

# The Effects of Emotion Augmentation on the Experience of Melancholia

Hendrik Meier

S3568849

Department of Psychology, University of Groningen

PSB3E-BT15: Bachelor Thesis

Group 35

Supervisor: Dr. Anja Ernst

Second evaluator: Dr. Anita Keller

In collaboration with: Christiana Paraschiv, Mara Hoppe, Sarah Moll, Jan

Weinhardt & Paul-S. Ehlers.

01.01.2023

*Abstract:* The study sought to investigate the effect emotion augmentation has on the experience of melancholia (defined according to DSM-V diagnosis of depression with melancholic tendencies). This was to provide an updated approach to the understanding of melancholic depression incorporating the time-dynamic aspects of emotion variation. A measurement of negative affect was used to provide validity to the measurement of melancholia. Linear regression showed a small effect size ( $R^2=.043$ ;  $p=.019$ ), indicating that higher values of emotion augmentation predict the frequency of melancholic depression. Similarly, emotion augmentation also predicted negative affect with a small effect size ( $R^2=.067$ ;  $p=.003$ ). These findings promote further research on the effect emotion augmentation has on negative affect and melancholic depression. This could be done by addressing specific emotion (components) predicting specific aspects of melancholia, instead of the general conceptualization that was used in this study.

## **The Effects of Emotion augmentation on the experience of Melancholia**

The field of emotion dynamics regards “the study of ... the trajectories, patterns, and regularities with which emotions, or one or more of their subcomponents (such as experiential, physiological, or behavioural components) fluctuate across time” (Kuppens & Verduyn, 2015). While it relates to the emotion (e.g., sadness) the focus is on features and principles that are shared across emotions. These features vary depending on the context of a situation, the emotion in question, and individual differences. One such feature is emotion augmentation, which regards “the degree to which an emotion (component) predicts another emotion (component) across time” (Kuppens & Verduyn, 2017). The study of emotion dynamics has emerged in the last few years, after recognizing a need to understand emotions dynamics separately from classic interpretations of emotion (e.g., Larsen, Augustine, & Primzic, 2009; Lewis, 2005; Scherer 2009).

Emotion research has already acknowledged emotions as dynamic (Tracy, 2014; Moors, 2014) but has yet to thoroughly investigate time dynamic aspects of emotions. As such, already existing research can benefit from re-evaluating the findings under the lens of emotion dynamics. A long-standing debate has surrounded the nature of depression and more explicitly melancholia, and the understanding of this condition (e.g., Joyce et al., 2002; Parker & Spoelma, 2021; Taylor & Fink, 2006). While a great deal of research has been done on melancholia, few investigations have used emotion dynamics as their point of reference. This means psychological research has focused too much on a static approach that does not account for emotional fluctuations over time. Furthermore, the dynamic nature of psychopathology has become increasingly clear over recent years with techniques such as network-modelling giving us new insights into their development and trajectory. This network approach regards mutually interacting symptoms and transdiagnostic factors as a set of causally related properties that do not necessarily share an underlying cause (Bringmann et

al., 2013). Taking these things into account, we may gain new insights into melancholia, its development, and its manifestation when taking on the perspective of emotion dynamics as one such transdiagnostic factor.

For the sake of this study, melancholia is defined as “a state of severe/debilitating sadness” also used in the DSM-V (American Psychiatric Association, 2013). This means that the term “melancholia” is only partially accurate, as the DSM-V diagnosis refers to “Depression with melancholic features”. However, it also describes a qualitative difference between the experiences of depression and depression with melancholic features (p.185). Following from this, in this study, the term “melancholia” refers to the diagnosis of clinical depression with the added specifier of “with melancholic features”, unless explicitly relating to another research (e.g., Taylor & Fink, 2006).

As such, this paper concerns itself with individual differences in the level of overall emotion augmentation and how these differences contribute to the experience of melancholia. On a theoretical level, it is to help in further understanding melancholia. Emotional inertia has been found to be related to depression beyond increasing negative, perseverative thoughts (Brose, Smiedek, Koval, & Kuppens, 2015), suggesting that emotional inertia contributes independently to the onset or maintenance of depression. As emotional inertia measures the degree to which emotions are self-predictive across time, this lends support to the notion that emotion augmentation (which is the degree to which emotion components predict each other across time) also influences the expression of depression. Regarding practical contributions, applications for the therapeutic and clinical setting were the focus of this study. By identifying the degree of influence of emotion augmentation on melancholia, an additional approach of treatment might become available in integrative therapy (e.g., Cognitive-Behavioural Therapy).

The aim of this study is to find out, similar to emotional inertia being an early marker for depression (Brose et al., 2015), if emotion augmentation can predict melancholia. In so

doing, it might provide an updated framework on how to understand melancholia, contributing to the diagnosis and treatment of the condition.

### **Emotion augmentation**

As of today's knowledge, emotion dynamics have been split into principles and features, the former describing how emotions operate. First is the principle of contingency, which describes that emotions consist of responses to external stimuli. Second, the principle of inertia describes an intrinsic tendency of emotions to resist change resulting in inter-situational carryover. Third, the principle of regulation concerns the continuous adjustment of emotions to maximize the fit with the currently desired state. Lastly, the principle of interaction regards the constant interaction between emotions resulting in augmenting or blunting each other (Kuppens, P. & Verduyn, P., 2017).

Measures related to an emotional episode are its duration and its intensity profile shape (IPS). The latter describes the shape of fluctuations in emotional intensity during the episode. For understanding the trajectory of emotions, four features have been identified. Emotional variability relates to the IPS but merely describes the range of emotion fluctuation. Emotion co-variation is the degree to which emotions covary over time. Emotional inertia was already mentioned as a principle of emotion dynamics, but as a feature extends to the degree to which emotions, or their components, carry over across situations. The last of the identified features, separate from the principles, is emotion augmentation/blunting which is the degree to which an emotion (component) predicts another emotion (component) across time (Kuppens & Verduyn, 2017). This directly relates to the principle of interaction and studying this feature of emotion dynamics may help in gaining more insight into the different interactions between emotions. As emotion dynamics have yet to be fully explored by current research, this study's focus was to begin understanding how emotion augmentation influences melancholia.

An earlier study established two effects for individuals with higher levels of depressive symptoms in relation to emotional inertia. On one hand, they show higher levels of emotional inertia and on the other, a stronger within-person association between affect and perseverative thoughts (Brose et al., 2015). This implies that emotional inertia contributes to depressive symptoms and is an early marker for the onset of depression. Furthermore, higher degrees of emotional inertia have been linked to lower well-being, even when controlling for differences in emotional context (Koval, Sütterling, & Kuppens, 2016). While this links together emotional inertia and depression, less is known about the influence of emotion augmentation on depression. As emotional inertia can also be described as the degree to which emotional states are self-predictive across time (De Longis et al., 2021) we can assume that emotion augmentation has a certain influence on depression, and by extension melancholia, as well.

A comprehensive meta-study by Houben, v. d. Noortgate & Kuppens (2015) investigated how short-term emotion dynamics were associated with psychological well-being. This was done to create a comprehensive overview of already found effects of emotion dynamics, as well as to provide a synthesis with earlier, more static models of emotion research (e.g., Frederickson & Joiner, 2002; Watson, Clark, & Leary, 1988). Overall emotion dynamic patterns were used to observe effect sizes. These included emotional variability, emotional instability, and emotional inertia. Significant positive correlations were found between variability and instability, and multiple factors indicating poor psychological well-being - including depression. Furthermore, inertia was also positively related to depressive symptoms and diagnosis, as well as negative affect. The general pattern that was found, is that lower levels of psychological well-being are characterized by more variable, more unstable and more inert emotions. While this meta-analysis indicates general relations between the concepts of emotion dynamics and psychological well-being, more specific explorations are

advised. As such, the principle of emotion augmentation was used to investigate the expression of melancholic depression.

Additionally, modern psychological research has found time-dynamic patterns and regulation of emotions to be associated with psychopathology (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Linehan, 1993; Peeters, Berkhof, Rottenberg, & Nicolson, 2010), further supporting the notion of emotion dynamics being classified as a transdiagnostic feature. This is again seen not only when looking at small time-intervals, but also across longer periods of time, preceding and predicting psychopathology (Kuppens et al., 2012; van de Leemput et al., 2014).

### **Melancholia**

As melancholia is a pervasive concept with a debate still going on around its nature, emotion dynamics, and more specifically emotion augmentation should provide another angle from which to approach understanding it. One of the points of contention is whether we should understand it as a categorical concept or a dimensional one. Some research suggests a categorical answer using a machine-learning approach (Parker & Spoelma, 2021). It was assessed whether a pre-established cut of score on the Sydney Melancholia Prototype Index (SMPI-R) would provide a clear differentiation between melancholic and non-melancholic depression, with findings supporting the notion of a clear distinction between the two depression types. Furthermore, the SMPI-R was built on the assumption of melancholia being a subtype of depression, which is characterized by more endogenous symptoms and lesser likelihood of being caused by antecedent stressors (Parker et al., 2013). That is to say, theory supports understanding melancholia as arising from and maintaining internal symptoms (e.g., personality traits), while being robust against stressors that precede the onset of melancholic depression. Accordingly, this supports emotion augmentation as a

On the other hand, research has indicated a more continuous spectrum, along which melancholic depression is oriented. When testing the DSM-IV against the CORE model of

melancholia, it was found that interrater reliability promoted the use of CORE as a dimensional model to evaluate melancholia (Joyce et al., 2002). However, when using a dichotomous score (i.e., a categorical approach) interrater reliability was too low to be useful in diagnosis of melancholic depression.

Simultaneously, research has investigated whether it should be considered a distinct disorder to depression or replace the term “depressive” entirely. The authors argue that diagnosing “depression” is the equivalent of a medical practitioner diagnosing an “infection”. By defining melancholia as a “recurrent, debilitating, pervasive brain disorder that alters mood, motor functions, thinking, cognition, perception and many basic physiologic processes”, they create a differential diagnosis for melancholic depression (unipolar depression) and other depression types (Taylor & Fink, 2006).

While classifying melancholia as categorical has certain benefits for treatment (i.e. simplicity) in a psychiatric setting, the dimensional aspect of any disorder should not be disregarded. Furthermore, while psychiatry may have to operate under strict limitations due to the associated responsibility of directly prescribing medication (as the study of psychiatry includes a medical curriculum), clinical psychology benefits from the understanding of a dimensional approach. As such, emotion dynamics, as a new field of research, was used to investigate the experience of melancholia on a spectrum. The main hypothesis of this study then, is that people who experience more emotion augmentation experience melancholia more frequently. This is due to higher emotional variability being associated with low psychological well-being predicting melancholia (Houben, v. d. Noortgate & Kuppens, 2015). As a second hypothesis, higher levels of emotion augmentation should also be able to predict negative affect. This follows logically due to the relationship between negative affect and melancholia.

Hypothesis I: Higher values of emotion augmentation are associated with experiencing melancholia more frequently.



Hypothesis II: Higher values of emotion augmentation are associated with more frequent negative affect.

## Methods

### Participants

The sample consisted of 130 participants with ages between 18 and 68 ( $M = 25.85$ ,  $SD = 10.19$ ), specifically 89 females from 18 to 68 years ( $M = 25.89$ ,  $SD = 10.03$ ), 37 males that were 19 to 58 years ( $M = 27.59$ ,  $SD = 11.57$ ) and one 'Non-binary/Third gender' with an age of 25 years. Finally, one participant that preferred to withhold gender related information had the age of 20 years. All participants were citizens of the EU. An a priori power analysis was conducted using G\*Power version 3.1.9.7 (Faul, Erdfelder, Lang, & Buchner, 2007) to determine the minimum sample size to test the study hypothesis. The analysis was based on a t-test as it seemed to be the most suitable test for conducting a between-subject comparison within our sample, since our sample required a between-subject comparison. Results indicated that a sample of (64) participants was required to achieve 80 % power for detecting a small effect size ( $d = 0.30$ ) at a significance criterion of  $\alpha = .05$ .

### Research Design and procedure

The study was approved by Ethical Committee Psychology (ECP). It was prefaced by an informed consent form and consisted of a cross-sectional questionnaire used during one online study. It was allowed for respondents to quit the study at any given time for no specified reason. Participants were also informed of their anonymity of their responses, with no personally identifiable information, like IP addresses, being collected.

The questionnaire which was created by the researchers took approximately five to ten minutes to complete. Therefore, reliability and validity will have to be checked for, due to the lack of professional peer review of the study conditions. The recruitment procedure was carried out by students from the Individual Differences in Emotion Dynamics bachelor thesis group at the University of Groningen, who distributed the study using their personal network

in WhatsApp groups, on Instagram and on Facebook. Prior to data collection, participants were provided information about the study after which they could either choose to give consent or discontinue the study. The other requirements for the participation and data collection were being older than 16 years old and being a citizen of the European Union. If either one was not the case for the subject, they were immediately brought to the end of the study and thereby excluded from participating. Participants were informed about potentially sensitive topics, for example risky behaviour and parenting styles, before taking part in the study.

### **Stimuli, Materials, and/or Apparatus**

The data for our current study was collected by means of a Qualtrics questionnaire ([https://rug.eu.qualtrics.com/jfe/form/SV\\_86BEHlu4oVXa43I](https://rug.eu.qualtrics.com/jfe/form/SV_86BEHlu4oVXa43I)), consisting of items that were developed by the authors (**see Appendix A**) themselves. As the items currently lack professional peer review, their reliability and validity are addressed in the following sections of this paper. In general, the main themes addressed in the questionnaire were parenting style, coping behaviour, emotion regulation, risky behaviour, personality assessment, negative affect and emotions augmentation. Most questions used a slider-scale format from zero to 100, with labels added at the middle-point, as well as extremities of the scale. This format was adopted to facilitate intuitive and comprehensive answering from participants, as well as for analysis purposes. An attention check was included, and the questionnaire items were spread and grouped over multiple pages to help maintain participant attention.

### **Negative emotion scale**

For improved reading, variables have been renamed in the text. “Emotion augmentation (EA)”, which was measured by question 14 in the questionnaire, “melancholia” for the frequency of Melancholia (question 27) and “negative affect” which was measured by question 26. All measurements were single item scales. One measured negative affect, the other measured melancholia. In both cases, the participants had to state how frequently they

experienced the aforementioned emotional state within the past month. This was assessed on a continuous scale, where zero represented “never”, and 100 stood for “always”.

### **Emotion augmentation scale**

One item measured emotion augmentation using a continuous scale from zero (little) to 100 (considerably). Participants were asked to indicate the increase in intensity of their perceived emotional experience, when thinking about emotions that augment each other.

## **Results**

### **Participant attrition**

Out of the (184) participants, a total of (127) participants were included in the analysis, which means that 69.02% were used. (57) Fifty-seven participants were removed from the 184, since they either did not complete the study or failed the attention check. Three of the 57 were removed due to not answering the question on melancholia, failing to provide data on the variable of interest.

### **Post-hoc Power Analysis**

A post-hoc power analysis with an assumed small effect size ( $d = .036$ ) and  $n = 127$  showed a power of 10.6% (Faul, Erdfelder, Lang, & Buchner, 2007) for the effect of emotion augmentation. When regarding the effect size of negative affect on melancholia ( $d = .385$ ), the power analysis ( $n = 127$ ) indicated a power of 99.8% (Faul, Erdfelder, Lang, & Buchner, 2007). Lastly, checking the effect of emotion augmentation on negative affect ( $d = .067$ ), a power of 18.6% could be established ( $n = 127$ ).

### **Correlations**

Correlations of the studied variables are presented in **Table 1**. Negative affect and melancholia show a significant moderate correlation, indicating decent validity of both measurements. Emotion augmentation has significant, low correlation with both melancholia ( $r = .208$ ;  $p = .019$ ) and negative affect ( $r = .259$ ;  $p = .003$ )

### **Reliability measurements**

To separate these concepts, questionnaire items from other members of the research team have been used to establish reliability of Emotion augmentation and negative affect. For Emotion augmentation, Cronbach's  $\alpha$  of .659 has been found (using Q13, Q14, Q22). For negative affect, a Cronbach's  $\alpha$  of .64 has been found (using Q19, Q26, Q27).

### **Emotion augmentation on Melancholia**

To establish whether high values of emotion augmentation would predict Melancholia, a linear regression was performed. For linear regression to be interpretable, the assumptions of independence, linearity, homoscedasticity, and normality should hold up. For the linear regression of emotion augmentation on melancholia, the assumption of independence is being upheld due to the research design. Additionally, linearity also holds up, as a clear linear trend can be observed in the plot. Homoscedasticity of the residuals is also given when looking at the corresponding residual plot, showing no pattern. When checking for normality of the residuals, the Q-Q plot shows slight violations, making interpretation a bit more problematic. However, as these violations are only minor, interpretability doesn't suffer. The distributions of the variables of interest are also roughly normal, with kurtosis and skewness for every variable falling into an acceptable range (EA: kurtosis = -.099; skewness = -.439; negative affect: kurtosis = -1.078; skewness = .112; Melancholia: kurtosis = -.612; skewness = .713) of -2 and +2 for univariate distributions (George & Mallery, 2010).

While the effect of emotion augmentation on Melancholia was significant, it has a very small effect size ( $R^2=.043$ ;  $F=5.653$ ;  $p=.019$ ). The intercept of the regression was 13.879 ( $t=1.994$ ;  $p=.049$ ) with its regression coefficient being 0.258 ( $t=2.378$ ;  $p=.019$ ) The 95% CI regarding the intercept was [0.106; 27,651], with 95% CI around the regression coefficient being [0.043; 0.473]. Even though effect size may be small, hypothesis I was supported in predicting melancholia with emotion augmentation.

### **Emotion augmentation on negative affect**

When performing linear regression for emotion augmentation, the same assumptions must hold as in the first linear regression. The research design accounts for the independence of observations being upheld. Linearity can also clearly be seen and is the second assumption that holds. When looking at the homoscedasticity of the residuals, the corresponding residual plot shows no discernible pattern and thus, the assumption holds as well. Lastly, checking for normality, again, reveals minor deviations but still falls into acceptable ranges for interpretation. As to establish further validity of the measurement, linear regression was also performed regressing emotion augmentation on negative affect. Effect size was small and significant ( $R^2=.067$ ;  $F=9.014$ ;  $p=.003$ ) The intercept of this regression was 24.602 ( $t=3.786$ ;  $p<.001$ ) with the corresponding regression coefficient being 0.304 ( $t=3.002$ ;  $p=0.003$ ). 95% CI around the intercept amounted to [11.742; 37.463], while the regression coefficient had a 95% CI [0.104; 0.505]. This supports hypothesis II in that emotion augmentation significantly predicts negative affect.

## Discussion

In the present study, the effect of emotion augmentation on Melancholia was investigated. The hypothesis was, that higher values of emotion augmentation predict an increased frequency of melancholia. While depression, and by extent melancholic depression, is characterized by affective flattening or emotional blunting, emotion dynamics regard the temporal trajectory of emotions (Kuppens, & Verduyn, 2017). Thus, people with higher degrees of emotion augmentation should, in theory, display more frequent bouts of melancholia. The results of the study support this notion, as individuals with higher levels of emotion augmentation reported feeling melancholic more often. Furthermore, given the definition of the DSM-V (American Psychiatric Association, 2013) of melancholic depression, we expect the data to represent that concept measurements were accurate for negative affect and melancholia. Lastly, if we expect emotion augmentation to predict melancholia, we would assume that emotion augmentation should also be able to predict

negative affect. While negative affect and melancholia are different concepts, they are hard to separate from each other. This is due to negative affect being a common predictor of depression and melancholic depression, but depression also being characterized by the increase in negative affect (American Psychiatric Association, 2013).

The results of the study provided evidence for the main hypothesis, showing that people with higher levels of emotion augmentation experienced melancholia more frequently. A one-unit increase in emotion augmentation was associated with an increase of melancholia by a small amount ( $\beta = .258$ , 95% CI: .043; .473). However, given that the effect size was only about 4%, we cannot yet conclude that it would be beneficial to put more emphasis on it in clinical treatment. While it gives an indication of further research being interesting and fruitful, 4% may not be enough to be practically relevant. This small effect may be due to the general assessment of emotion augmentation. When focusing on more specific emotions and how they predict each other, we may see an increase in the effect size. To be sure to classify emotion augmentation as a transdiagnostic feature, network analysis would have to use this more accurate measure and see if integration provides significant effect sizes. Accordingly, CBT could put more emphasis on emotion-regulation training as to lessen the effects of emotion augmentation on melancholia. After identifying more specific emotions (or their components), CBT could then integrate more interventions applying to the identified emotions (e.g., sadness), which should increase treatment effectiveness. Furthermore, negative affect has, again, been supported as a significant predictor for melancholic depression, with a moderate correlation ( $r = .625$ ). This was to lend support to the validity of the measurement of melancholia. Lastly, the hypothesis was tested that emotion augmentation could predict negative affect. Results show a similar effect size ( $R^2 = .067$ ) compared to the prediction of melancholia, supporting validity of both the measurement of negative affect, as well as melancholia. Accordingly, this provides another avenue of research for learning about negative affect through the lens of specific emotions (e.g., sadness, anger, envy) and their

resulting augmentations. As mentioned earlier, when using more specific emotions to predict melancholia, we might find more relevant effect sizes. This would also apply to negative affect, as negative affect is a very general description of a broad spectrum of emotions. When taking individual components of negative affect and trying to predict them with specific emotions, we may find a lot more conclusive evidence for the effect of emotion augmentation.

### **Strength and Limitations**

The biggest issue with this study is its simplistic assessment of the investigated concepts. Every concept (emotion augmentation, melancholia, negative affect) was measured using only one scale each. This limitation informs the rest of this section. One major limitation of the study is in its assessment of emotion augmentation. As it deals with the prediction of emotion components across time, a sensible option to study this phenomenon would be a cross-lagged correlation between emotions across time (Kuppens & Verduyn, 2017). As this method falls beyond the scope of a Bachelor thesis, an effort was made to conceptualize the questionnaire item in a way that would capture the interaction between emotions independent of time measurements. Future research may look into rectifying this flaw by choosing a cross-sectional questionnaire design, so multiple data points across time are available for analysis and interpretation. Another limitation is the conceptualization of emotion augmentation itself. While it may authentically measure emotion augmentation, correlation between this measurement and measurements of negative affect suggested that it may measure negative affect. However, as correlation was only weak ( $r = 0.259$ ), this might indicate a relationship between negative affect and emotion augmentation rather than the item being contaminated. Following research might put a bigger focus on establishing the nature of the relationship between negative affect and emotion augmentation. One thing to keep in mind is that this study investigates the effect of emotion augmentation on melancholia, with melancholia being defined as a state of depression. However, the sample that was used was not a clinically depressed sample, but a healthy one. This means, that the observed effect

might not accurately represent the real effect emotion augmentation has on a clinically depressed patient. Lastly, the sample consisted in large parts of women in their 20s, restricting generalizability to the population. As an inclusion criterion of the study was being a citizen of the EU, the study only generalizes to EU citizen, with more confidence when regarding women than men. Different cultures may display different patterns in emotion dynamics, which subsequently may alter results.

### **Theoretical and Practical Implications**

When regarding theoretical implications, this study supports a dimensional approach to the understanding of melancholia. Earlier literature defined melancholia as a subcategory of depression characterized by a lesser likelihood of antecedent stressors (Parker et al., 2013). The same study also concluded that melancholia should be regarded as a categorical concept. However, results of our study directly contradict these findings, as they support antecedent stressors, namely the degree of emotion augmentation, as a predictor for melancholia. Furthermore, by identifying a possible relationship between emotion augmentation and negative affect, additional avenues of research open up for the psychiatric treatment of depression and melancholia. The DSM-V (American Psychiatry Association, 2013) describes the chronicity of depressive symptoms as increasing the likelihood of an underlying personality disorder (p. 156). Furthermore, negative affectivity has also been linked to the development of a major depressive disorder (p. 166), making the possible relationship between negative affect and emotion augmentation even more relevant to explore in further depth. This study is also the first to investigate the direct relationship between emotion augmentation and melancholia, adding an updated approach to the understanding of melancholia.

The practical implications concern clinician-practitioners that seek to find a different or additional approach to treating unipolar, or melancholic, depression. By providing an additional variable that influences the frequency of depression with the mechanism of



emotion dynamics, integrative therapies such as CBT may place more emphasis on the training of emotion regulation as to prevent the development of depression. It might also help in treating already depressed individuals by educating them about the possible antecedents to their depression and factors that prolong it.

### **Conclusions**

The present study confirms two demonstratable findings on melancholia. First, individual differences in emotion augmentation are partly responsible for the frequency of melancholia, with higher levels of emotion augmentation predicting more frequent melancholic experiences. Furthermore, negative affect has been reaffirmed as a significant predictor of melancholia, supporting existing literature. Additionally, emotion augmentation has been found to be a significant predictor for negative affect. While the findings give further insight into the complexity of depression, its development, and maintenance, the study also suffers from the following restrictions. Severe time- and resource issues were limiting to accurate measurement of the variables of interest. As the only type of data collection available was a self-report questionnaire, generalizability and validity of the measurement are limited. For generalizability and validity to improve, further research is necessary. By taking measurements of negative affect, it has again been implicated as a good predictor for melancholic depression. The specific effect that emotion augmentation may have will have to be further investigated in future studies.

## References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders : DSM-5*. American Psychiatric Association.
- Brose, A., Smiedek, F., Koval, P., & Kuppens, P. (2015). Emotional inertia contributes to depressive symptoms beyond perseverative thinking. *Cognition and Emotion, 29*(3), 527-538.
- De Longis, E., Alessandri, G., Sonnentag, S., & Kuppens, P. (2021). Inertia of negative emotions at work: Correlates of inflexible emotion dynamics in the workplace. *Applied Psychology, 71*, 380-406.
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G\*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175-191.
- Fredrickson, B. L., & Joiner, T. (2002). Positive emotions trigger upward spirals toward emotional well-being. *Psychological Science, 13*, 172– 175.  
<http://dx.doi.org/10.1111/1467-9280.00431>
- George, D., & Mallery, M. (2010). *SPSS for Windows Step by Step: A Simple Guide and Reference, 17.0 update (10a ed.)*. Boston: Pearson.
- Joyce, P. R., Mulder, R. T., Luty, S. E., McKenzie, J. M., Sullivan, P. F., Abbott, R. M., & Stevens, I. F. (2002). Melancholia, definitions, risk factors, personality, neuroendocrine markers and differential antidepressant response. *Australian and New Zealand Journal of Psychiatry, 36*, 376-383.
- Koval, P., Sütterlin, S., & Kuppens, P. (2016). Emotional Inertia is Associated with Lower Well-Being when Controlling for Differences in Emotional Context. *Frontiers of Psychology, 6*:1997.
- Kuppens, P., & Verduyn, P. (2015). Looking at Emotion Regulation Through the Window of Emotion Dynamics. *Psychological Inquiry, 26*, 72-79.
- Kuppens, P., & Verduyn, P. (2017). Emotion dynamics. *Current Opinion in Psychology, 17*, 22-26.
- Kuppens, P., Sheeber, L. B., Yap, M. B., Whittle, S., Simmons, J. G., & Allen, N. B. (2012). Emotional inertia prospectively predicts the onset of depressive disorder in adolescence. *Emotion, 12*, 283-289.
- Larsen, R. J., Augustine, A. A., & Prizmic, Z. (2009). A process approach to emotion and personality; Using time as a facet of data. *Cognition and Emotion, 23*, 1409-1426.
- Lewis, M. D. (2005). Bridging emotion theory and neurobiology through dynamic systems modeling. *Behavioral and Brain Sciences, 28*, 169-194.
- Moors, A. (2014). Flavors of Appraisal Theories of Emotion. *Emotion Review, 6*(4), 303-307.

- Parker, G., & Spoelma, M. (2021). Melancholia defined with the precision of a machine. *Journal of Affective Disorders*, 282, 69-73.
- Parker, G., McCraw, S., Fletcher, K., Friend, P., & Futeran, S. (2013). Validation of a new prototypic measure of melancholia. *Comprehensive Psychiatry*, 835-841.
- Scherer, K. R. (2009). The dynamic architecture of emotion: Evidence for the component process model. *Cognition and Emotion*, 23, 1307-1351.
- Taylor, M. A., & Fink, M. (2006). *Melancholia : The Diagnosis, Pathophysiology and Treatment of Depressive Illness*. Cambridge University Press.
- Tracy, J. (2014). An Evolutionary Approach to Understanding Distinct Emotions. *Emotion Review*, 6(4), 308-312.
- van de Leemput, I. A., Wichers, M., Cramer, A. O., Borsboom, D., Tuerlinckx, F., Kuppens, P.,... Scheffer, M. (2014). Critical slowing down as early warning for the onset and termination of depression. *Proceedings of the National Academy of Sciences of the United States of America*, 111, 87–92. <http://dx.doi.org/10.1073/pnas.1312114110>
- Watson, D., Clark, L. A., & Carey, G. (1988). Positive and negative affectivity and their relation to anxiety and depressive disorders. *Journal of Abnormal Psychology* 97(3), 346-353.
- Wichers, M. (2014). The dynamic nature of depression: A new micro-level perspective of mental disorder that meets current challenges. *Psychological Medicine*, 44, 1349-1360.

**Table 1***Correlation table*

|   |                      | 1.    | 2.     | 3.      | 4. |
|---|----------------------|-------|--------|---------|----|
| 1 | Age                  | -     |        |         |    |
| 2 | Emotion augmentation | -.121 |        |         |    |
| 3 | Melancholia          | -.103 | .208** |         |    |
| 4 | Negative affect.     | -.083 | .259** | .625*** |    |

**Table 2***Linear Regression of Emotion augmentation on Melancholia*

| Model          |             | Unstandardized | Standard Error | Standardized | t      | p      | 95% CI |        |
|----------------|-------------|----------------|----------------|--------------|--------|--------|--------|--------|
|                |             |                |                |              |        |        | Lower  | Upper  |
| H <sub>0</sub> | (Intercept) | 29.661         | 2.127          |              | 13.948 | < .001 | 25.453 | 33.870 |
| H <sub>1</sub> | (Intercept) | 13.879         | 6.959          |              | 1.994  | 0.048  | 0.106  | 27.651 |
|                | Q14_1       | 0.258          | 0.109          | 0.208        | 2.378  | 0.019  | 0.043  | 0.473  |

*Note: DV: Melancholia, IV: Emotion augmentation*

**Table 3***Model Summary - Melancholia*

| Model          | R     | R <sup>2</sup> | Adjusted R <sup>2</sup> | RMSE   | R <sup>2</sup> Change | F Change | df1 | df2 | p     |
|----------------|-------|----------------|-------------------------|--------|-----------------------|----------|-----|-----|-------|
| H <sub>0</sub> | 0.000 | 0.000          | 0.000                   | 23.966 | 0.000                 |          | 0   | 126 |       |
| H <sub>1</sub> | 0.208 | 0.043          | 0.036                   | 23.535 | 0.043                 | 5.653    | 1   | 125 | 0.019 |

**Table 4**  
*Linear Regression of Emotion augmentation on Negative Affect*

| Model          |             | Unstandardized | Standard Error | Standardized | t      | p      | 95% CI |        |
|----------------|-------------|----------------|----------------|--------------|--------|--------|--------|--------|
|                |             |                |                |              |        |        | Lower  | Upper  |
| H <sub>0</sub> | (Intercept) | 43.213         | 2.011          |              | 21.486 | < .001 | 39.233 | 47.193 |
| H <sub>1</sub> | (Intercept) | 24.602         | 6.498          |              | 3.786  | < .001 | 11.742 | 37.463 |
|                | Q14_1       | 0.304          | 0.101          | 0.259        | 3.002  | 0.003  | 0.104  | 0.505  |

*Note: DV: Negative affect, IV: Emotion augmentation*

**Table 5**  
*Model Summary - Negative affect*

| Model          | R     | R <sup>2</sup> | Adjusted R <sup>2</sup> | RMSE   | R <sup>2</sup> Change | F Change | df1 | df2 | p     |
|----------------|-------|----------------|-------------------------|--------|-----------------------|----------|-----|-----|-------|
| H <sub>0</sub> | 0.000 | 0.000          | 0.000                   | 22.665 | 0.000                 |          | 0   | 126 |       |
| H <sub>1</sub> | 0.259 | 0.067          | 0.060                   | 21.977 | 0.067                 | 9.014    | 1   | 125 | 0.003 |



## Appendix A

### Questionnaire Survey Emotion Dynamics

|                 |  |
|-----------------|--|
| Age             |  |
| Gender          | Male/Female/Non-binary/Prefer not to say |
| Nationality     | EU citizen/ non EU citizen               |
| Gender Parent 1 | Male/Female/ Non-binary                  |
| Gender Parent 2 | Male/Female/ Non-binary                  |

|   |   |
|---|---|
| Think about <b>your childhood</b> and how you grew up over the years... |   |
| How did you perceive your parents combined parenting style to be ?      | 0 = Very neglectful; 50 = Balanced; 100 = Very overprotective |
| How did you perceive the parenting style of <b>Parent 1</b> to be?      | 0 = Very neglectful; 50 = Balanced; 100 = Very overprotective |
| How did you perceive the parenting style of <b>Parent 2</b> to be?      | 0 = Very neglectful; 50 = Balanced; 100 = Very overprotective |

|  |  |
|--|--|
| How well did you deal with negative emotions when you were younger ? (age 12-18) | 0 = Not well at all; 50 = Average 100 = Exceptionally well |
| How well did you deal with negative emotions from age 19 to today?               | 0 = Not well at all; 50 = Average 100 = Exceptionally well |

|   |  |
|---|--|
| Once faced with an anxious, depressive otherwise negative emotion: How much does it affect your mood throughout the day ? | 0 = Little; 50 = Average; 100 = Considerably |
|---|--|

|  |  |
|--|--|
| Think about a situation in which emotions might have augmented each other (e.g. anxiousness making you more irritated and irritation contributing to anger). How much did the intensity of your emotional experience increase? | 0 = Little; 50 = Average; 100 = Considerably |
|--|--|

|  |  |
|--|--|
| Think about your mood/lifestyle <b>in the last month</b> . Determine whether you agree or disagree with the following statement. |  |
| If I am sad, the feeling passes quickly and I do not feel sad anymore.   | 0 = Strongly disagree; 50 = Neither agree nor disagree; 100 = Strongly agree |
| When I'm sad, I believe there is nothing I can do to make me feel better.  | 0 = Strongly disagree; 50 = Neither agree nor disagree; 100 = Strongly agree |
| I can manage my emotions as well as I would like to.   | 0 = Strongly disagree; 50 = Neither agree nor disagree; 100 = Strongly agree |
| When I am sad, I extensively analyze my emotions' causes, manifestations or consequences.  | 0 = Strongly disagree; 50 = Neither agree nor disagree; 100 = Strongly agree |
| When I am sad I want to resolve the feeling as soon as possible.   | 0 = Strongly disagree; 50 = Neither agree nor disagree; 100 = Strongly agree |
| When I am sad I know exactly what to do to resolve this feeling.   | 0 = Strongly disagree; 50 = Neither agree nor disagree; 100 = Strongly agree |
| I am someone who gets easily nervous.  | 0 = Strongly disagree; 50 = Neither agree nor disagree; 100 = Strongly agree |
| When confronted with a task I tend to do it immediately and thoroughly.  | 0 = Strongly disagree; 50 = Neither agree nor disagree; 100 = Strongly agree |
| I see myself as outgoing and sociable.   | 0 = Strongly disagree; 50 = Neither agree nor disagree; 100 = Strongly agree |

|  |
|--|
| Think about your mood/lifestyle <b>in the past month</b> . This section will be concerned with the <i>frequency</i> of your experiences. |
|--|

|  |   |
|--|---|
| How often did you experience negative emotions, e.g. sadness?  | 0 = Never, 50 = About half the time; 100 = Always |
| How often did you experience Melancholia (defined as a state of deep or deliberating sadness)?   | 0 = Never, 50 = About half the time; 100 = Always |
| How often do you pay attention? If you're paying attention now, answer with 60.  | 0 = Never, 50 = About half the time; 100 = Always |
| How often did you engage in risky driving behavior (e.g. speeding, drink-drive, unfastening of a seat belt, driving while feeling sleepy, and highway code violations) when feeling sad? | 0 = Never, 50 = About half the time; 100 = Always |
| How often did you engage in risky driving behavior to reduce feelings of sadness?  | 0 = Never, 50 = About half the time; 100 = Always |
| How often did you engage in aggressive behavior (e.g. acts of physical violence, shouting, swearing, and harsh language) when feeling sad?   | 0 = Never, 50 = About half the time; 100 = Always |
| How often did you engage in aggressive behavior to reduce feelings of sadness?   | 0 = Never, 50 = About half the time; 100 = Always |
| How often do you engage in substance use (alcohol, drugs) when feeling sad?  | 0 = Never, 50 = About half the time; 100 = Always |
| How often do you engage in substance use to reduce feelings of sadness?  | 0 = Never, 50 = About half the time; 100 = Always |
| How often do you engage in sexual risky behaviour (unprotected sex, multiple sex partners) when feeling sad?   | 0 = Never, 50 = About half the time; 100 = Always |
| How often do you engage in sexual risky behaviour to reduce feelings of sadness?   | 0 = Never, 50 = About half the time; 100 = Always |