithm. After repeating these steps for each emotion in the scale, sum, and multiplied by minus one, the global emodiversity score is calculated. To create separate scores for negative and positive emodiversity, only the negative or positive emotion ratings are used. Additionally, since emodiversity is a way of calculating the affect scores, therefore there is no specific questionnaire or scale to use.

Even though the adapted version of Shannon's entropy formula is preferred by Quoidbach et al. (2014) in the first place and is commonly used in emodiversity research, other metrics can be used to calculate diversity such as the Gini (1912) coefficient, richness index, Simpson's Index (1949) (Benson et al. 2018). In our study, Shannon's entropy is preferred since it is used by Quoidbach et al. (2014), it is the most commonly used formula in emodiversity research, and it calculates both richness and evenness.

## 2.2 Affective Forecasting

### 2.2.1 What is Affective Forecasting?

Predictions on how one would feel in the future are called affective forecasting (Wilson and Gilbert 2003). Studies have shown that people can be quite inaccurate when they are asked to predict how they will feel during an emotion-evoking event (Ayton, Pott, and Elwakili 2007; Dunn and Laham 2006; Hoerger et al. 2012; Wilson and Gilbert 2003, 2005): that is, they show affective forecasting errors (Gilbert et al. 1998).

People might predict three aspects of their future emotions: valence, intensity, and duration (Gilbert et al. 1998). Thinking about how eating ice cream makes one very happy for an hour can be an example of affective forecasting. People often mistake the valence, intensity, and/or duration of their future emotions. One example of misprediction of valence can be that while expecting to feel happy and excited on the first day of a new job, people might experience stress. Intensity errors happen when people accurately forecast their excitement and happiness but underestimate or overestimate how excited and happy they would be. Lastly, people might also inaccurately forecast how long the excitement and happiness will last.

### 2.2.2 Why is It Important to Study Affective Forecasting?

How one will feel as a consequence of their actions have an impact on decisions. For instance, people consider their emotions while they are accepting a job offer, marrying someone, or buying a technological device. Due to that, one's expectation of the happiness, joy, excitement, anger, or sadness that the decision will bring becomes important. People prefer positive emotions to negative ones to feel as an outcome of their actions (Levine et al. 2012) and they tend to seek risk when they forecast pleasure and avert risk when they forecast discomfort (Mellers and McGraw 2001). Even though individuals tend to assume that they can accurately forecast the intensity of how positive or negative they would feel due to that decision (Ayton, Pott, and Elwakili 2007), they often overestimate the intensity of their emotions (Marroquín, Nolen-Hoeksema, and Miranda 2013)

These errors become more interesting and worth studying given that individuals mispredict their emotions despite their previous experiences. For example, dieters who wanted to lose weight forecasted how they would feel about all possible outcomes

and it is found that dieters who failed to lose weight or gained weight did not feel as bad as they expected, in other words, they overestimated the displeasure even though they are familiar with the process of losing weight (Mellers 2000). It shows that people can make systematic errors on emotions over a previously experienced process, and this is an interesting subject to investigate. Knowing to which factors the affective forecasting errors are related and what the underlying mechanisms are may help us to understand why people are making these errors, if there is a function or benefit to it and if it is possible to prevent these errors. Even though a lot of research has focused on this subject, there is still much to discover and one important outstanding question is whether affective forecasting errors are related to the diversity of experienced emotions in daily life. Any relation might help to understand the role of daily experiences in emotional expectations.

### 2.2.3 Factors Related to Affective Forecasting Errors

Research investigating the related factors to the affective forecasting errors revealed that forecasts are influenced by biases (Wilson and Gilbert, 2003), explained by Decision Affect Theory, associated with mood states (Wilson and Gilbert 2003), and mental health (Hoerger et al. 2012), and individual differences (Dunn et al. 2007).

#### 2.2.3.1 Biases related to affective forecasting errors

Biases are having an important role in the occurrence of affective forecasting errors. People may underestimate or overestimate the intensity of their future emotions (Schwartz and Sommers 2013), which is called intensity bias (Buehler and McFarland 2001). Impact bias is the combination of intensity bias and durability bias, and durability bias is the inaccurate predictions for how long one will continue to feel forecasted emotions (Gilbert et al. 1998). For instance, in a study, failed test takers of a driving license exam overestimated how long they would feel disappointed (Ayton, Pott, and Elwakili 2007).

There are a couple of explanations listed in the literature as reasons behind the biases of affective forecasting errors. According to Gilbert et al. (1998), there are six reasons: People tend to make an inaccurate forecast when they have no experience (misconstrual), when they know too much (inaccurate theories), and when they use these forecasts to be motivated for an event (motivated distortions), when they

undercorrect the duration of expected emotion (undercorrection), when they focus on emotions caused by one specific event (focalism) and when they are not aware they have a psychological immune system (immune neglect), which is a system that has defense mechanisms, such as motivated reasoning and positive illusions, and it tries to protect emotional well-being like physiological immune system protects the body from threats (Wilson and Gilbert 2005). Furthermore, Wilson and Gilbert (2005) suggested that people tend to attend, react and try to explain self-relevant but poorly understood events and when they make sense of these events, they display an emotional adaptation, which makes the event normal and results in affective forecasting errors.

#### 2.2.3.2 Decision affect theory

According to Mellers and McGraw (2001), decisions are influenced by the expected emotions occurring as an outcome. To support this claim they performed both laboratory studies during which participants gambled on a computer and real-life studies during which participants made a decision, forecasted their emotions for every possible outcome, and rated their actual feelings when the event occurred. As a result of their studies, they concluded that there are three factors that have an impact on expected emotion.

First of them is the "Outcome Effect": the greater the amount of expected gain, the greater the expected pleasure. In a simpler way, when people imagine a great amount of outcome, for instance in gambling, they start to forecast greater pleasure. The second one is the "Comparisons Effect": when there is a worse outcome that may be obtained, people expect disappointment, and the expected pleasure decreases. Also, when there is a better outcome that may not be obtained, people forecast regret, and the expected pleasure decreases. In other words, when there is more than one option to decide, people compare the outcomes, and the possibility of getting the worse outcome influences their expected pleasure. The last one is the "Surprising Effect": If the outcome is surprising when the event happened, the intensity of actual feelings is greater than forecasted ones.

#### 2.2.3.3 Mood states

People's judgments may be influenced by current moods and two different perspectives argue that this can occur: the feeling-as-information perspective (Schwarz and

Clore 1983) and the mood-congruent recall perspective (Bower 1981). Feeling-as-information approach suggests that people use moods and emotions as a source of information for their judgments (Schwarz and Clore 1983). However, it is hard to distinguish the incidental feelings (current feelings) from the integral feelings (feelings related to the target) and this may result in feeling congruent judgments. If the current feeling matches the feeling elicited by the target, the congruency will not cause any error, yet, if it does not, it may result in mistakes (Schwarz and Clore 1983). On the other hand, the mood-congruent-recall approach argues that since it is easier to remember a material when there is a congruence between the affective state during learning and remembering (Bower 1981), recall of a target may result in mood-congruent judgment (Bower 1983). When these approaches are applied for future judgments, and affective forecasts, it can be said that mood may have a role in anticipated future feelings.

In another study, Buehler et al. (2007) hypothesized that people may use forecasts as a way of regulating their emotions, and the ones wanting to change their unpleasant moods might forecast a relatively pleasant mood for events. To study this, they first manipulated the moods in two ways: neutral and negative. They also manipulated the orientation towards the moods as ruminative or reflective. They found that people who used reflective thinking, expected themselves to feel more positive in the future if they are in a negative mood group as compared to people in neutral mood group. This indicated a mood-incongruent expectation for the future.

Gopala Krishnan (2010) studied if the current mood has an influence on affective forecasts for her master's thesis and she emphasized that there were no studies investigating only the impact of current moods on affective forecasting up to date. She used the mood-inducing method and gave participants scenarios and asked them to predict if those events happen to them that night or one year later. She found that participants made mood-congruent forecasts for negative events when they are making forecasts for one year later. It means that participants who were experiencing negative moods made more negative forecasts for one year later. This study showed that for mood-congruent forecasts both the valence and the time are important.

Lastly, in one study examining this relationship, Marroquín et al. (2016) conducted a mood-inducing study during which participants first rated their baseline emotions and filled some questionnaires, then watched either negative or neutral films for 5 minutes. After the film, each participant reported their emotions, forecasted their future affect, and estimated the likelihood of future events. They could not observe a significant effect of emotion on forecasts, but the likelihood estimations

are influenced by it. Participants feeling negative considered the negative events more likely compared to ones in the neutral condition.

Overall, it can be said that although there is a theory behind it, there are no consistent results on the role of current moods on affective forecasting errors, but it does not eliminate the possibility of the influence of general mood on affective forecasting errors. Relationships between affective forecasting errors and mood disorders are commonly observed and discussed in the next section.

#### 2.2.3.4 Mental health problems related to affective forecasting errors

Mental health problems are another related factor to affective forecasting errors and affective forecasting errors' relationships with depression are widely studied in the literature. In a study, Hoerger et al. (2012) asked participants to forecast their emotions for Valentine's Day and two days following in two different scenarios: when they have a date and when they do not. Results showed that dysphoric individuals overestimated their negative emotional reactions regardless of the predicted event's unpleasantness. They argued that these findings are consistent with dysphoric forecasting bias, which is the inclination of people with dysphoria for overestimates of future negative reactions (Hoerger et al. 2012). Moreover, researchers argued that their findings are in line with Beck's cognitive model (1976), which suggests that negativistic evaluations of events are caused by dysphoric schemas.

The relationship between higher levels of depressive symptoms and more pessimistic and less optimistic future expectations is demonstrated in another study by Wenze, Gunthert, and German (2012). It was an ecological momentary assessment (EMA) study during which participants reported their current emotions four times a day for seven days. They forecasted their emotions on future events and predicted some events' likelihood of occurring. Additionally, they completed a questionnaire measuring their depressive and anxious state. After seven days, the participants completed a survey about the events and their moods during the week. They found that higher depression levels are associated with the prediction of more negative and less positive moods as compared to lower depression levels. A similar pattern was observed for high and low anxiety levels for negative mood predictions, not positive mood predictions. Moreover, higher depression and anxiety levels together are more biased toward the prediction of negative mood as compared to lower depression and anxiety levels. During the analysis, instead of examining the direct relationship between mean mood and forecasting errors, researchers preferred to use mean mood level as a covariate. They found that people with higher depression levels or anxiety

levels are biased in negative mood expectations independent of general mood levels. This study demonstrates that depressive mood is associated with higher negative and lower positive expectations, whereas anxiety is only associated with higher negative expectations. It not only shows that mood disorders may affect the forecasts, but it also shows mood disorders' influence on predictions varies.

Marroquín and Nolen-Hoeksema (2015) gave participants specific events to forecast and made likelihood estimations, a questionnaire on anhedonia, and another questionnaire measuring using emotion as information. They divided participants into a dysphoric group and a non-dysphoric control group by looking at their depression levels. The results revealed that dysphoria is associated with underestimates of positive emotions, considering negative events more likely and positive events less likely, following their negative feelings more and positive feelings less.

These three examples from the literature indicate that mood disorders have a relationship with future forecasts. They demonstrated that long-term moods have a role in shaping expectations, and depressed samples have negativistic biases. These findings indicate a consistency over the long-term moods and forecasts, which was not demonstrated in short-termed induced mood studies. This difference between long-term moods and short-term induced moods is one of the theoretical arguments behind our hypothesis on the emodiversitys' possible association with affective forecasting errors.

#### 2.2.3.5 Individual differences related to affective forecasting errors

Individual differences have a role in affective forecasting errors, as well. One of the types of individual differences in emotional intelligence is the ability to accurately process, use, understand emotional knowledge, and regulate emotion-based behavior (Mayer and Salovey 1997). In a study, participants were asked to forecast their feelings for a day after a basketball game (Dunn et al. 2007). They made forecasts for both winning and losing. Results showed that there is a positive correlation between affective forecasting accuracy and emotional intelligence levels (Dunn et al. 2007). In another study that requires forecasting emotional reactions to pictures with emotion-evoking quality, Hoerger et al. (2012) demonstrated the positive association between emotional intelligence and forecasting accuracy. Although there are other types of individual differences such as gender and personality that are also studied in the affective forecasting literature, they will not be discussed in detail since they are out of the scope of our study.

When all the factors mentioned above are taken into consideration, it can be said that there are many components of and related factors to affective forecasting errors. However, there is still more to examine. For instance, to our best knowledge, it is not known whether frequently experienced daily emotional experiences have a role in inaccurate forecasts for future emotions and to study this, we used the emodiversity and looked at if there is a relationship between emodiversity and affective forecasting errors.

### 2.2.4 How to Study Affective Forecasting Errors?

Affective forecasting errors occur when one cannot predict one's own emotions regarding a day or event in the future. It is possible to conduct cross-sectional studies (within samples and between samples) and within samples longitudinal studies to investigate affective forecasting errors. There are two aspects of it: overall inaccuracy (total error) and bias toward a particular expectation.

Inaccuracy (total error) can be calculated by calculating the absolute difference between forecasts and actual emotions. Two methods are widely used in the literature to study the inaccuracy of affective forecasts. One way of studying is by giving participants real-life scenarios and asking them how they would feel if a certain event happens in the future. Participants are also asked how they felt when the event actually happened with a follow-up study. For example, in a study, Hoerger et al. (2010) asked participants to forecast their emotions two weeks after the elections are finished. Two weeks after the election day, researchers asked participants to report how they feel. They calculated the inaccuracy of predictions by looking at the difference between the forecasted and actual emotions. The second method is asking participants to predict their emotions for a future day without giving a specific event and collecting data from participants one more time when that day becomes.

Both methods have their advantages and disadvantages. One benefit of giving specific events (e.g. elections or exam grades) is that it helps to compare individuals' expectations on selected events (Wenze, Gunthert, and German 2012). It is also making it possible to assess and/or control all the possible outcomes to forecast and whether they have previous experience regarding that event. However, the importance of and pre-existed knowledge about the target events may not be similar for each participant. On the other hand, asking to forecast for a day or week allows making predictions without a reference point and thinking about the possible moods or emotions considering all aspects of a day or week (Wenze, Gunthert, and German 2012), yet it is harder to control for individual differences as compared to specific

events method and it may be harder to foresee upcoming day or week's difficulties.

Some studies are using the between-subjects method for longitudinal studies. In these, predictions of some groups of participants are compared with actual emotions of other groups of people who lived that event (Ayton, Pott, and Elwakili 2007). For example, researchers may ask people who are single to predict their feelings for a wedding day and compare those forecasts to the actual feelings of people who got married.

There are several benefits of this method according to Loewenstein and Schkade (1999; as cited in Ayton, Pott, and Elwakili 2007): First, it is more practical to collect data from people who have already experienced a given situation. For example, people may be asked to forecast their emotions when they win the lottery, but it may take a very long time to wait for them to win one. Also, expectations may have an influence on experiences, having a lot of positive expectations can cause disappointment and result in feeling worse than they should. In case of remembering the reported expectations, the participants may change their answers to avoid errors.

It is also possible to look at whether there is a bias in predictions rather than examining the inaccurate estimates. Two methods can be used to investigate biases in predictions: In the first one, participants are given a specific event, a day or a week in the future ans asked to forecast how they would feel if that event happens to them or how they would feel on that day or week. Then, with the help of a follow up study, actual emotional experiences due to that event, day or week are collected. Biases in the forecasts can be investigated by controlling for actual feelings in the analysis (Wenze, Gunthert, and German 2012). The second method to look at biases in forecasts can be applied when there is no collection of actual feelings, such as studies in which participants are given hypothetical scenarios and asking how they would feel the scenarios occur in the future (Marroquín and Nolen-Hoeksema, 2015). Since there is no collection of actual feelings regarding those events, it is not possible to control for them.

In this research, we used both methods of measuring biases. To prevent any confusion, we labeled the biases we analyzed by controlling for actual scores as bias; we named the second method where we cannot control for actual emotions as forecasts.

## 2.3 Summary

Literature shows that emodiversity is related to mental and physical health independent of mean affect intensity. On the other hand, affective forecasting errors are correlated with individual differences and mental health. We know that there are no consistent significant results showing that momentary moods are associated with forecasting errors although they might be correlated (Bower 1981; Schwarz and Clore 1983). However, mood disorders seem to have a consistent relationship with forecasting errors, especially with negative affect. Findings from the emodiversity literature indicate that positive emodiversity is negatively associated with depression, but there are some inconsistencies between negative emodiversity and depression relationship. Overall, it can be said that although there are some mismatches in the literature, we believe that emodiversity might be a useful tool to assess if long-term emotional experiences are related to affective forecasting errors.

# 3. CURRENT RESEARCH

As stated before, in this research, we examined the relationship between emodiversity and affective forecasting errors. The reasons behind the necessity of this research can be explained as follows:

Although there are contradictory findings regarding mood states and forecasting, studies have more consistently shown that trait depression and dysphoria correlate with inaccurate forecasts (Hoerger et al. 2012), negatively biased forecasting (Hoerger et al. 2012; Wenze, Gunthert, and German 2012), and underestimates of positive forecasts (Marroquín and Nolen-Hoeksema, 2015). Given that both persistent negative feelings and negative expectancies (e.g. Abramson, Metalsky, and Alloy 1989) are key features of depression, it is important to look beyond current mood and investigate how daily emotional experience relates to inaccurate affective forecasting, and especially forecasts of future wellbeing.

Both variables (affective forecasting and emodiversity) have been associated with trait depression (Hoerger et al. 2012; Quoidbach et al. 2014), so it should be verified whether they have an independent relationship. Emodiversity might provide a better way to examine experienced emotions' relationship with future-oriented thinking since even the emotions of the same valence can have different influences on future thinking (DeSteno et al. 2000; Lerner and Keltner 2000). Furthermore, if the emodiversity is an indicator of self-awareness as Quoidbach et al. (2014) suggested, emodiversity might be related to forecasting errors. It is because research showed that being attentive to one's own emotions is related to making mood-congruent likelihood estimates, influenced by moods when making judgments, and being more responsive to emotional stimuli (Gasper and Clore, 2000 and Gohm 2003, as cited in Marroquín et al. 2016).

It is expected to see that emodiversity is related to affective forecasting errors, but more specifically, we expected that greater positive emodiversity and less negative emodiversity will be associated with less error. This hypothesis was dependent on

the studies showing that greater positive emodiversity and lower negative emodiversity are associated with better mental health outcomes (Urban-Wojcik et al. 2020; Werner-Seidler et al., 2020). It was possible to argue that greater emodiversity will be associated with less overall error since according to Quoidbach et al (2014) emodiversity might be an indicator of self-awareness. However, to the best of our knowledge, there is no study investigated if it is indeed related to self-awareness. Therefore, we based the hypothesis on the most replicated finding of emodiversity literature.

Since this is a new hypothesis, rather than directly running experiments we wanted to know whether naturally-occurring individual differences in emodiversity were related to affective forecasting errors in a more ecologically-valid correlational study. To our best knowledge, there are no studies on this topic in the literature. To fill this gap, we conducted three studies.

Study I was a longitudinal study, participants rated their emotions every day for a week. On the first day, we asked them to forecast how they would feel six days later. We used ratings of the first six days to calculate emodiversity scores. To assess foresting errors, we compared forecasts and actual emotions on the seventh day. We found that negative emodiversity is associated with overestimations of future negative affect independent of depression and emotional intelligence. In Study II, we asked participants to indicate how frequently they experience some emotions and gave them a list of events to forecast how positive and negative they would feel if those events happen. We could not observe a relationship between emodiversity and forecasts. Study III was the exact replication of Study II and we could not find any significant association between emodiversity scores and forecasts.

# 4. STUDY I

In Study 1, we conducted a survey study with a required 7 days of participation and measured participants' affective states daily, and asked for affect forecasts and experiences for a predetermined day. We expected to see a relationship between emodiversity scores and affective forecasting errors and biases: More specifically, we predicted that greater positive emodiversity (P.Emo) and poorer negative emodiversity (N.Emo) will correlate with less overall error. To gauge these relationships more fairly, we also assessed and controlled for trait depression, and also emotional intelligence, which correlates with depression and affective forecasting errors (Dunn et al., 2007; Downey et al., 2008; Fernandez-Berrocal and Extremera 2016; Hoerger et al. 2012).

## 4.1 Method

### 4.1.1 Participants

Two hundred forty-seven Sabancı University students participated in the study for course credit. One hundred thirty-five participants' data were included in analyses (87 females, 47 males, and 1 other; aged 18-25). One hundred twelve participants were removed from the analysis due to not participating in all parts of the study, or having a psychiatric or neurological disorder other than depression.

### 4.1.2 Procedure

Surveys were conducted online, in Turkish. On Day 1, after signing consent, participants completed the Beck Depression Inventory (BDI), the Revised Schutte Emotional Intelligence Scale (EI), and the Positive and Negative Affect Schedule

(PANAS) to gauge their current affect, in random order. They were then asked to complete a second PANAS, to forecast how they would feel on Day 7. Demographics were then collected.

On Days 2 to 6, participants completed the PANAS gauging their current affect on that day. On Day 7, they completed the final PANAS for their current affect and were debriefed. From Day 2 onward, participants who had completed the previous day(s) received their survey link and two subsequent reminder emails. Data were collected in five separate weeks: in each week, a group of participants started the study on the same day and followed the same procedure.

## 4.2 Measures

### 4.2.1 Positive and Negative Affect

The PANAS (Watson, Clark, and Tellegen 1988; trans. Gençöz 2000) was used to assess both affective forecasting and emodiversity. Participants responded on a 5-point Likert Scale (1 = Very slightly or not at all to 5 = Extremely).

#### 4.2.1.1 Affective forecasting

For affective forecasting analyses, two different outcome variables are calculated: inaccuracy and bias. Both of these were calculated for positive and negative affect separately. For inaccuracy, we averaged the absolute difference between Day 1 forecast affect and Day 7 current affect for all appropriately-valenced items in the PANAS. For bias, we averaged the difference respecting sign (i.e., not the absolute difference), allowing us to gauge the overall direction of forecasting errors. When using bias as our outcome in subsequent analyses, we controlled for Day 7 current affect (Mathersul and Ruscio 2020).

#### 4.2.1.2 Emodiversity

Three separate emodiversity scores are calculated: Global Emodiversity, Positive Emodiversity, and Negative Emodiversity. These scores are calculated using the adaptation of Shannon's entropy formula (Quoidbach et al. 2014; Shannon 1948).

### 4.2.2 Control Variables

#### 4.2.2.1 Depression

Participants completed the BDI (Beck et al. 1961; trans. Hisli 1989) on Day 1 and Day 7; here we analyze Day 1 scores, but Day 7 scores are included in our archived data, available at https://doi.org/10.17605/OSF.IO/PW2NS. In this questionnaire, there were 21 specific subjects (e.g. changes in weight, suicidal thinking, changes in sleep) and four different choices for each subject. Participants choose the answer choice that fits them the most.

#### 4.2.2.2 Emotional intelligence

The Turkish Adaptation of the EI (Austin et al., 2004; trans. Tatar, Tok, and Saltukoğlu 2011) uses a 5-point Likert Scale (0 = totally disagree, 5 = totally agree). The internal consistency of the whole scale is  = .82. In these analyses, the total EI score was used.

## 4.3 Results

Since many of our variables were not normally distributed, we used Spearman rank correlations to test their associations. See Table 4.1 for descriptive statistics and 4.2 for Spearman correlations.

### 4.3.1 Emodiversity

#### 4.3.1.1 Inaccuracy

Inaccuracy of forecast negative affect positively correlated with negative emodiversity and with positive emodiversity, but the inaccuracy of forecast positive affect did not correlate with positive or negative emodiversity. We checked whether these significant relationships could be explained by our control variables by running partial Spearman correlations; confidence intervals were estimated by bootstrapping with 5000 resamples.

Table 4.1 Descriptive Statistics - Study I

| | Mean | Std. Dev. |
|---|---|---|
| **P. Emo.** | 1.909 | 0.404 |
| **N. Emo.** | 1.154 | 0.574 |
| **G. Emo.** | 2.362 | 0.25 |
| **Mean PA** | 1.511 | 0.645 |
| **Mean NA** | 0.752 | 0.561 |
| **Mean Affect** | 1.132 | 0.358 |
| **BDI** | 13.741 | 8.59 |
| **EI** | 151.852 | 13.173 |
| **Actual PA** | 1.475 | 0.779 |
| **Forecast PA** | 1.916 | 0.864 |
| **Actual NA** | 0.726 | 0.746 |
| **Forecast NA** | 0.868 | 0.718 |
| **Inaccuracy PA** | 0.972 | 0.522 |
| **Inaccuracy NA** | 0.753 | 0.584 |
| **Inaccuracy Affect** | 0.862 | 0.438 |

Inaccuracy of forecast negative affect's relationship with positive emodiversity remained significant when emotional intelligence was controlled, ρ (132) = -.21, 95% CI [-.37, -.03], $p$ = .02, but not when depression was controlled, ρ (132) = -.11, 95% CI [-.27, .06], $p$ = .21. Its relationship with negative emodiversity, on the other hand, remained significant with both controlled, ρ (131) = .35, 95% CI [.17, .51], $p$ < .001; the same was true for global emodiversity, ρ (131) = .21, 95% CI [.04, .37], $p$ = .02.

#### 4.3.1.2 Bias

We assessed bias by testing partial Spearman correlations between emodiversity and Day 7 forecast affect, controlling for Day 7 current affect (Mathersul and Ruscio 2020). We then checked whether any significant correlations could be explained by our control variables.

Positive emodiversity was associated with over-estimations of positive affect, ρ (132) = .20, 95% CI [.01, .39], $p$ = .02, and this remained significant when emotional intelligence was controlled, ρ (131) = .19, 95% CI [.00, .39], $p$ = .03, but not when depression was controlled, ρ (131) = .13, 95% CI [-.07, .34], $p$ = .13; negative emodiversity was not related to biased forecasts of positive affect, ρ (132) = -.06, 95% CI [-.22, .10], $p$ = .48.

Positive emodiversity was associated with under-estimations of negative affect, ρ (132) = -.17, 95% CI [-.34, -.00], $p$ = .04, but controlling for either depression

or emotional intelligence reduced this to non-significance. Negative emodiversity did correlate with over-estimations of negative affect, ρ (132) = .39, 95% CI [.21, .54], $p < .001$, and this remained significant when both depression and emotional intelligence were controlled, ρ (130) = .25, 95% CI [.05, .43], $p = .004$.

In the emodiversity literature, it is common to control for mean affect, calculated from the same instrument used to measure emodiversity, to separate the diversity of affect from the intensity of affect (Quoidbach et al. 2014). Since we used the PANAS to measure affective forecasting as well as emodiversity, controlling for mean affect would remove a large portion of the systematic variance between our key variables. In our bias analyses, we control for Day 7 current affect to separate forecasting bias from individual differences in experienced affect: since both variables are calculated from PANAS scores, this achieves largely the same thing as controlling for mean affect during the emodiversity assessments.

Table 4.2 Spearman Correlations - Emodiversity and Affective Forecasting

| Spearman correlations. | | | | | | |
|---|---|---|---|---|---|---|
| | Inaccuracy PA | Inaccuracy NA | Forecast PA | Actual PA | Forecast NA | Actual NA |
| P.Emo | -.11 | -.23** | .40** | .54** | -.20* | -.12 |
| N.Emo | -.03 | .43** | -.15 | -.20* | .52** | .63** |
| G.Emo | -.06 | .20* | .20* | .28** | .26** | .39** |
| BDI | -.06 | .30** | -.34** | -.29** | .45** | .30** |
| EI | .25** | -.13 | .34** | .26** | -.37** | -.21* |

Note. * $p$ <.05, ** $p$ <.01. N = 135.

### 4.3.2 Depression and Emotional Intelligence

Trait depression is found to be positively correlated with inaccuracy of future negative affect, ρ (133) = .30, 95% CI [.12, .46], $p < .001$. Inaccuracy of future positive affect does not have a significant relationship with depression. Also, trait depression is associated with underestimations of future positive affect, ρ (132) = -.24, 95% CI [-.41, -.04], $p = .005$, and overestimations for future negative affect ρ (132) = .38, 95% CI [.20, .53], $p < .001$.

Emotional intelligence is associated with inaccuracy of future positive affect, ρ (133) = .25, 95% CI [.08, .41], $p = .004$. There are no significant findings for inaccuracy of future negative affect. Moreover, total emotional intelligence scores are associated with underestimations of future negative affect, ρ (132) = -.32, 95% CI [-.47, -.15], $p < .001$, and overestimations of future positive affect, ρ (132) = .26, 95% CI [.09, .42], $p = .002$.

### 4.3.3 Additional Analysis

Although it is beyond the main goal of this study, we wanted to perform some extra analysis for depression to see if the data replicate previous findings on the depression and emodiversity relationship. Also, we wanted to examine if the emodiversity and emotional intelligence are correlated and to the best of our knowledge, this is the first study investigating this relationship. Furthermore, we looked at whether emodiversity has a moderating effect on trait depression and affective forecasting errors relationship. Feel free to skip this part if you are not interested.

#### 4.3.3.1 Depression

We examined the depression and emodiversity relationship by performing partial Spearman correlations; confidence intervals were estimated by bootstrapping with 5000 resamples.

Depression is found to be negatively correlated with positive emodiversity $\rho$ (133) = -.44, 95% CI [-.58, -.28], $p < .001$, but controlling for mean positive affect reduced this to non-significance. Similarly, negative emodiversity was positively correlated with depression, $\rho$ (133) = .47, 95% CI [.33, .59], $p < .001$ but this relationship became non-significant after controlling for mean negative affect. No significant relationship is found between global emodiversity and depression. These findings are not consistent with previous research (Quoidbach et al. 2014).

Additionally, we performed regression analysis to replicate Quoidbach et al. (2014) and see if there is an interaction between mean affect variables and emodiversity. First, we examined the relationship between positive emodiversity and depression. Our predictors were positive emodiversity, mean positive affect, and interaction of positive emodiversity and mean positive affect. The overall regression was significant $R^2 = 0.23$, $F(3,131) = 12.68$, $p < .001$, but none of the predictors significantly predicted the outcome. We also calculated regression coefficients from 5000 bootstraps, and no significant relationship is found.

A similar analysis is performed for depression and negative emodiversity. The predictors were negative emodiversity, mean negative affect, and interaction of negative emodiversity and mean negative affect. The overall regression was significant, $R^2 = 0.25$, $F(3,131) = 14.64$, $p < .001$, any of the predictors did not significantly predict the outcome. We also calculated regression coefficients from 5000 bootstraps, and no significant relationship is found.

Lastly, we looked at depression and global emodiversity. The predictors were global emodiversity, mean affect, and interaction of global emodiversity and mean affect. The overall regression was not significant, $R^2 = 0.04$, $F(3,131) = 1.63$, $p = .186$. Depression is significantly predicted by mean affect, B = -37.18, 95% CI [-70.73, -.3.64], $p = .030$, and the interaction, B = 14.57, 95% CI [1.49, 27.66], $p = .029$. We also calculated regression coefficients from 5000 bootstraps, and results showed that only the mean affect remained significant, B = -37.19, 95% CI [-78.08, 1.86].

Lastly, we wanted to perform a moderation analysis to investigate if emodiversity moderates the relationship between depression and affective forecasting errors, but we could not find any significant interactions.

#### 4.3.3.2 Emotional intelligence

First, we found that there is a negative association between emotional intelligence and depression, $\rho$ (133) = -.36, 95% CI [-.51, -.20], $p < .001$. This relationship is in line with previous studies (Downey et al. 2008).

Secondly, the relationship between emotional intelligence and emodiversity is examined. To our best knowledge, this is the first study investigating a possible relationship between emotional intelligence and emodiversity. Although both positive and negative emodiversity were associated with emotional intelligence, $\rho$ (133) = .20, 95% CI [.01, .37], $p = .021$ and $\rho$ (133) = -.37, 95% CI [-.52, -.21], $p < .001$ respectively, controlling for positive or negative mean affect led to non-significant findings. Emotional intelligence and global emodiversity were not associated.

Additionally, we performed regression analysis and checked regression coefficients calculated from 5000 bootstraps. First, we looked at positive emodiversity and emotional intelligence. The predictors were positive emodiversity, mean positive affect, and interaction of positive emodiversity and mean positive affect. The overall regression was significant, $R^2 = 0.11$, $F(3.131) = 5.18$, $p = .002$. None of the predictors significantly predicted the outcome.

We looked at the relationship between negative emodiversity and emotional intelligence. The predictors were negative emodiversity, mean negative affect, and interaction of negative emodiversity and mean negative affect. The overall regression was significant, $R^2 = .16$, $F(3,131) = 8.55$, $p < .001$. Again, any of the predictors were not significant and the same results are observed in bootstrap coefficients, as well.

Lastly, global emodiversity and emotional intelligence relationship is examined. The predictors were global emodiversity, mean affect, and interaction of global emodiversity and mean affect. The model was significant $R^2$ = .09, $F(3,131)$ = 4.11, $p$ = .008. Emotional intelligence is significantly predicted by mean affect B = 78.52, 95% CI [28.44, 128.60], $p$ = .002 and the interaction, B = -28.37, 95% CI [-47.90, -8.83], $p$ = .005. Both mean affect, B = 77.91, 95% CI [27.27, 131.79], and the interaction, B = -28.03, 95% CI [-48.84, -8.82] are found as significant predictors when we checked the bootstrapped coefficients. As the mean affect increases, the influence of global emodiversity on EI decreases.

Lastly, we performed 5000 resamples bootstrap moderation analysis to see if emodiversity moderates the relationship between emotional intelligence and depression. We found that there is a significant interaction between positive emodiversity and depression, B = .69, 95% CI [.08, 1.30]. (See Table 4.3)

Table 4.3 Moderation - P.Emo: EI and Depression

| P.Emo | Effect | SE | $t$ | $p$ | LLCI | ULCI |
|---|---|---|---|---|---|---|
| 1.50 | -0.63 | 0.16 | -3.92 | .001 | -0.94 | -0.32 |
| 1.90 | -0.35 | 0.14 | -2.45 | .015 | -0.62 | -0.06 |
| 2.30 | -0.07 | 0.21 | -0.34 | .737 | -0.49 | 0.34 |

## 4.4 Discussion

Negative emodiversity correlated with negative affect forecast error; positive emodiversity's relationship with negative affect forecast errors seemed to be attributable to these variables' relationships with trait depression. Similarly, negative emodiversity correlated with over-estimations of future negative affect; while positive emodiversity showed correlations with under-estimations of negative affect and over-estimations of positive affect, again, these correlations seemed to be artifacts of these variables' relationships with trait depression.

It seems that negative emodiversity is related to having negative expectations, independently of the person's level of trait depression: this is consistent with studies demonstrating that forecasts of positive affect are less inaccurate than forecasts of negative affect in unselected samples (Finkenauer et al. 2007; Thompson et al. 2017), but it contrasts with studies reporting no effect of induced negative emotion on negative forecasts (Marroquín et al. 2016). This finding supports our suggestion, in the Introduction, that longer-term emotional experiences might have a relationship with expectations.

As discussed in Chapter I, there are different approaches to studying affective forecasting errors. In study 1, we preferred to do a longitudinal study to be able to capture daily emotions better for having more representative emodiversity scores. We also asked to forecast feelings for a day in the future to allow participants to consider their emotions in a broader sense. We believe that using this approach helped us to examine experienced and expected emotions with a more ecologically valid method, which was also the method recommended by Brown and Coyne (2017).

Although it is not the primary goal of this study, data allowed us to perform a couple of additional analyses. First, contrary to previous literature on emodiversity and mental health, we did not observe any significant relationship between emodiversity and depression. One possible explanation for that might be our small sample size as compared to other studies demonstrating this relationship. Especially when we consider the Quoidbach et al. (2014)'s significant $p$ values with small effect sizes (Quoidbach et al. 2014; 2018) with a big data set, the role of our small sample size in the findings became more noteworthy.

Secondly, our findings suggest that when depression levels increase, people's errors on future negative affect increase. More specifically, depression levels are associated with underestimations of future positive emotions and overestimations of future negative emotions. Our data replicated the previous research on depression and affective forecasting errors. Also, trait depression is found to be negatively correlated with emotional intelligence, which replicates the literature.

Thirdly, we wanted to see if there is a relationship between emodiversity and emotional intelligence. Although this is an important area of research, given the fact that self-awareness is a part of emotional intelligence (Chernis and Goleman 2001; as cited in Killian 2012), the original version of the EI scale that is used in this study is found to be positively correlated with an emotional self-awareness questionnaire developed by Killian (2012) as an EI measure, and emodiversity is considered as a signal to self-awareness (Quoidbach et al. 2014), the relationship between these two constructs have not been studied before. The results showed that there is a relationship between both positive and negative emodiversity and emotional intelligence, these relationships were not above and beyond mean positive and negative affect. However, the interaction of positive emodiversity and depression is significant and according to additional moderation analysis, the negative association between depression and emotional intelligence becomes stronger when the positive emodiversity decreases. Even though not observing a significant relationship between emodiversity and emotional intelligence does not match the self-awareness assumption, the moderating effect of positive emodiversity is an indicator of the necessity of future

research on this subject. In these data, only the total score is available for emotional intelligence, but future research might look at the relationship of emodiversity with subcategories of emotional intelligence, as well.

This study has a couple of limitations. First, using the same instrument (the PANAS) to measure average affect, emodiversity and affective forecasting errors resulted in strong correlations between these variables, which might potentially bias our results. The relatively modest sample size and high drop-out rate are also weak sides of this study.

We used a different approach to investigate the same question in Study II to see if there is an effect of methodology on the findings, and we were able to cover some of the limitations of Study I.

# 5. STUDY II

In Study 2, we conducted an online survey. Participants were asked how frequently they experience some emotions and they were given negative and positive daily life scenarios to rate how positive and negative they would feel if those events happened to them. This time we controlled our variables with depression and anxiety and hypothesized that there will be a positive association between forecasted positive feelings for positive events and positive emodiversity; there will be a positive association between forecasted negative feelings for negative events and negative emodiversity, independent of depression.

## 5.1 Method

### 5.1.1 Participants

Two hundred thirteen Sabancı University students participated in this study. Forty-three of them were removed from analysis due to not completing more than half of the study, and having neurological or mental diagnostic history other than depression and/or anxiety. One hundred thirty-six participants' data were analyzed after the outliers were removed. We used box plots, scatter plots, and cook's distance to identify outliers.

### 5.1.2 Procedure

After signing the consent form participants were presented with the Turkish version of the Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), the Positive and Negative Affect Schedule (PANAS), and a total of 30 emotion-evoking event scenarios (15 positive and 15 negative, chose and translated from Ergüler and Durak

Batıgün 2018 and Miranda 2004, see Appendix A) in a randomized order. They were asked to complete BDI and BAI, and to indicate how frequently they experience emotions given in PANAS, how positive or negative they would feel if a given positive or negative event happen to them, how long they would feel positive or negative, and the probability of occurring of a given event. Demographics were then collected.

## 5.2 Measures

### 5.2.1 Positive and Negative Affect

The PANAS (Watson, Clark, and Tellegen 1988; trans. Gençöz 2000) was used to assess emodiversity. Participants responded on a 5-point Likert Scale (1 = Very slightly or not at all to 5 = Extremely).

#### 5.2.1.1 Affective forecasting

For affective forecasting analysis, we investigated the bias in responses to emotion-evoking events. This time we did not have actual emotional experiences. Therefore, we investigated the biases, but labeled as forecasts (see 2.2.4. How to study affective forecasting errors). Participants responded following questions for each positive and negative event: "How positive would you feel if this event happens?", "How negative would you feel if this event happens?", "For how long you would feel positive if this event happens?", For how long you would feel negative if this event happens?", "What is the probability of this event's occurrence?" on a 7-point Likert Scale (see Appendix A). Cronbach's $\alpha$ of positive events, calculated from positive feelings ratings for positive events, was .87; Cronbach's $\alpha$ of negative events, calculated from negative feelings ratings for negative events, was .90.

#### 5.2.1.2 Emodiversity

Three separate emodiversity scores are calculated: Positive Emodiversity, Negative Emodiversity, and Global Emodiversity. These scores are calculated using the adaptation of Shannon's entropy formula (Quoidbach et al. 2014; Shannon 1948).

### 5.2.2 Control Variables

#### 5.2.2.1 Depression

Participants completed the Turkish version of BDI (Beck et al. 1961; trans. Hisli 1989).

#### 5.2.2.2 Anxiety

Participants completed the Turkish version of BAI (Beck et al. 1988; trans. Ulusoy, Sahin, and Erkmen 1998). This inventory includes 21 self-report items which are physical and cognitive symptoms of anxiety.

## 5.3 Results

Since many of our variables were not normally distributed, we used Spearman rank correlations to test their associations. Confidence intervals were estimated by bootstrapping with 5000 resamples. See Table 5.1 for descriptive statistics.

Table 5.1 Descriptive Statistics - Study II

| | **Mean** | **Std. Dev.** |
|---|---|---|
| **P. Emo.** | 2.094 | 0.271 |
| **N. Emo.** | 1.662 | 0.478 |
| **G. Emo.** | 2.604 | 0.209 |
| **Mean PA** | 1.981 | 0.776 |
| **Mean NA** | 1.219 | 0.677 |
| **Mean Affect** | 1.6 | 0.457 |
| **BDI** | 14.452 | 8.486 |
| **BAI** | 15.56 | 9.596 |
| **NE_PF** | 0.592 | 0.584 |
| **NE_NF** | 4.44 | 0.764 |
| **NE_PD** | 0.322 | 0.481 |
| **NE_ND** | 4 | 0.805 |
| **NE_Probability** | 3.3 | 0.758 |
| **PE_PF** | 5.076 | 0.553 |
| **PE_NF** | 0.246 | 0.33 |
| **PE_PD** | 4.289 | 0.627 |
| **PE_ND** | 0.195 | 0.32 |
| **PE_Probability** | 3.994 | 0.731 |

### 5.3.1 Forecasts

#### 5.3.1.1 Emodiversity

Positive emodiversity is found to be associated with forecast negative feelings for negative events, ρ (132) = -.27, 95% CI [-.41, -.11], $p$ = .002; forecast duration of negative feelings for negative events, ρ (132) = -.28, 95% CI [-.43, -.12], $p$ < .001; probability of negative events, ρ (132) = -.32, 95% CI [-.46, -.15], $p$ < .001; forecast negative feelings for positive events, ρ (132) = -.24, 95% CI [-.40, -.06], $p$ = .006; forecast duration of negative feelings for positive events, ρ (132) = -.19, 95% CI [-.36, -.02], $p$ = .026; and probability of positive feelings, ρ (132) = .32, 95% CI [.14, .48], $p$ < .001. None of these correlations remained significant after they were controlled for mean positive affect, but one significant association between forecast positive feelings for positive events observed, which was not present before, ρ (131) = -.27, 95% CI [-.42, -.08], $p$ = .002. This correlation is a product of suppression.

Negative emodiversity is found to be positively associated with the forecast duration of negative feelings for negative events, ρ (132) = .25, 95% CI [.08, .41], $p$ = .003; probability of negative events, ρ (132) = .21, 95% CI [.04, .38], $p$ = .013. These were the only significant correlations that we observed for negative emodiversity and they become non-significant when it is controlled for mean negative affect. We observed an association between positive feelings for negative events and negative emodiversity after we controlled it for mean negative affect, ρ (131) = .19, 95% CI [.03, .32], $p$ = .031.

Global emodiversity is not related to any of the variables before but positive feelings for positive events became significant after we controlled it for mean affect, ρ (131) = -.21, 95% CI [-.36, -.04], $p$ = .016.

#### 5.3.1.2 Mean affect scores

We looked at the correlations between affect scores and forecasts before and after the correlations are controlled for emodiversity.

We found that mean positive affect is negatively correlated with depression, ρ (132) = -.56, 95% CI [-.68, -.41], $p$ < .001; anxiety, ρ (132) = -.31, 95% CI [-.46, -.14], $p$ < .001; forecast negative feelings for negative events, ρ (132) = -.26, 95% CI [-.41, -.09], $p$ = .003; forecast duration of negative feelings for negative events, ρ (132) = -.30, 95% CI [-.44, -.13], $p$ < .001; probability of negative events, ρ (132)

= -.38, 95% CI [-.52, -.21], $p < .001$; forecast negative feelings for positive events, ρ (132) = -.24, 95% CI [-.40, -.06], $p = .006$; forecast duration of negative feelings for negative events, ρ (132) = -.23, 95% CI [-.39, .-.07], $p = .007$; and positively correlated with probability of positive events, ρ (132) = .40, 95% CI [.23, .56], $p <$ .001. Its relationship with depression, anxiety, probability of negative events and probability of positive events remained significant after it was controlled for positive emodiversity (see Table 5.2).

Table 5.2 Spearman's Partial Correlations - Mean PA and Affective Forecasting

| | Mean PA | BAI | BDI | NE_Prob | PE_Prob |
|---|---|---|---|---|---|
| Mean PA | - | - | - | - | - |
| BAI | -.24** | - | | | |
| BDI | -.27** | .56*** | - | - | - |
| NE_Prob | -.21* | .34*** | .42** | - | - |
| PE_Prob | .27** | -.08 | -.23** | .-27** | - |

Note. Conditioned on variables: P.Emo.
* $p$ <.05, ** $p$ <.01, *** $p$ <.001

Mean negative affect is positively correlated with depression, ρ (132) = .49, 95% CI [.35, .61], $p < .001$; anxiety, ρ (132) = .57, 95% CI [.44, .68], $p < .001$; forecast negative feelings for negative events, ρ (132) = .28, 95% CI [.11, .44], 001; forecast duration of negative feelings for negative events, ρ (132) = .35, 95% CI [.19, .50], $p < .001$. It continued to be correlated with depression, anxiety, forecast negative feelings for negative events, forecast duration of negative feelings for negative events after it is controlled for negative emodiversity (see Table 5.3).

Table 5.3 Spearman's Partial Correlations - Mean NA and Affective Forecasting

| | Mean NA | BAI | BDI | NE_NF | NE_ND |
|---|---|---|---|---|---|
| Mean NA | - | - | - | - | - |
| BAI | .39*** | - | | | |
| BDI | .44*** | .52*** | - | - | - |
| NE_NF | .29*** | .19* | .35*** | - | - |
| NE_ND | .27** | .19* | .34*** | .76*** | - |

Note. Conditioned on variables: N.Emo.
* $p$ <.05, ** $p$ <.01, *** $p$ <.001

Mean affect is found to be associated with probability of positive events only, ρ (132) = .27, 95% CI [.10, .43], $p = .002$; and this relationship became stronger when it is controlled for global emodiversity, ρ (131) = .29, 95% CI [.12, .44], $p < .001$ (see Table 5.4).

Table 5.4 Spearman's Partial Correlations - Mean Affect and Affective Forecasting

| | Mean Affect | PE_Probability |
|---|---|---|
| Mean Affect | - | - |
| PE_Probability | .29*** | - |

Note. Conditioned on variables: G.Emo.
* $p$ <.05, ** $p$<.01, *** $p$<.001

#### 5.3.1.3 Factor scores

Additionally, we also calculated factor scores for events by using the data of forecast positive feelings for positive events and forecast negative feelings for negative events. We again looked at if there is a relationship between emodiversity and forecasts above and beyond the mean affect scores.

We found a negative correlation between positive emodiversity and forecast negative feelings for negative events, ρ (126) = -0.26, 95% CI [-.41, -.10], $p$ = .003; after it is controlled for positive affect factor scores, this relationship did not remained significant, but forecast positive feelings for positive events become significant, ρ (122) = -.27, 95% CI [-.42, -.08], $p$ = .003.

We could not find any significant correlation for negative emodiversity until its controlled for negative affect factor scores; it is found that negative emodiversity and forecast positive feelings for positive events is negatively correlated, ρ (122) = -.21, 95% CI [-.36, -.05], $p$ = .021.

#### 5.3.1.4 Depression and anxiety

Trait depression is found to be negatively correlated with anxiety as expected, ρ (131) = .58, 95% CI [.45, .69], $p$ < .001. It is also positively correlated with forecast negative feelings for negative events, ρ (132) = .36, 95% CI [.20, .50], $p$ < .001, forecast duration of negative feelings for negative events, ρ (132) = .39, 95% CI [.24, .52], $p$ < .001, the probability of negative events, ρ (132) = .50, 95% CI [.35, .63], $p$ < .001, forecast negative feelings for positive events, ρ (132) = .24, 95% CI [.07, .40], $p$ = .005, and forecast duration of negative feelings for positive events, ρ (132) = .27, 95% CI [.11, .42], $p$ = .002. It is negatively associated with the probability of positive events, ρ (132) = -.34, 95% CI [-.49, -.18], $p$ < .001.

Anxiety is positively correlated with forecast negative feelings for negative events, ρ (131) = .23, 95% CI [.07, .37], $p$ = .009, forecast duration of negative feelings for negative events, ρ (131) = .28, 95% CI [.12, .43], $p$ = .001, the probability of

negative events, ρ (131) = .38, 95% CI [.22, .52], $p < .001$, and forecast duration of negative feelings for positive events, ρ (131) = .22, 95% CI [.06, .37], $p = .010$.

### 5.3.2 Additional Analysis

Once again, our data allowed us to perform some additional analysis. We first looked at whether we can replicate the depression and emodiversity results of Quoidbach et al. (2014), then, we investigated the emodiversity and anxiety relationship. Furthermore, an analysis is performed to see if emodiversity has a moderating effect on the relationship between anxiety and depression. Feel free to skip this part if you are not interested.

#### 5.3.2.1 Depression

We found that there is a negative association between depression and positive emodiversity, ρ (132) = -.51, 95% CI [-.63, -.37], $p < .001$, but this did not remain significant after it is controlled for mean positive affect.

A positive correlation between depression and negative emodiversity is found, ρ (134) = .31, 95% CI [.14, .46], $p < .001$, and this relationship continued to be significant after it is controlled for mean negative affect, but it changed direction ρ (131) = -.18, 95% CI [-.35, .01], $p = .035$.

No significant finding is detected for global emodiversity and depression until it is controlled for mean affect, ρ (131) = .20, 95% CI [.01, .37], $p = .024$.

Additionally, we performed linear regression analysis and checked coefficients bootstrapped with 5000 resamples, as well. First, we looked at positive emodiversity and depression. The predictors were positive emodiversity, mean positive affect and interaction of positive emodiversity and mean positive affect. The overall model was significant, $R^2 = .38$, $F(3,130) = 26.18$, $p < .001$. Only the positive emodiversity predicts depression, B = -9.97, 95% CI [-18.13, -1.82], $p = .017$. Positive emodiversity remained as a significant predictor after bootstrapping, B = -9.78, 95% CI [-23.58, -0.65].

Secondly, we performed a linear regression analysis for negative emodiversity and depression. The predictors were negative emodiversity, mean negative affect and interactions of negative emodiversity and mean negative affect. The overall regression was significant, $R^2 = .29$, $F(3,130) = 17.30$, $p < .001$. Mean negative affect

significantly predicted depression, B = 16.02, 95% CI [6.98, 25.06], $p < .001$, and the interaction was marginally significant, B = -4.11, 95% CI [-8.36, 0.15], $p = .058$. Both remained significant when bootstrapped for 5000 resamples: Mean negative affect, B = 15.84 95% CI [8.41, 29.58]; interaction, B = -4.08, 95% CI [-9.42, -.18].

Lastly, a regression analysis for global emodiversity and depression relationship is performed. The predictors were global emodiversity, mean affect and interaction of global emodiversity and mean affect. The model was not significant, $R^2 = .04$, $F(3,130) = 2.01$, $p = .115$. Mean affect significantly predicted the outcome, B = -42.65, 95% CI [-82.99, -2.32], $p = .038$. Interaction was marginally significant, B = 14.58, 95% CI [-.24, 29.40], $p = .054$. However, when we bootsrapped with 5000 samples, the mean affect, B = -42.95 95% CI [-83.36, -2.04], and the interaction, B = 14.60, 95% CI [0.69, 29.61], were significant. It shows that when the mean affect decreases, the influence of global emodiversity on depression increases.

We also investigated if there is a moderation effect of emodiversity scores on the relationship between depression and forecast variables, but we could not find any significant interaction between any of the variables.

#### 5.3.2.2 Anxiety

We found that there is a negative correlation between anxiety and positive emodiversity, $\rho\ (132) = -.21$, 95% CI [-.37, -.04], $p = .014$, but it did not remain significant after it is controlled for mean positive affect. A positive correlation between anxiety and negative emodiversity is found, $\rho\ (132) = .46$, 95% CI [.31, .59], $p < .001$, but this relationship becomes non-significant after it is controlled for mean negative affect. Also, a positive relationship between global emodiversity and anxiety is detected, $\rho\ (132) = .31$, 95% CI [.13, .46], $p < .001$ and it remained significant after it is controlled for mean affect, $\rho\ (131) = .29$, 95% CI [.11, .45], $p < .001$

Also, we looked at linear regression analysis. For positive emodiversity and anxiety, the predictors were positive emodiversity, mean positive affect, and interaction of positive emodiversity and mean positive affect. The overall model was significant, $R^2 = .11$, $F(3,130) = 5.22$, $p = .002$. There was no significant predictor.

For negative emodiversity and anxiety, the predictors were negative emodiversity, mean negative affect and interaction of negative emodiversity and mean negative affect. The overall model was significant $R^2 = .31$, $F(3,130) = 19.25$, $p < .001$. Only the mean negative affect was significant predictor of anxiety, B = 12.14, 95% CI [2.10, 22.18], $p = .018$, it did not remained significant after bootstrapped for 5000

resamples.

The predictors for global emodiversity and anxiety relationship were global emodiversity, mean affect and interaction of global emodiversity and mean affect. The overall model was not significant, $R^2 = .06$, $F(3,130) = 2.51$, $p = .062$. There was no significant predictor.

Lastly, we performed a moderation analysis to see if the emodiversity moderates the relationship between anxiety and depression. We found that global emodiversity and depression interaction is significant, B = -.85, 95% CI [-1.69, -.14] (See Table 5.5 for moderation analysis).

Table 5.5 Moderation - G.Emo: BDI and BAI

| G.Emo | Effect | SE | $t$ | $p$ | LLCI | ULCI |
|---|---|---|---|---|---|---|
| 2.40 | .85 | .09 | 9.49 | .000 | .68 | 1.03 |
| 2.60 | .67 | .08 | 8.75 | .000 | .52 | .82 |
| 2.81 | .49 | .12 | 3.96 | .001 | .24 | .73 |

## 5.4 Discussion

In this study, we could not observe any significant relationship between emodiversity and positive or negative event forecasts after we controlled for mean positive and mean negative affect, respectively. Additionally, we could not observe any significant relationships when we analyzed factor scores.

It would be possible to argue that there is no relationship between affective forecasting errors and emodiversity above and beyond mean affect; however, when the results of Study II are interpreted by considering the findings of Study I, it is possible to suggest two possible explanations: It can be argued that when people are making forecasts for overall positivity and negativity, they do not take their own specific emotions into account, but instead focus on the general valence. Or, people might not reflect the diversity of the emotions they experience when they are forecasting their feelings for specific events with obvious valence rather than forecasting for an ambiguous future day. However, more research is needed to understand these non-significant findings.

One important finding is that when we used the same analysis method to examine the relationship between forecast variables and mean affect scores we found statistically significant correlations that remained significant after controlling for emodiversity scores.

We were not able to observe a significant association between depression and positive emodiversity after we controlled for mean positive affect. However, we found positive emodiversity as a significant predictor in linear regression analysis. We need to emphasize that our data is not normally distributed. Therefore, this result should be interpreted with caution.

We found that the relationship between negative emodiversity and depression was positively associated first, but the association changed sign and became negative when mean negative affect is controlled. Although this finding is in line with Quoidbach (2014) and against Urban-Wojcik et al. (2020) and Werner-Seidler et al. (2020), we believe that it is a product of suppression as it is argued by Brown and Coyne (2017). We acknowledge that Quoidbach et al (2018) supported their argument by claiming that suppression is not a problem if the finding is replicated over studies and there is a theoretical rationale for that result. However, if we consider our finding not as suppression but a robust statistical outcome, we need to argue that positive emodiversity might not be related to positive outcomes since we observed a negative correlation between positive emodiversity and forecast positive feelings for positive events after we controlled for mean positive affect. Therefore, the only possible explanations for these findings are the fact that they are products of suppression and statistical artifacts. However, this does not mean that emodiversity is not related to mental health, on the contrary, it is hard for us to conclude from these results since positive emodiversity is always found to be related to better mental health in the literature, which is something we are not able to demonstrate in our Spearman's partial correlations.

Our data allowed us to examine the relationship between emodiversity and anxiety. We found that there are no relationships that remained significant after controlling for related mean affect, except the global emodiversity. More importantly, we found that the interaction between depression and global emodiversity significantly predicts anxiety, and global emodiversity moderates the correlation between depression and anxiety. Observing that as the diversity of frequently experienced both negative and positive emotions increases, the association between depression and anxiety weakens might be considered as a supportive finding on how a well-functioning emotional ecosystem with a great diversity of emotions provides resilience for mental health. However, to our best knowledge, this is the only study showing this relationship, therefore it is very early to point to this possibility.

There are a couple of consistencies and inconsistencies between Study I and Study II. Since both of these studies are the first ones in this literature, we wanted to replicate them. However, due to time constraints, we only had a chance to collect

enough data for the replication of Study II, which is presented as Study III below.

# 6. STUDY III

In Study II, we could not observe any significant relationship between emodiversity and forecast variables after we controlled the correlations for mean affect scores. In Study III, we replicated Study II without changing any of the variables and materials to see if we can find the same results again with different samples.

## 6.1 Method

### 6.1.1 Participants

One hundred seventy-three Sabancı University students and one hundred twenty-one people outside of Sabancı University, mostly students and alumni of Bilkent University, participated in this study. One hundred fifty-six data remained after we removed outliers and participants who did not complete more than half of the study, and have neurological or mental diagnostic history other than depression and/or anxiety.

### 6.1.2 Procedure

The procedure was the same as the Study II. Participants were presented with the Turkish version of the Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), the Positive and Negative Affect Schedule (PANAS), and a total of 30 emotion-evoking event scenarios (15 positive and 15 negative, chose and translated from Ergüler and Batıgün, 2018 and Miranda 2004) in a randomized order. They were asked to complete BDI and BAI, and to indicate how frequently they experience emotions given in PANAS, how positive or negative they would feel if a given positive or negative event happen to them, how long they would feel positive or

negative, and the probability of occurring of a given event. Demographics were then collected.

## 6.2 Measures

### 6.2.1 Positive and Negative Affect

The PANAS (Watson, Clark, and Tellegen 1988; trans. Gençöz 2000) was used to assess emodiversity. Participants responded on a 5-point Likert Scale (1 = Very slightly or not at all to 5 = Extremely).

#### 6.2.1.1 Affective forecasting

For affective forecasting analysis, we investigated the bias in responses to emotion-evoking events. This time we did not have actual emotional experiences. Therefore, we investigated the biases, but labeled as forecasts (see 2.2.4. How to study affective forecasting errors). Participants responded following questions for each positive and negative event: "How positive would you feel if this event happens?", "How negative would you feel if this event happens?", "For how long you would feel positive if this event happens?", For how long you would feel negative if this event happens?", "What is the probability of this event's occurrence?" on a 7-point Likert Scale (see Study 2; see Appendix A). Cronbach's $\alpha$ of positive events, calculated from positive feelings ratings for positive events, was .86; Cronbach's $\alpha$ of negative events, calculated from negative feelings ratings for negative events, was .88.

#### 6.2.1.2 Emodiversity

Three separate emodiversity scores were calculated: Global Emodiversity, Positive Emodiversity, and Negative Emodiversity. These scores are calculated using the adaptation of Shannon's entropy formula (Quoidbach et al. 2014; Shannon 1948):

### 6.2.2 Control Variables

#### 6.2.2.1 Depression

Participants completed the Turkish version of BDI (Beck et al. 1961; trans. Hisli 1989).

#### 6.2.2.2 Anxiety

Participants completed the Turkish version of BAI (Beck et al. 1988; trans. Ulusoy, Sahin, and Erkmen 1998).

## 6.3 Results

We performed Spearman correlations bootstrapped with 5000 resamples. See Table 6.1 for descriptive statistics.

Table 6.1 Descriptive Statistics - Study III

| | Mean | Std. Dev. |
|---|---|---|
| **P. Emo.** | 2.15 | 0.166 |
| **N. Emo.** | 1.758 | 0.442 |
| **G. Emo.** | 2.671 | 0.165 |
| **Mean PA** | 2.046 | 0.635 |
| **Mean NA** | 1.287 | 0.688 |
| **Mean Affect** | 1.666 | 0.388 |
| **BDI** | 13.277 | 8.164 |
| **BAI** | 13.846 | 9.421 |
| **NE_PF** | 0.611 | 0.58 |
| **NE_NF** | 4.499 | 0.72 |
| **NE_PD** | 0.319 | 0.468 |
| **NE_ND** | 4.02 | 0.845 |
| **NE_Probability** | 3.358 | 0.657 |
| **PE_PF** | 5.05 | 0.554 |
| **PE_NF** | 0.213 | 0.278 |
| **PE_PD** | 4.228 | 0.646 |
| **PE_ND** | 0.171 | 0.292 |
| **PE_Probability** | 4.116 | 0.65 |

### 6.3.1 Forecasts

#### 6.3.1.1 Emodiversity

We found that positive emodiversity is associated with forecast duration of negative feelings for negative events, ρ (154) = -.19, 95% CI [-.35, -.03], $p$ = .016; probability of negative events, ρ (154) = -.34, 95% CI [-.47, -.21], $p$ < .001. When it is controlled for mean positive affect, these relationships became non-significant. Forecast positive feelings for positive events, ρ (153) = -.16, 95% CI [-.32, -.01], $p$ = .045 , and probability of positive events, ρ (153) = -.21, 95% CI [-.36, -.04], $p$ = .010, started to display significant correlations with positive emodiversity.

Negative emodiversity is found to be positively correlated with forecast negative feelings for negative events, ρ (154) = .20, 95% CI [.04, .35], $p$ = .013, forecast duration of negative feelings for negative events, ρ (154) = .24, 95% CI [.08, .38], $p$ = .003, probability of negative events, ρ (154) = .33, 95% CI [.18, .47], $p$ < .001. When we controlled for mean negative affect, none of the significant correlations remained significant.

Global emodiversity is positively associated with forecast duration of negative feelings for negative events, ρ (154) = .17, 95% CI [.01, .32], $p$ = .035; probability of negative events, ρ (154) = .17, 95% CI [.02, .31], $p$ = .037. After it is controlled for mean affect, global emodiversity became more strongly correlated with probability of negative events, ρ (153) = .22, 95% CI [.06, .38], $p$ = .006. Also, forecast positive feelings for positive events, ρ (154) = -.16, 95% CI [-.33, .01], $p$ = .05; probability of positive events, ρ (154) = -.24, 95% CI [-.37, -.09], $p$ = .003, became significant.

Once again controlling for mean affect scores resulted in losing significant correlations between emodiversity and forecast variables or suppression effects, which shows that emodiversity is not related to forecasts above and beyond mean affect scores.

#### 6.3.1.2 Mean affect scores

Like we did in Study II, we looked at how mean affect scores associated with affective forecasting variables especially after it is controlled for emodiversity scores. We found that mean positive affect is associated with forecast duration of negative feelings for negative events, ρ (154) = -.22, 95% CI [-.38, -.06], $p$ = .005; probability of negative events, ρ (154) = -.37, 95% CI [-.50, -.21], $p$ < .001; probability of

positive events, ρ (153) = .36, 95% CI [.21, .49], $p < .001$. When it is controlled for positive emodiversity, probability of negative events remained significant, ρ (153) = -.18, 95% CI [-.34, -.03], $p = .027$; probability of positive events became stronger, ρ (152) = .39, 95% CI [.25, .51], $p < .001$ and lastly forecast positive feelings for positive events became significant, ρ (152) = .18, 95% CI [.01, .33], $p = .029$.

Mean negative afffect is found to be associated with forecast negative feelings for negative events, ρ (154) = .24, 95% CI [.08, .40], $p = .002$; forecast duration of negative feelings for negative events, ρ (154) = .31, 95% CI [.16, .46], $p < .001$; probability of negative events, ρ (154) = .33, 95% CI [.18, .47], $p < .001$; forecast negative feelings for positive events, ρ (153) = .19, 95% CI [.03, .34], $p = .019$; probability of positive events, ρ (153) = -.18, 95% CI [-.33, -.03], $p = .025$. When we control for negative emodiversity, forecast duration of negative feelings for negative events, ρ (153) = .22, 95% CI [.06, .37], $p = .006$, and probability of positive events, ρ (152) = -.18, 95% CI [-.32, -.02], $p = .029$, remained significant. Forecast positive feelings for negative events became significant, ρ (153) = -.16, 95% CI [-.30, -.01], $p = .042$.

Mean affect and its relationship with forecast variables are also investigated. We found that it is only correlated with forecast negative feelings for negative events, ρ (154) = .17, 95% CI [-.00, .33], $p = .036$. When it is controlled for global emodiversity, forecast positive feelings for positive events, ρ (152) = .21, 95% CI [.04, .37], $p = .009$ and probability of positive events, ρ (152) = .27, 95% CI [.12, .41], $p < .001$, became significant.

#### 6.3.1.3 Factor scores

Like we did in Study II, we calculated factor scores for forecast positive feelings for positive events, forecast negative feelings for negative events, and PANAS. We could not find any significant relationship between positive emodiversity and forecast positive feelings for positive events. Similarly, there was no significant relationship between positive emodiversity and forecast negative feelings for negative events. When we looked at the associations between negative emodiversity and factor scores of forecast variables, we found that negative emodiversity is positively correlated with forecast negative feelings for negative events only, ρ (133) = .23, 95% CI [.06, .40], $p = .007$. Then, we controlled this relationship with factor scores of negative affect and the correlation became non-significant.

#### 6.3.1.4 Depression and anxiety

We examined the relationship between depression and forecast variables. We found that depression is correlated with, forecast negative feelings for negative events, ρ (157) = .34, 95% CI [.18, .48], $p < .001$; forecast duration of negative feelings for negative events, ρ (157) = .30, 95% CI [.15, .44], $p < .001$; probability of negative events, ρ (157) = .33, 95% CI [.18, .47], $p < .001$; forecast positive feelings for positive events, ρ (157) = .16, 95% CI [.01, .32], $p = .039$; probability of positive events, ρ (156) = -.27, 95% CI [-.41, -.12], $p < .001$.

We investigated the relationship between anxiety and forecast variables. We found that anxiety is associated with forecast negative feelings for negative events, ρ (154) = .32, 95% CI [.16, .46], $p < .001$; forecast duration of negative feelings for negative events, ρ (154) = .18, 95% CI [.02, .33], $p = .027$; probability of negative events, ρ (154) = .24, 95% CI [.08, .40], $p = .003$; forecast positive feelings for positive events, ρ (153) = .17, 95% CI [.01, .31], $p = .039$; forecast negative feelings for positive events, ρ (153) = .20, 95% CI [.04, .35], $p = .014$.

### 6.3.2 Additional Analysis

Our data allowed us to look at how depression and anxiety relate to emodiversity. Additionally, we performed a moderation analysis.

#### 6.3.2.1 Depression

Positive emodiversity is negatively associated with depression, ρ (154) = -.48, 95% CI [-.59, -.35], $p < .001$ and this relationship remained significant after we controlled for mean positive affect, ρ (153) = -.17, 95% CI [-.32, .01], $p = .039$. This is the first time we replicate Quoidbach et al. (2014) for positive emodiversity by using Spearman's partial correlations.

The relationship between negative emodiversity and depression was significant, ρ (154) = .53, 95% CI [.41, .63], $p < .001$, but it did not remained significant after we controlled for mean negative affect.

Global emodiversity is positively correlated with depression, ρ (154) = .30, 95% CI [.15, .43], $p < .001$, and this relationship remained significant after controlling for mean affect, ρ (153) = .27, 95% CI [.10, .43], $p < .001$. Although this is the first

time we found a significant relationship between global emodiversity and depression, which is over and beyond of mean affect scores. However, this finding is not in line with Quoidbach et al. (2014).

Additionally, we performed linear regression analysis for positive emodiversity and depression. The predictors were positive emodiversity, mean positive affect, and interaction of positive emodiversity and mean positive affect. The overall model was significant $R^2 = .26$, $F(3,152) = 17.88$, $p < .001$. None of the predictors were significant.

Secondly, we looked at negative emodiversity and depression relationship. The predictors were negative emodiversity, mean negative affect and interaction of negative emodiversity and mean negative affect. The overall model was significant, $R^2 = .45$, $F(3,152) = 40.82$, $p < .001$. Mean negative affect significantly predicts the depression, B = 14.70, 95% CI [4.02, 25.37], $p = .007$, and it remained significant after bootstrapping with 5000 resamples, B = 15.04, 95% CI[4.46, 23.67].

Lastly, we analysed global emodiversity and depression relationship with linear regression analysis. The predictors were global emodiversity, mean affect and interaction of global emodiversity and mean affect. The overall model was significant, $R^2 = .09$, $F(3,152) = 5.13$, $p = .002$. Mean affect predicted depression, B = -56.24, 95% CI [-105.69, -6.79], $p = .026$. Global emodiversity and mean affect interaction was significant, as well, B = 21.35, 95% CI [3.02, 39.68], $p = .023$. Mean affect, B = -57.07, 95% CI[-100.53, -4.60], and the interaction, B = 21.58, 95% CI[2.94, 38.23], remained significant after bootstrapping with 5000 resamples. It means that when the mean affect decreases, the influence of global emodiversity on depression increases.

Like we did in Study II, we investigated if the emodiversity scores moderate the relationship between depression and forecast variables. We found that the interaction of depression and positive feelings for negative events is significant, B = -18.73, 95% CI [-27.53, -8.07] (see Table 6.2 for moderation)

Table 6.2 Moderation - PE: Depression and NE_PF

| P.Emo | Effect | Se | *t* | *p* | LLCI | ULCI |
|---|---|---|---|---|---|---|
| 1.98 | 2.69 | 1.47 | 1.83 | .07 | -.22 | 5.59 |
| 2.15 | -.42 | .97 | -.44 | .67 | -2.33 | 1.49 |
| 2.30 | -3.29 | 1.33 | -2.47 | .01 | -5.92 | -.65 |

#### 6.3.2.2 Anxiety

Positive emodiversity is negatively associated with anxiety, ρ (154) = -.24, 95% CI [-.38, -.09], $p = .002$; when it is controlled for mean positive affect, this relationship became non-significant. Negative emodiversity was ρ (154) = .42, 95% CI [.27, .56], $p < .001$ until it is controlled for mean negative affect. Global emodiversity is positively associated with anxiety, ρ (154) = .36, 95% CI [.20, .49], $p < .001$; it remained significant when we controlled for mean affect, ρ (153) = .28, 95% CI [.10, .44], $p < .001$.

Like we did for depression, we performed linear regression analysis for anxiety and emodiversity relationship, as well.

First, we examined anxiety and positive emodiversity, where the anxiety is the outcome and the positive emodiversity, mean positive affect, and their interactions are predictors. The overall model was significant $R^2 = .09$, $F(3,152) = 4.71$, $p = .004$. Positive emodiversity significantly predicts anxiety, B = 30.43, 95% CI [5.84, 55.03], $p = .016$; mean positive affect predicts the outcome, B = 55.64, 95% CI [14.31, 96.97], $p = .009$; interaction is significant, B = - 26.01, 95% CI [-44.34, -7.69], $p = .006$. When we bootstrapped with 5000 resamples, we found that mean positive affect, B = 54.55 95% CI[5.34, 106.85], and interaction, B = -25.50 95% CI[-48.54, -4.11], remained significant. It shows that when the mean positive affect increases, the influence of positive emodiversity on anxiety decreases.

Linear regression analysis for negative emodiversity and anxiety is performed. The predictors were negative emodiversity, mean negative affect, and interaction of negative emodiversity and mean negative affect. The overall regression was significant, $R^2 = .24$, $F(3,152) = 16.27$, $p < .001$. None of the predictors were related to the outcome.

Lastly, we looked at global emodiversity and anxiety relationship. The predictors were global emodiversity, mean affect and interaction of global emodiversity and mean affect. The overall regression was significant, $R^2 = .17$, $F(3,152) = 10.01$, $p < .001$. Mean affect significantly predicted anxiety, B = -80.82, 95% CI [-135.72, -25.92], $p = .004$. Interaction of global emodiversity and mean affect was also significant, B = 30.81, 95% CI [10.46, 51.16], $p = .003$. Bootstrap coefficients showed that global emodiversity significantly predicted anxiety, B = -30.24 95% CI[-66.30, -0.84]; mean affect was a significant predictor, B = -81.16 95% CI[-135.85, -28.878]; interaction was significant, as well, B = 30.78 95% CI [11.62, 52.08]. It shows that when mean affect decreases, the influence of global emodiversity on anxiety increases.

We wanted to examine if emodiversity scores moderate the relationship between depression and anxiety. We found that the interaction between positive emodiversity and depression was significant in linear regression analysis, but when we bootstrapped with 5000 resamples it became non-significant.

## 6.4 Discussion

In this study, we were not able to observe any significant correlation between emodiversity and forecast variables after we controlled for the mean affect scores. This finding is in line with Study 2. When we analyzed the mean affect scores' relationship with forecast variables, we were able to detect some significant correlations even after we controlled for emodiversity scores. This finding is important since we again showed that mean affect is more important than the emodiversity scores for forecasts with the help of this replication study.

In line with Study 2 and the affective forecasting literature, our data displayed significant correlations between depression and forecasts. More specifically, we found that depression is related to forecast negative feelings for negative events, forecast duration of negative feelings for negative events, probability of negative events, and probability of positive events in both of the studies (Study II and Study III). Similarly, the analysis of anxiety and forecast variables showed significant correlations. In both Study II and Study III we found that anxiety is correlated with forecast negative feelings for negative events, forecast duration of negative feelings for negative events, and probability of negative events. Different from Study II, in Study III, we found a significant association between anxiety and forecast positive feelings for positive events and forecast negative feelings for positive events, as well.

We found that greater positive emodiversity is associated with lower levels of depression, which is in line with emodiversity literature (Quoidbach et al 2014; Urban-Wojcik et al 2020). This is the first time that we were able to observe this relationship. Additionally, we found that greater global emodiversity is associated with higher levels of depression. In any of the studies we performed, we did not see this relationship, and to the best of our knowledge, there is any study showing a positive relationship between global emodiversity and depression.

Lastly, for the second time, we found a positive correlation between global emodiversity and anxiety. Although this time we were not able to replicate the results of moderation analysis of global emodiversity in Study II, finding a consistent positive

association between global emodiversity and anxiety is noteworthy. However, there is no study in the literature that helps us to explain this results. More research should be conducted to understand why greater global emodiversity is positively correlated with higher levels of anxiety although other type of emodiversity scores (positive and negative) do not have any significant relationship with anxiety.

# 7. GENERAL DISCUSSION

We conducted three studies to investigate the relationship between emodiversity and affective forecasting. The most important limitation of these studies was that they are the first studies on this topic in the literature. Although there is a lot of research in the field of affective forecasting, the number of studies in emodiversity literature is limited. It made the interpretation of the findings very challenging.

We examined the relationship between emodiversity and affective forecasting errors with three survey-based correlational studies.

In Study I, we found that negative emodiversity is associated with overestimations of future negative affect. This relationship was independent of trait depression and emotional intelligence. We found that positive emodiversity is associated with overestimations of forecast negative affect. Also, it is correlated with underestimations of forecast positive affect. These relationships are dependent on depression. This first finding is more interesting because it might indicate the role of long-term emotional experiences in future estimations. We know that this finding is not in line with Quoidbach et al. (2014) findings demonstrating greater negative emodiversity is beneficial. On the contrary, it is possible to argue that our results show that experiencing a diversity of negative emotions might create sensitivity to developing depression over a longer period, which might explain the results of Werner-Seidler et al. 2020. However, we acknowledge that one study is not enough to reach this conclusion, especially when we could not find any moderating effect of negative emodiversity on depression and affective forecasting errors in our additional analysis.

Study I showed that both the valence and the diversity of emotional experiences play roles in biasing expectations. More importantly, the finding that positive and negative emodiversity have differentiable relationships with affective forecasts – the former as a side-effect of high trait depression, the latter independent from trait depression – reinforces the premise that positive emodiversity and negative emodi-

versity are two separable constructs. Merely having low positive emodiversity is not associated with unrealistic negative affect forecasts: instead, people need increased negative emodiversity (or high trait depression) for the forecasting errors to manifest. But more research is needed to understand and explain the role of trait depression in the relationship between positive emodiversity and affective forecasting errors.

Given that pessimism in general, and biased affective forecasting in particular, have been associated with depression (Hoerger et al. 2012; Wenze, Gunthert, and German 2012), these results reveal a potential pathway through which experiencing diverse negative emotions may increase vulnerability to depression by exaggerating pessimistic expectations. This mechanism may partially explain the link between elevated negative emodiversity and depression (Urban-Wojcik et al. 2020; Werner-Seidler et al. 2020). However, this interpretation should be taken into consideration with caution since we did not see a moderation effect of emodiversity on the relationship between depression and affective forecasting errors. We acknowledge that more research is necessary to investigate this suggestion.

In Study II and Study III (the replication of Study II), we could not find any significant association between emodiversity scores and forecast variables after controlling for related mean affect score, except for the forecast positive feelings for positive events variable. However, we explained this finding as suppression and supported this argument with another finding that is under the effect of suppression in the discussion part of Study II.

Since we did not observe any consistent significant relationship between forecasting and emodiversity scores, we performed additional analysis to gain more perspectives. First, we calculated factor scores for forecasts of positive and negative feelings, and mean positive and negative affect scores. However, we could not observe any significant relationship between emodiversity and factor scores of forecast variables when we control for factor scores of mean affect scores. Secondly, we looked at how mean affect scores relate to forecasting variables while controlling for emodiversity scores. Contrary to emodiversity findings, we observed consistent significant associations between the mean affect variables and forecast variables above and beyond emodiversity scores. For example, mean positive affect was associated with the probability of positive and negative events in both studies. Similarly, the forecast duration of negative feelings for negative events variable was related to mean negative affect after controlling for negative emodiversity in both studies. Lastly, we found that mean affect is associated with the probability of positive events in Study II and III, as well. These results are important not just because they show that non-significant findings of emodiversity in Study II and Study III are valid. Also, emodiversity

is not independent of mean affect scores. It is also not better than mean affect scores in the case of forecasts for the overall valence of specific events. It seems when there is a specific reference point for forecasting, how diverse or balanced the emotional experiences became non-significant. However, this does not mean that the forecasts are not related to overall (on average) affect. Finding that mean affect scores are related to forecasts shows that emotional intensities are associated with forecasts, but not the emotional diversity. Altogether these findings may indicate two things: emodiversity is not an independent construct for all psychological phenomena and/or the diversity of experienced emotions is not useful when forecasting the general valence.

There are methodological discrepancies between Study I and Study II. First, in Study I, we calculated the mean emodiversity score from collected emotion ratings daily over a week; in Study II, rather than measuring affect ratings daily, we asked participants to indicate how frequently they experienced given affect items in the scale, which is the method originally used in Quoidbach et al. (2014). Secondly, in Study I, we used PANAS to gauge emodiversity calculation, forecasted emotions, and actual emotions, which was one of the limitations of study one since it prevented us from controlling for mean affect scores in emodiversity analysis; on the other hand, we used different methods for emodiversity calculations and forecasting in Study II, PANAS is used for emodiversity scores and forecasting questions were about general positivity and negativity. Third, in Study I, participants were asked to forecast for six days later; but in Study II, we gave specific life scenarios. Lastly, the design of Study I allowed us to look at the inaccuracy by calculating the absolute difference between forecasted and felt emotions; however, in Study II and Study III, we only collected forecasts for given events, and due to that, we were not able to analyze inaccuracy.

Even though it might not be the only explanation or have a role in differences in findings, we know that studies using daily reports to calculate emodiversity scores (e.g. Urban-Wojcik et al. 2020) and asking to report the frequently experienced emotions (Quoidbach et al. 2014) yielded different results. In our case, we could not observe any consistent outcomes for the relationship between emodiversity and depression in any of our studies using different methods, but we could not replicate the significant findings of Study I with Study II and Study III. By emphasizing how using different types of affect score measurements to calculate emodiversity scores is related to affective forecasting errors is hard to explain, we need to highlight this small possibility. Secondly, although we do not see major discrepancies in the results of affective forecasting studies conducted using two different methods (asking for a day in the future vs. giving specific events to forecast), we observed inconsistent re-

sults for affective forecasting variables and emodiversity in our studies. Forecasting for a day in the future requires consideration of multiple variables such as different aspects of the day, plans and events of the day, and possibilities for experiencing different moods and emotions (Wenze, Gunthert, and German 2012), therefore, it might be easier to reflect frequently experienced emotions into the forecasts, but giving specific life scenarios narrows the influence of daily considerations and increases the focus on the event. Furthermore, as mentioned above, we asked to forecast general positivity and negativity for given events rather than asking to evaluate every single emotion one by one. We do not know if the diversity of specific emotions becomes unrelated or less useful with the process of thinking, decision making, or forecasting when the evaluation and forecasts focus on the general valence only, but overall results indicate a possibility in this direction.

We were able to replicate the literature on the relationship of affective forecasting errors with depression, and anxiety in Study II and Study III, yet, we did not find any significant correlation between emodiversity scores and forecasts over and beyond the mean affect scores. Although other variables showed significant relationships, emodiversity consistently showed non-significant results in Study II and Study III, which means that our results from Study II and Study III supported neither our hypothesis nor the findings of Study I. This discrepancy between emodiversity variables and other variables in Study II and III is important since significant findings of control variables show that the events and questions we used for forecasting purposes did not cause a problem or bias in the results of Study II and Study III.

It is important to note that we were not able to find significant relationships between depression and emodiversity in the first two studies, and the result of Study III was partially supported by the literature. In the case of depression, although there are no consistent results on what kind of association between depression and emodiversity exists, to our best knowledge, no published studies are showing there is no significant association between them after it is controlled for mean affect. However, Bantly (2020) found a non-significant correlation between these variables in his thesis study. One possible explanation for this may be the small number of participants we had, especially as compared to published studies. Also, we wanted to draw attention to the difficulty in replication of significant $p$ values, therefore, our first conclusion was that this relationship requires more research.

To our best knowledge, Study I was the first study in the literature investigating the relationship between emotional intelligence and emodiversity. We used emotional intelligence as a control variable since it has an established relationship with affective forecasting errors and depression, but our data allowed us to examine the

possible relationship between emodiversity and emotional intelligence. Although we did not form any specific hypothesis for this relationship, it was surprising to find no significant link between emodiversity and emotional intelligence since in theory emodiversity is about being aware of one's emotions and emotional self-awareness is one of the parts of emotional intelligence (Chernis and Goleman 2001, as cited in Killian 2012). Although it might be suggested that our small sample size and looking at total emotional intelligence scores instead of subcategories of the emotional intelligence scale have a role in these non-significant results, finding total emotional intelligence scores related to depression, mean affect, and emodiversity (before it is controlled for mean affect scores) weakens these explanations. Furthermore, we found that emotional intelligence continues to be positively correlated with mean positive affect after it is controlled for positive emodiversity, but we were not able to observe a similar outcome when we looked at emotional intelligence and positive emodiversity relationship which is controlled for mean positive affect. Therefore, it cannot be argued that emodiversity on its own is linked to emotional intelligence, but the positive affect is linked to higher emotional intelligence above and beyond emodiversity, and this makes the self-awareness argument of Quoidbach et al. (2014) questionable. Lastly, we measured emotional intelligence with a questionnaire; however it is not the only way to measure emotional intelligence (see O'Connor et al 2019 for a review). The non-significant relationship between emodiversity and emotional intelligence might be due to using self-report questionnaire. Further research can investigate the relationship between emodiversity and performance based emotional intelligence scores. This is the first study investigating this relationship, therefore more research should be conducted.

The findings on the inconsistent relationship of emodiversity with affective forecasting errors may not be very informative for the nature of emodiversity since these are the first studies conducted with a small group of participants by using a variety of techniques, however, our findings on emodiversity's relationship with mental health variables such as depression and anxiety displayed mostly non-significant but generally inconsistent results with the literature. By emphasizing that we had a small number of participants who were mostly undergraduate students, we must indicate that our results did not replicate the literature, and we observed suppression effects in the analysis. The published research articles on emodiversity have much bigger data sets and are generally from older age groups. Therefore, this study may put question marks on the validity and generalizability of emodiversity as a construct that works independently from the mean intensity of experienced emotions to different numbers of people and backgrounds.

A contribution to our work on the emodiversity and affective forecasting relationship

can be studying individual differences in using emotion as information to guide future cognition since personal distinctions have a noteworthy role in using emotions as a piece of information (Marroquin et al. 2016).

Despite our limitations and inconsistent results between studies, we believe our findings provide a good basis for experimental work on emodiversity and mental health to build upon. Now we have evidence that naturally-occurring individual differences in emodiversity are related to affective forecasting errors when forecasting for an ambiguous future, experimental studies are now needed to demonstrate whether having greater or lower emodiversity has an impact on forecasts more than temporary moods do. Also, even though our data demonstrate the discrepancies between positive and negative emodiversity's relationship with affective forecasting errors in Study I, it is not enough to explain why trait depression affects them differently. Therefore, future studies should address this issue.

# 8. GENERAL LIMITATIONS

We conducted three studies to investigate the relationship between emodiversity and affective forecasting. The most important limitation of these studies was that they are the first studies on this topic in the literature. Although there is a lot of research in the field of affective forecasting, the number of studies in emodiversity literature is limited, which made the interpretation of the findings of this study very challenging.

Each study had its limitations: In Study I, we used PANAS to measure daily affect measures and affective forecasts. Due to that, we could not control emodiversity analysis for mean affect scores, but instead, we controlled it for affect scores of Day 7. Additionally, although we tried to collect data for replication of Study I, we could not do that due to time constraints. In Study II (and Study III), we solved the methodological limitation of Study I, and we did not have a major methodological limitation for Study II. However, we changed the questionnaires for forecasts and the way of collecting emotion ratings that will be used in emodiversity scores calculation, which caused two different explanations for the discrepancy between the findings of Study I and Study II. Unfortunately, we did not have enough time to conduct another study to eliminate at least one of the possible explanations.

Lastly, another important limitation was the number of participants we had. The studies in the emodiversity literature are generally from big data sets, and our studies had a very small sample size. Additionally, the majority of our samples were undergraduate students. Although we tried to collect data from non-student communities outside of Sabancı University, the participation rate was very low.

# 9. CONCLUSION

We investigated if there is a correlation between emodiversity and affective forecasting. We found that negative emodiversity is associated with overestimations of future negative affect when people forecast how they would feel in the future. This relationship was independent of depression and emotional intelligence. These findings show that contrary to current moods, long-term emotional experiences might have a role in expectations. However, we could not replicate this finding when people forecast how positive or negative they would feel if a specific event happened. A reason behind this might be the methodological differences between the studies, or the diversity of experienced emotions might not be important when people make overall valence predictions. These are the first studies looking at the relationship between emodiversity and affective forecasting, and our results indicate that more research is necessary.

# BIBLIOGRAPHY


Abrahamson, Lyn Y., Gerald I. Metalsky, and Lauren B. Alloy. 1989. "Hopelessness depression: A theory-based subtype of depression." *Psychological Review* 96(2): 358–372.

Austin, Elizabeth J., Donald H. Saklofske Sandra HS Huang, and Deanne McKenney. 2004. "Measurement of trait emotional intelligence: Testing and cross-validating a modified version of Schutte et al.'s (1998) measure." *Personality and Individual Differences* 36(3): 555–562.

Ayton, Peter, Alice Pott, and Najat Elwakili. 2007. "Affective forecasting: Why can't people predict their emotions?" *Thinking & Reasoning* 13(1): 62–80.

Banty, Robert. 2020. "Emodiversity as a Predictor of Anxiety and Depression Symptomology in Older Adults." *PhD diss.* Rosalind Franklin University of Medicine and Science.

Beck, Aaron T. 1976. *Cognitive therapy and the emotional disorders.* New York: IUP.

Beck, Aaron T., Calvin H. Ward Mock Mendelson Jeremiah Mock, and John Erbaugh. 1961. "An inventory for measuring depression." *Archives of General Psychiatry* 4(6): 561–571.

Beck, Aaron T., Norman Epstein Gary Brown, and Robert A. Steer. 1988. "An inventory for measuring clinical anxiety: psychometric properties." *Journal of Consulting and Clinical Psychology* 56(6): 893–897.

Benson, Lizbeth, and Anthony Ong. 2020. "Positive Emodiversity Buffers the Association Between Stress and Depressive Symptoms." *Innovation in Aging* 4(Suppl 1): 653.

Benson, Lizbeth, Nilam Ram David M. Almeida Alex J. Zautra, and Anthony D. Ong. 2018. *Fusing biodiversity metrics into investigations of daily life: Illustrations and recommendations with emodiversity.* Vol. 73 Oxford University Press US.

Bower, Gordon H. 1981. "Mood and memory." *American psychologist* 36(2): 129–148.

Bower, Gordon H. 1983. "Affect and Cognition." *Philosophical Transactions of the Royal Society of London. B, Biological Sciences* 302(1110): 387–402.

Brown, Nicholas JL, and James C. Coyne. 2017. "Emodiversity: Robust predictor of outcomes or statistical artifact?" *Journal of Experimental Psychology: General* 146(9): 1372–1377.

Buehler, Roger, and Cathy McFarland. 2001. "Intensity bias in affective forecasting: The role of temporal focus." *Personality and Social Psychology Bulletin* 27(11): 1480–1493.

Buehler, Roger, Cathy McFarland Vassili Spyropoulos, and Kent CH Lam. 2007. "Motivated prediction of future feelings: Effects of negative mood and mood orientation on affective forecasts." *Personality and Social Psychology Bulletin* 33(9): 1265–1278.

Cherniss, Cary, and Daniel Goleman. 2001. *The emotionally intelligent workplace: How to select for, measure, and improve emotional intelligence in individuals, groups, and organizations.* Jossey-Bass San Francisco, CA.

Clifford, Georgina, Caitlin Hitchcock, and Tim Dalgleish. 2020. "Negative and positive emotional complexity in the autobiographical representations of sexual trauma survivors." *Behaviour Research and Therapy* 126: 1–7.

DeSteno, David, Richard E. Petty Duane T. Wegener, and Derek D. Rucker. 2000. "Beyond valence in the perception of likelihood: the role of emotion specificity." *Journal of Personality and Social Psychology* 78(3): 397–416.

Dickerson, Sally S., Margaret E. Kemeny Najib Aziz Kevin H. Kim, and John L. Fahey. 2004. "Immunological effects of induced shame and guilt." *Psychosomatic Medicine* 66(1): 124–131.

Downey, Luke A., Patrick J. Johnston Karen Hansen Rachel Schembri Con Stough Virginia Tuckwell, and Isaac Schweitzer. 2008. "The relationship between emotional intelligence and depression in a clinical sample." *The European Journal of Psychiatry* 22(2): 93–98.

Dunn, Elizabeth W., and Simon M. Laham. 2006. *Affective forecasting: A user's guide to emotional time travel.* Psychology Press.

Dunn, Elizabeth W., Marc A. Brackett Claire Ashton-James Elyse Schneiderman, and Peter Salovey. 2007. "On emotionally intelligent time travel: Individual differences in affective forecasting ability." *Personality and Social Psychology Bulletin* 33(1): 85–93.

Ergüler, Hasan, and Ayşegül Durak Batıgün. 2018. "Geleceğe Yönelik Öngörüler Ölçeği geçerlik ve güvenirlik çalışması." *Klinik Psikiyatri Dergisi* 21(2): 168–176.

Fernández-Berrocal, Pablo, and Natalio Extremera. 2016. "Ability emotional intelligence, depression, and well-being." *Emotion Review* 8(4): 311–315.

Finkenauer, Catrin, Marcello Gallucci Wilco W. van Dijk, and Monique Pollmann. 2007. "Investigating the role of time in affective forecasting: Temporal influences on forecasting accuracy." *Personality and Social Psychology Bulletin* 33(8): 1152–1166.

Gasper, Karen, and Gerald L. Clore. 2000. "Do you have to pay attention to your feelings to be influenced by them?" *Personality and Social Psychology Bulletin* 26(6): 698–711.

Gençöz, Tülin. 2000. "Pozitif ve Negatif Duygu Durum Ölçeği: Geçerlik ve güvenirlik çalışması [Positive and Negative Affect Schedule: A study of validity and reliability]." *Türk Psikoloji Dergisi* 15(46): 19–28.

Gilbert, Daniel T., Elizabeth C. Pinel Timothy D. Wilson Stephen J. Blumberg, and Thalia P. Wheatley. 1998. "Immune neglect: a source of durability bias in affective forecasting." *Journal of Personality and Social Psychology* 75(3): 617–638.

Gini, Corrado. 1912. *Variabilità e mutabilità.* Memorie di metodologica statistica. Rome, Italy: Libreria Eredi Virgilio Veschi.

Gohm, Carol L. 2003. "Mood regulation and emotional intelligence: individual differences." *Journal of Personality and Social Psychology* 84(3): 594–607.

Gopala Krishnan, Rajshree. 2011. "Mood Congruency in Affective Forecasting: The Effects of Current Mood in Near versus Distant Future Predictions." Doctoral dissertation, University of Otago.

Grossmann, Igor, Harrison Oakes, and Henri C. Santos. 2018. "Wise reasoning benefits from emodiversity, irrespective of emotional intensity." *Journal of Experimental Psychology: General* 148(5): 805–823.

Hisli, Nesrin. 1989. "Beck Depresyon Envanterinin üniversite öğrencileri için geçerliği, güvenirliği." *Psikoloji Dergisi* 7(23): 3–13.

Hoerger, Michael, Benjamin P. Chapman Ronald M. Epstein, and Paul R. Duberstein. 2012*a*. "Emotional intelligence: a theoretical framework for individual differences in affective forecasting." *Emotion* 12(4): 716–725.

Hoerger, Michael, Stuart W. Quirk Benjamin P. Chapman, and Paul R. Duberstein. 2012*b*. "Affective forecasting and self-rated symptoms of depression, anxiety, and hypomania: Evidence for a dysphoric forecasting bias." *Cognition Emotion* 26(6): 1098–1106.

Hoerger, Michael, Stuart W. Quirk Richard E. Lucas, and Thomas H. Carr. 2010. "Cognitive determinants of affective forecasting errors." *Judgment and Decision Making* 5(5): 365–373.

Killian, Kyle D. 2012. "Development and validation of the emotional self-awareness questionnaire: A measure of emotional intelligence." *Journal of Marital and Family Therapy* 38(3): 502–514.

Lachman, Margie E., and Patricia A. Tun. 2008. *Cognitive testing in large-scale surveys: Assessment by telephone.* Sage Publications, Inc.

Lachman, Margie E., Stefan Agrigoroaei Patricia A. Tun, and Suzanne L. Weaver. 2014. "Monitoring cognitive functioning: psychometric properties of the brief test of adult cognition by telephone." *Assessment* 21(4): 404–417.

Lee, Soomi, Emily J. Urban-Wojcik Susan T. Charles, and David M. Almeida. 2022. "Rich and balanced experiences of daily emotions are associated with activity diversity across adulthood." *The Journals of Gerontology: Series B* 77(4): 710–720.

Lerner, Jennifer S., and Dacher Keltner. 2000. "Beyond valence: Toward a model of emotion-specific influences on judgement and choice." *Cognition & Emotion* 14(4): 473–493.

Levine, Linda J., Heather C. Lench Robin L. Kaplan, and Martin A. Safer. 2012. "Accuracy and artifact: Reexamining the intensity bias in affective forecasting." *Journal of Personality and Social Psychology* 103(4): 1–22.

Loewenstein, George, and David Schkade. 1999. *Wouldn't it be nice? Predicting future feelings.* Well-being: The foundations of hedonic psychology.

Marroquín, Brett, and Susan Nolen-Hoeksema. 2015. "Event prediction and affective forecasting in depressive cognition: Using emotion as information about the future." *Journal of Social and Clinical Psychology* 34(2): 117–134.

Marroquín, Brett, Chloe C. Boyle Susan Nolen-Hoeksema, and Annette L. Stanton. 2016. "Using emotion as information in future-oriented cognition: Individual differences in the context of state negative affect." *Personality and Individual Differences* 95: 121–126.

Marroquín, Brett, Susan Nolen-Hoeksema, and Regina Miranda. 2012. "Escaping the future: Affective forecasting in escapist fantasy and attempted suicide." *Journal of Social and Clinical Psychology* 32(4): 446–463.

Mathersul, Danielle C., and Ayelet Meron Ruscio. 2020. "Forecasting the future, remembering the past: misrepresentations of daily emotional experience in generalized anxiety disorder and major depressive disorder." *Cognitive Therapy and Research* 44(1): 73–88.

Mayer, John D., and Peter Salovey. 1997. *What is emotional intelligence? In P. Salovey D. Sluyter (Eds.).* New York: Basic Books.

Mellers, Barbara A. 2000. "Choice and the relative pleasure of consequences." *Psychological bulletin* 126(6): 910–924.

Mellers, Barbara A., and A. Peter McGraw. 2001. "Anticipated Emotions as Guides to Choice." *Current Directions in Psychological Science* 10(6): 210–14.

Miranda, Regina. 2004. "Efficiency in predicting the future: Depressive predictive certainty deriving from diminished positive or increased negative expectancies." New York University.

Moons, Wesley G., Naomi I. Eisenberger, and Shelley E. Taylor. 2010. "Anger and fear responses to stress have different biological profiles." *Brain, Behavior, and Immunity* 24(2): 215–219.

O'Connor, Peter J., Andrew Hill Maria Kaya, and Brett Martin. 2019. "The measurement of emotional intelligence: A critical review of the literature and recommendations for researchers and practitioners." *Frontiers in Psychology* 10: 1116.

Ong, Anthony D., Lizbeth Benson Alex J. Zautra, and Nilam Ram. 2018. "Emodiversity and biomarkers of inflammation." *Emotion* 18(1): 3–14.

Pavot, William, and Ed Diener. 1993. "Review of the Satisfaction With Life Scale." *Psychological Assessment* 5(1): 164–172.

Quoidbach, Jordi, June Gruber Moïra Mikolajczak Alexsandr Kogan Ilios Kotsou, and Michael I. Norton. 2014. "Emodiversity and the emotional ecosystem." *Journal of Experimental Psychology: General* 143(6): 2057–2066.

Quoidbach, Jordi, Moïra Mikolajczak June Gruber Ilios Kotsou Aleksandr Kogan, and Michael I. Norton. 2018. "Robust, replicable, and theoretically-grounded: A response to Brown and Coyne's (2017) commentary on the relationship between emodiversity and health." *Journal of Experimental Psychology: General* 147(3): 451–458.

Schwartz, Barry, and Roseanna Sommers. 2013. *Affective Forecasting And Well Being.* Oxford Handbook of Cognitive Psychology.

Schwarz, Norbert, and Gerald L. Clore. 1983. "Mood, misattribution, and judgments of well-being: informative and directive functions of affective states." *Journal of personality and social psychology* 45(3): 513–523.

Shannon, Ce. 1948. "A mathematical theory of communication." *Bell System Technical Journal* 27(3): 379–423.

Simpson, Edward H. 1949. "Measurement of diversity." *Nature* 163(4148): 688–688.

Tatar, Arkun, Serdar Tok, and Gaye Saltukoğlu. 2011. "Gözden Geçirilmiş Schutte Duygusal Zekâ Ölçeğinin Türkçe'ye Uyarlanması ve Psikometrik Özelliklerinin İncelenmesi." *Klinik Psikofarmakoloji Bülteni-Bulletin of Clinical Psychopharmacology* 21(4): 325–338.

Thompson, Renee J., Aleksandr Spectre Philip S Insel Douglas Mennin Ian H. Gotlib, and June Gruber. 2017. "Positive and negative affective forecasting in remitted individuals with bipolar I disorder, and major depressive disorder, and healthy controls." *Cognitive Therapy and Research* 41(5): 673–685.

Ulusoy, Mustafa, Nesrin H. Sahin, and Hüsnü Erkmen. 1998. "Turkish version of the Beck Anxiety Inventory: psychometric properties." *Journal of Cognitive Psychotherapy* 12(2): 163–172.

Urban-Wojcik, Emily, Alexandra Barnes Dan Fitch Andrew Kirvin-Quamme Elizabeth Nord Lauren Gresham Richard Davidson, and Stacey Schaefer. 2021. "More Negative Emodiversity Is Associated With Worse Mental Illness During (but Not Before) COVID-19." *Innovation in Aging* 5(Suppl 1): 19.

Urban-Wojcik, Emily J., Jeanette A. Mumford David M. Almeida Margie E. Lachman Carol D. Ryff Richard J. Davidson, and Stacey M. Schaefer. 2020. "Emodiversity, health, and well-being in the Midlife in the United States (MIDUS) daily diary study." *Emotion* .

Ware Jr, John E., and Cathy Donald Sherbourne. 1992. "The MOS 36-item short-form health survey (SF-36): I. Conceptual framework and item selection." *Medical Care* 30(6): 473– 483.

Watson, David, Lee Anna Clark, and Auke Tellegen. 1988. "Development and validation of brief measures of positive and negative affect: the PANAS scales." *Journal of Personality and Social Psychology* 54(6): 1063–1070.

Wenze, Susan J., Kathleen C. Gunthert, and Ramaris E. German. 2012. "Biases in affective forecasting and recall in individuals with depression and anxiety symptoms." *Personality and Social Psychology Bulletin,* 38(7): 895–906.

Werner-Seidler, Aliza, Caitlin Hitchcock Emily Hammond Emma Hill Ann-Marie Golden Lauren Breakwell Rajini Ramana Richard Moore, and Tim Dalgleish. 2020. "Emotional complexity across the life story: Elevated negative emodiversity and diminished positive emodiversity in sufferers of recurrent depression." *Journal of Affective Disorders* 273: 106–112.

Wilson, Timothy D., and Daniel T. Gilbert. 2003. "Affective forecasting." *Advances in Experimental Social Psychology* 35: 345–411.

Wilson, Timothy D., and Daniel T. Gilbert. 2005. "Affective forecasting: Knowing what to want." *Current directions in psychological science* 14(3): 131–134.

# APPENDIX A

## List of Events used in Study 2 and 3

Lütfen aşağıdaki cümleleri dikkatle okuyunuz. Her madde için gelecekte başınıza gelmedurumunda kendinizi ne kadar pozitif hissedeceğinizi, kendinizi ne kadar negatif hissedeceğinizi, bu olayların başınıza gelme ihtimalini belirtilen yerlere yazınız.

1. Yanlış anlaşılmış olduğunuzu hissedeceksiniz.
2. İnsanlar sizi takdir edecekler.
3. Oldukça fazla enerjiniz ve coşkunuz olacak.
4. Yanlış giden şeyler için siz suçlanacaksınız.
5. Size yakın birisi sizi reddedecek.
6. Dersinizde başarılı olacaksınız.
7. İşler ümit ettiğiniz gibi gelişmeyecek.
8. İnsanlar sizden hoşlanmayacaklar.
9. Bitirmek üzere başladığınız şeylerin üstesinden geleceksiniz.
10. Oldukça zinde ve sağlıklı olacaksınız.
11. Arkadaşlarınızla oldukça iyi vakit geçireceksiniz.
12. İnsanlar sizin başarısız bir kimse olduğunuzu düşünecekler.
13. Birçok hata yapacaksınız.
14. Üzerinizdeki baskılarla kolay bir şekilde başa çıkabileceksiniz.
15. Zihniniz oldukça canlı ve uyanık olacak.
16. İşlerinizden kötü bir şekilde geri kalacaksınız.
17. İyi ve uzun süreli arkadaşlıklar kuracaksınız.
18. İnsanlar sizinle dalga geçecekler.
19. Görüştüğünüz insanlar sizi sevecekler.
20. Sorumluluklarınızla başa çıkamayacaksınız.
21. Kaybettiğiniz bir eşyanızı bulacaksınız.
22. Birisi size iltifat edecek.
23. Size hediye olarak yeni bir bilgisayar alınacak.
24. Çıkma teklifiniz reddedilecek.
25. Konuşurken aptalmış gibi hissedeceksiniz.
26. Her şeyin kötü gittiği bir gün geçireceksiniz.
27. Göze çarpan bir kişisel başarı kazanacaksınız.

28. Bir yarışmayı kazanacaksınız.
29. Bir araba kazasında orta derecede yaralanacaksınız.
30. Önemli biri tarafından azarlanacaksınız.

Her madde için sorular:
Gelecekte başınıza gelse kendinizi ne kadar pozitif hissedersiniz?
0 (Hiç) ———————————————————— 100 (Çok fazla)

Gelecekte başınıza gelecek olsa, ne kadar süre boyunca pozitif hissedersiniz?
Bu olay karşısında pozitif hissetmezdim - Birkaç dakika - Yaklaşık bir saat - Birkaç saat - Birkaç gün - Birkaç hafta - Birkaç ay

Gelecekte başınıza gelse kendinizi ne kadar negatif hissedersiniz?
0 (Hiç) ————————————————————- 100 (Çok fazla)

Gelecekte başınıza gelecek olsa, ne kadar süre boyunca negatif hissedersiniz?
Bu olay karşısında pozitif hissetmezdim - Birkaç dakika - Yaklaşık bir saat - Birkaç saat - Birkaç gün - Birkaç hafta - Birkaç ay

Gelecekte başınıza gelmek ihtimali nedir?
Bana asla olmaz - Muhtemelen bana olmaz - Bana olmayabilir - Bana olabilir ya da olmayabilir - Bana olabilir - Muhtemelen bana olur - Bana kesinlikle olur