



MASTER THESIS

# The Relation between Happiness and Anger in Daily Life: An Experience Sampling Study

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15.08.2021

## Abstract

**Background.** Happiness and anger represent daily emotional experiences for most people. While happiness can be associated with good mental and physical health, anger stands in relation to several mental and physical diseases. Nonetheless, anger can be beneficial, for example in overcoming obstacles, if regulated effectively. This leads to the question how happiness and anger are associated in daily life. **Objective.** The present study aimed to provide insight to the relation of happiness and anger on momentary state dimension and the more stable trait dimension, which reflects the tendency to experience a certain state emotion more frequently. It was further investigated whether trait happiness is better predicted by average levels of state anger or by a lack of instant anger regulation resulting in a tendency for state anger persistence. For the understanding of state anger, it was researched whether it can be explained by happiness in a between- or within person association. **Method.** In the present online experience sampling study 53 participants answered trait questionnaires for happiness and anger on their private mobile devices at the beginning of the study. Subsequently, participants rated their state levels of happiness and anger four times a day over the course of one week. **Results.** A weak significant negative relation for trait happiness and trait anger ( $r = -.361, p = .008$ ) and a moderately strong significant negative relation for trait happiness and average state anger ( $r = -.410, p = .002$ ) could be indicated, while no significant association was found for trait anger and average state happiness. State anger persistence could not be shown to predict trait happiness in a linear or cubic regression model. Multilevel analysis indicated state anger to be negatively predicted by happiness in a between- as well as in a within person association ( $\beta = -.42, SE = .022, p < .001, CI_{95}[-.46; -.38]$ ;  $\beta = -.45, SE = .023, p < .001, CI_{95}[-.49; -.41]$ ) with approximate moderate strength. **Conclusion.** The findings of a negative relationship of happiness and anger on both state and trait dimension can find practical implementation in anger management and communication strategies. Deeper insight to the underlying mechanisms of these relations need to be shown by future research, in which it is advised to disaggregate between different emotion regulation strategies as they might be crucial to further specify the happiness-anger relationship.

**Keywords.** Emotions, Anger, Happiness, State, Trait, Experience Sampling Method,

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## **Happiness and Anger in Daily Life**

The philosopher and writer Ralph Waldo Emerson (1803-1882) once stated that for every angry minute, you lose 60 seconds of happiness. This subtly implies that it is not possible to be happy and angry at the same time. Furthermore, it indicates that not being happy is a loss and that happiness should be valued higher and be strived for. His quote gives rise to the questions whether these assumptions can hold true and what is already known about happiness and anger and their relation to each other. The present paper aims to answer these questions by investigating the happiness-anger relationship

Both happiness and anger are basic emotions (e.g. Izar, 2011; Panksepp & Watt, 2011; Levenson, 2011). Basic emotions are considered to be discrete and therefore refer to clearly distinguishable entities, which provide the basis on which all the other emotions emerge from (Ekman & Cordaro, 2011). While sometimes different emotions are considered to be basic, Tracy and Randles (2011) found an overlap in all respected studies within a literature study identifying sadness, fear, anger and happiness as basic emotions. Especially sadness and fear have been of major interest in research, while anger was disregarded for large parts (Deffenbacher et al., 1996). Happiness as the only pleasant basic emotion has always attracted interest and desire in humanity, however interest in happiness research has just aroused recently during the last decades (Veenhoven, 2003). Therefore, less is known about the relation of happiness and anger.

To lay the theoretical basis for the present study, the state-trait differentiation of emotion is introduced in the following. While a certain emotion can refer to a psychological state, certain emotions also have a trait component such as anxiety or anger (Spielberger et al., 1983; Spielberger, 2010), which means that an individual is more prone to experience this specific state emotion. Trait and state emotions reflect independent processes (Russel et al., 1999 as cited in Williams, 2017). The role of the trait component is highlighted in the latent state-trait theory (Steyer, Schmitt, & Eid, 1991) that integrates the arise of emotions in a contextual framework by proposing “that human (...) emotions (...) depend systematically on characteristics of the person (traits), characteristics of the situation and the interaction between person and situation” (p. 391).

## **Happiness**

Desirable outcomes related to happiness are healthy social relationships, advanced levels of prosocial behaviour, successful achievement outcomes (Diener et al., 2009), good general health (Diener et al., 2009; Roysamb et al., 2003; Okun et al., 1984) and longevity in

healthy populations (Veenhoven, 2008). Furthermore, Fredricksons broaden and built theory (e.g. 2013) points out how positive emotions, contrary to negative emotions, can initiate an upward spiral by broadening the perception and the scope for thought-action repertoires, which offer the chance to build resources and therefore to experience even more pleasant emotions.

Even though advantages of happiness can clearly be highlighted, happiness can be dysfunctional when being experienced on an inappropriate level or in the wrong context (Gruber et al, 2011). Levels of happiness that are too high can result in mania or hypomania (Gruber et al, 2011, Nesse, 2004) and the absence of negative affect paired with high positive affect can possibly be linked to psychopathy (Bentall, 1992). When being in danger, activation of unpleasant emotions such as anger or fear prepare the individual in a more functional way to protect itself. In social situations happiness can block out emotions such as guilt or shame and may lead the individual to behave in a socially inappropriate way, which can impair its social acceptance and even lead to exclusion by others (Gruber et al, 2011). Therefore, Nesse (2004) emphasizes that even though happiness might feel highly pleasant, it is best understood within its action-motivational and behaviour-inducing context, but not as an overall goal.

### **State and Trait Happiness**

The state-trait differentiation of happiness explains why certain situations do not cause the same amount of happiness in every individual and why regardless the situation some individuals experience more frequent moments of happiness than others (Chamorro-Premuzic et al., 2007). In this regard state happiness is the transitory subjective experience of positive affect in response to a momentary condition or event in the environment (Csikszentmihalyi & Wong, 1991). It is a state of “liking without wanting” in absence of disruptive desires (Kringelbach & Berridge, 2009, p. 675). Trait happiness on the other hand refers to a condition that is relatively stable over time and consistent across situations (Stones et al., 1995). Interestingly, situations that cause great amounts of positive affect are not decisive for long lasting happiness. Brickmann and colleagues (1978) could show that winning the lottery caused smaller positive affect in response to everyday events and that happiness evoked by the lottery win lasted for only a few weeks. This indicates that long-term happiness is mainly caused by features of the person instead of the situation, respectively by certain traits for happiness. There is no close relation between intense positive affect of state happiness and long-term happiness as described in trait happiness (Diener et al., 1991). Instead, trait happiness refers to the tendency to experience state happiness with a higher frequency, but not higher in intensity. Following Lyubomirsky et al. (2005) trait happiness is determined by circumstantial factors, which account for 10% trait happiness variance, intentional voluntary activities a person

engages in to sustain the level of happiness, which account for 40% variance in trait happiness and a genetically determined set point for happiness, which accounts for the largest part of 50% of trait happiness variance.

It needs to be emphasized that being precise in giving unambiguous definitions is of particular importance in happiness research, because terms like joy, delight, bliss, contentment as well as well-being, satisfaction with life or quality of life have often been used interchangeably (Layard, 2010 as cited in Bartels, 2015). As a basic emotion happiness is the basis for all conceptually related state emotions. Therefore, state happiness is simply defined and conceptualized as the current experience of a happy mood, which can incorporate feelings of joy, delight, bliss or contentment. The conceptualization of trait happiness allows for greater discrepancy. Therefore, Aristotle's (468-403 B.C.) differentiation of hedonia and eudaimonia is introduced. Hedonia, which is about the experience of positive affect, absence of negative affect and which highlights pleasure in particular, has been conceptualized in happiness research as subjective well-being (Ryff, 1989) or life satisfaction (Diener et al., 1999). Eudaimonia which goes beyond that and adds the idea of a purpose of life by highlighting aspects such as self-acceptance, personal growth, relations with others, autonomy, mastery of life and achievement of life goals has been conceptualized as psychological well-being (Ryff 1989) and is represented in the self-determination theory (Ryan & Deci, 2000). The constructs of hedonia and eudaimonia are distinct (Di Fabio & Palazzeschi). Likewise, subjective well-being and psychological well-being are “conceptually related, but empirically distinct streams of psychological functioning.” (Huta & Ryan, 2010 as cited in Alexander et al., 2021, p. 223). Nevertheless, hedonia and eudaimonia correlate highly and influence each other (Keyes et al., 2002; Waterman, 1993 as cited in Bartels, 2015), just as overall well-being, life satisfaction or general positive affect (Bartels, 2015). The present study uses the hedonic conceptualization of trait happiness as subjective well-being, which is of greater relevance as it highlights the frequent experience of state happiness, which will likewise be investigated. Relevant components of subjective well-being are life satisfaction, satisfaction regarding important life domains, high amounts of positive affect and low levels of negative affect (Diener et al., 2009).

### **Anger**

At a basic level anger can be defined as “an emotional state that varies in intensity, from mild irritation or annoyance to intense fury and rage” (Darwin cited in Spielberg & Reheiser, 2009, p. 403). There is a wide range of possible triggers for anger such as “cost imposition, inattention, anger from another, insufficient reciprocity, insufficient praise, another's ignorance

of your achievements” (Sell 2011, p. 382), disconfirmation of expectations (Ellis & Tafrate, 1997 as cited in DiGiuseppe & Froh, 2002), insults and threat to self-esteem (Izard, 1977; Kemper, 1987; Kliewer, 1986 as cited in DiGiuseppe & Froh, 2002). In healthy individuals the duration of anger experiences varies from several minutes up to a few hours and occurs once or twice a week (Kassinove et al., 1997). Anger is seen as a necessary instrument to build a sense of personal consistency and autonomy and to stick to certain goals even in the face of failure (Mahler et al., 1975; Kohut, 1977 as cited in Williams, 2017).

Whether anger serves the individual or not depends much on its handling and regulation of this emotion (Tamir et al., 2008). Anger can motivate to overcome obstacles and reach goals (Panksepp, 1998; Mahler et al., 1975 cited in Williams, 2017), but furthermore it also increases optimism regarding success, promotes confidence and leads people to engage in greater risk (Gordon et al., 2016). When not regulated in a constructive way, anger can produce certain problems. It can have harmful impact in the social context, stands in relation to physical and mental health problems and can bare risks such as imperilled road safety in anger driving (Abdu et al., 2012). Uncontrolled anger can go along with socially unacceptable and stigmatising emotional outbursts (Kassinove & Sukhodolsky, 1995). Furthermore, it can end up in aggression and lead to domestic violence (Maiuro et al., 1988). Physical health can badly be influenced by resulting in cardiovascular disease (Siegman & Smith, 1994) and hyperactivation of anger can be linked to several mental health disorders (Williams, 2017).

### **State and Trait Anger**

State anger is defined as the transitory feeling of being angry, that can vary in duration and intensity and produces physiological reactivity (Spielberger et al., 1983). It is a universally shared and temporary emotional-physiological condition in response to an immediate situation (Deffenbacher, 1996). The psychophysiological activation that is present in state anger enables the organism to overcome certain obstacles more vigorously, which promotes the achievement of the individual's goal (Williams, 2017). When controlled, functional state anger heightens motivation and increases optimism regarding success (Szasz et al., 2011). Cognitive appraisal could be shown to be effective in managing state anger while repression does not cause a decrease (Szasz et al., 2011).

Trait anger in contrast represents a relatively stable personality dimension that describes how frequently an individual is triggered to experience state anger, how intense the emotion becomes and how long it lasts (Deffenbacher, 1996; Quinn et al., 2014). The amount of trait anger differs in every individual (Lievaart et al., 2016). High levels of trait anger are strongly correlated with increased levels of aggression and aggressive behaviour as well as with risk

taking behaviour (Deffenbacher et al., 2003; Gordon et al., 2016). In addition, individuals that score high on trait anger tend to show more dysfunctional and maladaptive coping with state anger (Quinn et al., 2014) and interpret certain situations in a more negative way (Gordon et al., 2016). Consequences of high trait anger are lower self-esteem, decreased perception of social support, proneness to suicidal ideation and greater alienation from school or university (Quinn et al., 2014). This illustrates how high levels of trait anger can have a severe impact on well-being and the general quality of an individual's life (Hamdan-Mansour et al., 2012). In this regard, mental health issues like bipolar disorder or borderline, antisocial, narcissistic and paranoid personality disorder can be associated with high trait anger (Williams, 2017).

Deffenbacher et al. (1996) investigated the interplay of trait anger and state anger in adults by testing Spielberger's state-trait theory of anger. It could be shown that trait anger is associated with higher frequency and longer duration of state anger, stronger experience of state anger, greater proneness to state anger, more maladaptive state anger expression, specifically suppression and explosion and more frequent and more severe negative outcomes of state anger. Quinn et al. (2014) could show comparable results for adolescents.

### **Happiness and Anger**

The anger-happiness relation still remains uninvestigated for the greater part (Hong & Giannakopoulos, 1994). On the one hand, existing literature suggests a negative relation for happiness and anger. Harmon- Jones and colleagues (2009) could show a negative correlation of happiness and anger on momentary state-dimension in a laboratory test. Further research on trait dimension by Hong and Giannakopoulos (1994) indicates higher life satisfaction (eudaimonic conceptualisation) for lower levels of trait anger. Diong and Bishop (1999) find higher expressions of anger to be related to lower levels of psychological well-being (eudaimonic conceptualisation). Howard and colleagues (2010) could also show lower levels of psychological well-being (eudaimonic conceptualisation) and life satisfaction in relation to anger expression by physical and verbal aggression. However, it needs to be emphasized that anger and aggression are overlapping, but distinct constructs and that the confusion of both terms has caused unambiguity in the research landscape earlier. Therefore, these results should be handled with care when trying to tailor them to the trait anger - trait happiness relation. Furthermore, psychological well-being is not congruent with trait happiness as conceptualized in this paper (hedonic conceptualization). The concepts show an overlap, nevertheless they are distinct (Bartels, 2015).

On the other hand, beneficial consequences of anger have been described earlier, which

challenges the assumption of a negative relation of happiness and anger. Harmon-Jones and colleagues (2009) concede possible positive effects of anger on life satisfaction by pointing out an energizing effect of anger that can positively affect life satisfaction. Emotion regulation seems to be crucial in determining whether anger can serve the individual (Tamir et al., 2008). Nonetheless, it still remains unclear how these beneficial characteristics of anger can be linked to happiness. Healthy emotion regulation strategies can be linked to emotional stability (Kokkonen & Pullkinen, 2001), which in turn could be shown to be one of the highest predictors for trait happiness, conceptualised as subjective well-being (Kobylinska et al., 2020). To clearly estimate and understand the anger-happiness relation further research is inevitable, which gives rise to the present study.

### **Present study**

Regarding the association of anger and happiness on both trait and state dimension, the scientific landscape is lacking research for the greater part. The present research aims to fill this gap. As mentioned above previous research could show an inverse relation for trait anger and psychological well-being (eudaimonic conceptualisation). The present study aims to find out whether this association can be confirmed for anger and trait happiness, conceptualized as subjective well-being (hedonic conceptualisation), as well. For the relation on trait level it is hypothesized that individuals who score high on trait anger are more likely to score low on trait happiness (H1). In case that average state scores represent a reflection of the trait score, the same relation should be shown for these associations. It is hypothesized that trait anger and average state happiness have an inverse relation (H2), just like trait happiness and average state anger (H3).

It is assumed that helpful emotion regulation strategies help the individual to deregulate state anger more quickly and therefore lower the persistence to it, which in turn causes lower state anger autocorrelation. It is aimed to find out whether state anger autocorrelation is a suitable predictor for trait happiness. Furthermore, it is investigated whether this possible predictor might be even stronger than actual average state anger levels. It is hypothesized that state anger autocorrelation predicts trait happiness negatively and more strongly than average state anger (which also predicts trait happiness negatively (see H2)) (H4).

Lastly, it is investigated whether the state level relationship of anger and happiness is better described by a trait-like or a state-like association. Because the crucial role of personality traits for the arise of certain state emotions has been highlighted earlier and it could additionally be shown that sometimes numerous state emotions can be experienced simultaneously it is

hypothesized that state anger is better predicted by average state happiness as a between-subject association than by state happiness as a within-subject association (H5).

- H1: There is a negative association between trait anger and trait happiness.
- H2: There is a negative association between trait anger and average state happiness.
- H3: There is a negative association between trait happiness and average state anger.
- H4: The autocorrelation of state anger predicts trait happiness better than average state anger.
- H5: State anger is better predicted by average state happiness as a trait-like (between-subject) association than by state happiness as a state-like (within-subject) association.

### **Methods**

Data used in this paper was collected at two points in time. The first data set was collected in April 2020 and approved by the Behavioural, Management, and Social Science Committee of the University of Twente in 2020 (Nr: 200371). To analyse a bigger and therefore more robust sample additional data was collected from April to March 2021 by using the same survey and following the exact procedure as previously.

### **Design**

This study uses the experience sampling method (ESM). This methodology allows repeated assessment of momentary experiences in daily life over a period of time. It offers the advantage to collect data of participants in real time on different occasions within their natural environment (Conner & Mehl, 2015). While collection of cross-sectional data solely allows insights on interindividual between-subject level, the collection of longitudinal data that is gained in repeated measures as in ESM also enables the researcher to observe intraindividual fluctuations and to compare momentary experiences on within-subject level (Curran & Bauer, 2001). Furthermore, the ambulatory technique of real-time data collection in ESM avoids the occurrence of a memory bias, which is usually a major problem in self-report measures. While retrospective and trait-self-report techniques are linked to the remembering and the believing self respectively, ambulatory techniques gather momentary information provided by the experiencing self (Conner & Feldman Barrett, 2012).

## Participants

In total 83 participants joined the study of which 53 participants could be included in the final sample. The data collection in April 2020 included 29 participants and the data collection from March to April 2021 included 24 participants. For demographics regarding gender, nationality, occupation and age of the total and partial samples see Table 1.

Table 1

*Demographics of partial and total sample*

		2020	2021	Total
<i>N</i>		29	24	53
Gender	Female	24 (82.8%)	18 (75.0%)	42 (79.2%)
	Male	5 (17.2%)	5 (20.8%)	10 (18.2%)
	Other	--	1 (4.2%)	1 (1.9%)
Nationality	German	28 (96.6%)	23 (95.8%)	51 (96.2%)
	Dutch	--	1 (4.2%)	1 (1.9%)
	Other	1 (3.4%)	--	1 (1.9%)
Occupation	Student	17 (58.6%)	2 (8.3%)	19 (32.1%)
	Student + Working	10 (34.5%)	7 (29.2%)	17 (13.2%)
	Other	2 (6.9%)	15 (62.5%)	17 (32.1%)
Age	M (S.D.)	21,07 (1.13)	36.54 (13.44)	28.08 (11.88)
	Range	19-24	24-61	19-61

## Materials

The online survey tool *Ethica* was used to generate and provide the online survey. Data regarding six state items and four trait items were collected from each participant. For this study only the data collected by the questionnaires related to anger (state and trait) and happiness (state and trait) will be used.

### Ethica

*Ethica v.152* (<https://ethicadata.com>) is a platform, created to design online surveys that is provided via a web app or more commonly via a mobile app that is available for *iOS* or *Android* smartphones. Researchers need a research-account in *Ethica* to create a survey,

likewise participants need a participation-account (and the app downloaded) to take part in a certain survey. The *Ethica* app is able to send push notifications, following a certain trigger that is chosen by the researcher. In combination with the mobile use of the app, these characteristics make it possible to request data from participants in their natural environment, at several times a day and over the course of a short- or long-time period. Therefore, *Ethica* is especially suitable to conduct experience sampling studies. For the current study, data was collected four times a day and over the course of one week.

### Measures

#### Trait Questionnaires

**Trait Happiness.** The subscale Happiness, which is part of the AB5C (Bäckström et al., 2009; Mitchelson et al., 2009), was used to measure the individuals' level of trait happiness (see Appendix 1). It consists of 10 items, which needed to be answered on a five-point Likert scale, which ranged from 1 "very inaccurate" to 5 "very accurate". The questionnaire included items like "I look at the bright side of life". There were five items, which were reverse code scale items, such as "I often feel blue". Bäckström et al. (2009) could show good internal consistency ( $\alpha = .84$ ) and acceptable structural validity. For the present study a Cronbach's alpha of .81 could be shown.

**Trait Anger.** The subscale Anger, which is part out of four subscales of The Aggression Questionnaire (Buss & Perry, 1992), was used to measure the individuals' level of trait anger (see Appendix 2). It consists of seven items, which needed to be answered on a five-point Likert scale, which ranged from 1 "extremely uncharacteristic of me" to 5 "extremely characteristic for me". The questionnaire included items like "I have trouble controlling my temper". Scores on the questionnaire can range from 1 to 35. Higher scores indicated higher amounts of anger (Buss & Perry, 1992). Good internal consistency could be shown for the test (.72 up to .88). Cronbach's alpha scores were ranging from .83 up to .91. In addition, there was a good test-retest reliability of .72 (Hornsveld et al., 2008). For the present study a Cronbach's alpha of .81 could be shown.

#### State Questionnaires

**State Happiness.** Questionnaires designed to measure state happiness were not available. Therefore, the regarding item "I feel happy at the moment" was formulated by the researcher. It needed to be answered on a five-point Likert scale, which ranged from 1 "very inaccurate" to 5 "very accurate". Psychometric properties had not been investigated earlier. The split-half reliability was estimated for the state happiness item and the Spearman Brown test

(Eisinga, Grotenhuis & Pelzer, 2012) delivered a highly significant and good result of .701 ( $p < .001$ ).

**State Anger.** Questionnaires designed to measure state anger were not available. Therefore, the regarding two items “I am mad right now” and “I am irritated right now” were formulated by the researcher. They needed to be answered on a five-point Likert scale, which ranged from 1 “not at all” to 5 “very much so”. Psychometric properties had not been investigated earlier. Analyses have been conducted with the mean of both state anger items in order to work with just one state variable just like for state happiness. Split half reliability has been estimated for the state mean variable and the Spearman Brown test delivered a highly significant and good result of .759 ( $p < .001$ ).

### Procedure

Participants were recruited via social media. The link to the study was shared via WhatsApp and Facebook, where it has been dropped in certain groups that were established to bring together researchers and interested potential participants. For the first data collection, that took place in April 2020, the Test Subject Pool SONA of the University of Twente was used in addition to recruit participants. Students who joined the study via this way received one credit as compensation for their efforts. Participants who joined elsewhere did not receive any compensation.

To take part in the survey, participants had to download the app *Ethica* to their smartphones. Subsequently they had to create a participant account by using an e-mailaddress and a self-chosen password. To get access to the study participants had to use the specific code for this study to find it on *Ethica* or they could follow the direct link to it. Important information for participants regarding protection of data privacy, contact details of the researcher, a narrow description of the process and extent as well as general information on the studies content and goals were offered at the beginning. Afterwards participants were able to sign up. They were given a concrete process description and were then asked to fill in their demographics (age, gender, nationality, occupation). Trait dimension of happiness and anger were assessed in two distinct questionnaires. Starting from the following day, participants were asked to fill in their data within a fixed sampling on four occasions per day (9-10 am, 12-1 pm, 4-5 pm, 8-9 pm). As soon as the questionnaire was ready to be answered, participants received a push notification via *Ethica*. If tasks were not answered 30 minutes later, a second push notification was sent. Participants were given one hour to complete the questionnaires. If those were not filled in by then, the task was removed. As soon as participants had answered the last question, they

received a notification on the end of the study. They were thanked for their participation and encouraged to contact the researcher in case of remaining questions.

### Data Analysis

For data analysis *IBM SPSS Statistics 27* was used. The criterion to determine significance was set at  $\alpha < 0.05$  throughout the whole study for all statistical tests. In a first step, the data set was cleansed from participants who did not meet the requirements for inclusion. Earlier experience sampling studies have used a cut-off score between 50% (Connor & Lehmann, 2012) and 75% (Znir & Zohar, 2008). The mean response rate of the present study has been 73.89%. In order to include sufficient data on the one hand and to exclude participants whose response rate was notable below the mean, a cut of score of 64.29% (18 out of 28 timepoints answered) was defined.

Person mean (PM) scores were calculated for state happiness and state anger for each participant. By subtracting the PM-score from the original state-score of respectively state happiness and state anger for each measured timepoint and every participant, person-mean-centred (PMC) scores were calculated (Curran & Bauer, 2011). These variables make it possible to disaggregate between and within person parts of state data within one model.

Descriptive statistics were estimated for trait happiness, trait anger, state happiness (PM) and state anger (PM) by calculating the means, standard deviations and ranges (minimum and maximum). In order to check for normal distribution skewness with standard error and kurtosis with standard error were calculated as well. In this regard an additional Shapiro-Wilks-Test was conducted which tests the hypothesis of impaired normal distribution. Therefore, a non-significant result indicates normal distribution. These steps were conducted for the total sample of all data collections (2020 and 2021), as well as for the partial samples of 2020 and 2021.

The samples of 2020 and 2021 were compared and checked for significant differences. A one-way ANOVA was conducted to show between-subject effects of trait happiness, trait anger, state happiness (PM) and state anger (PM) with timeperiod of data collection as criterion. A second one-way ANOVA was conducted with occupation as criterion as demographics had indicated differences for the partial samples regarding this feature as well.

Psychometric properties were tested. A factor analysis was conducted with both trait items to estimate construct validity. The maximum likelihood method was applied with an additional Varimax rotation. Internal consistency of trait happiness and trait anger was tested by conducting a reliability analysis. To test reliability of the state measurements, which were represented by only one variable each, the sample was split in two halves by separating between

measurements of even and odd timepoints per participant. For both halves the mean of each participant was calculated and a Spearman Brown Test was conducted to estimate the split-half reliability (Eisinga, Te Grotenhuis, & Pelzer, 2013).

Correlations were estimated by calculating Pearson's  $r$  for trait happiness, trait anger, state happiness (PM) and state anger (PM) and for state happiness (PMC) and state anger (PMC) to explore the relationship of the respective variables.

The autocorrelation (AC) for state anger per participant was computed by correlating the original state anger score of the respective participant with his state anger lag(1) score, which was computed by shifting the regarding state anger score by one and deleting data when measurements jumped a day. Single-linear regressions were conducted with standardized state anger (AC) as independent variable and standardized trait happiness as dependent variable and with standardized state anger (PM) as independent variable and standardized trait happiness as dependent variable in order to estimate the best predictor for trait happiness. During the process of data analysis it was decided to conduct an additional analysis that tested standardized state anger (AC) as independent variable and standardized trait happiness as dependent variable in a cubic regression model.

In a linear mixed model (LMM) it was tested whether state anger is better predicted by average state happiness in a between-subject association or by state happiness in a within-subject association (Van den Pol & Wright, 2009). Standardized state anger was set as dependent variable and standardized state happiness (PM) and standardized state happiness (PMC) as fixed independent variables.

## Results

### Descriptive Statistics and Testing for Normality

Descriptive statistics including mean, standard deviation, minimum and maximum, skewness and kurtosis were calculated for the total sample and the partial samples to allow comparison. Values are presented in table 2. Values of skewness and kurtosis do not exceed the cut off points of -2 and 2 for skewness and -7 and 7 for kurtosis (Byrne, 2010) for all samples among the trait and state variables, which indicates a normal distribution for those samples. The Shapiro-Wilks-Test confirms the normal contribution for the total sample regarding trait happiness (TH) ( $p = .78$ ) and trait anger (TA) ( $p = .66$ ) as well as for the partial samples ( $p_{TH2020} = .98$ ;  $p_{TH2021} = .97$ ;  $p_{TA2020} = .96$ ;  $p_{TA2021} = .98$ ). The same can be shown for the total sample regarding state happiness (SH) (PM) ( $p = .98$ ) and state anger (SA) (PM) ( $p = .95$ ) as well as for the partial samples ( $p_{SHPM2020} = .94$ ;  $p_{SHPM2021} = .98$ ;  $p_{SAPM2020} = .94$ ;  $p_{SAPM2021} = .97$ ). It is

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noticeable that among all samples participants tend to report the experience of more state happiness and less state anger.

Table 2

*Descriptive Statistics*

	M			SD			Range			Skewness			Kurtosis		
	Total	2020	2021	Total	2020	2021	Total	2020	2021	Total	2020	2021	Total	2020	2021
TH	33.19	34.21	31.96	5.67	5.35	5.92	18.00-45.00	24.00-45.00	18.00-43.00	-.291	-.038	-.453	-.009	-.659	.292
										(.327)	(.434)	(.472)	(.644)	(.845)	(.918)
TA	19.53	19.38	19.71	5.06	4.73	5.54	9.00-32.00	10.00-27.00	9.00-32.00	.048	.054	.018	-.402	-.978	.027
										(.327)	(.434)	(.472)	(.644)	(.845)	(.918)
SH (PM)	3.71	3.82	3.57	.48	.41	.52	2.25-4.68	3.00-4.58	2.25-4.68	-.566	-.461	-.424	.597	-.110	.811
										(.327)	(.434)	(.472)	(.644)	(.845)	(.918)
SA (PM)	1.78	1.62	1.95	.50	.34	.60	1.00-3.35	1.00-2.73	1.00-3.35	.919	.944	.373	1.02	2.809	-.158
										(.327)	(.434)	(.472)	(.644)	(.845)	(.918)

*Notes.* TH = Trait Happiness, TA = Trait Anger, SH (PM) = State Happiness Personal Mean, SA (PM) = State Anger Personal Mean, SH(PC) = State Happiness Personal Mean Centred, SA(PC) = State Anger Personal Mean Centred; Sample Sizes for TH, TA, SH (PM), SA (PM) N Total = 53, N 2020 = 29, N 2021 = 24.

### Comparison and Aggregation of Partial Samples

An additional data collection took place from March to April 2021 to extend the original data set collected in April 2020. To justify the aggregation of both samples they were compared and checked for significant differences. Table 3 shows results for between-subject effects with time period of data collection (2020/2021) as criterion and trait values and state (PM) values as dependent variables. No significant differences could be shown for trait happiness, trait anger and state happiness (PM). For state anger (PM) a significant difference with a medium effect could be shown.

Table 3

*Tests of between-subject effects with time period of data collection (2020/2021) as criterion*

	Type III Sum of Squares	df	Mean Square	F	<i>p</i>	$\eta^2$
TH	66.396	1	66.396	2.106	.153	.041
TA	1.422	1	1.422	.054	.816	.001
SH (PM)	.808	1	.808	3.719	.059	.068
SA (PM)	1.456	1	1.465	6.420	<b>.014</b>	.112

*Notes.* TH = Trait Happiness, TA = Trait Anger, SH (PM) = State Happiness Person Mean, SA (PM) = State Anger Person Mean; N (2020) = 29, N (2021) = 24.

By comparing the sample demographics, it can be remarked that next to the different time periods of data collection additional differences between the samples are present. While both samples are relatively homogenous regarding gender and nationality, they show a different contribution regarding occupation and a nearly non-overlapping range of age. Table 4 shows between-subject effects with occupation (student/student&working/other) as criterion to check for significant differences among this feature. For trait happiness, trait anger and state happiness (PM) no significant differences could be shown. For state anger (PM) a difference that is highly significant and has a medium effect could be found. However, this still does not deliver certainty whether period of data collection or occupation is responsible for the difference in state anger (PM) between 2020 and 2021. To check whether age as criterion delivers a significant difference for state anger (PM) is unfortunately not possible, because dividing the total sample by age would result in nearly identical groups as dividing the sample by period of data collection. Dividing the total sample into more groups is not reasonable because of its contribution of age (see Appendix 3) and the fact that respective groups would not incorporate a sufficient sample size.

Table 4

*Tests of between-subject effects with occupation (student/student&working/other) as criterion*

	Type III Sum of Squares	df	Mean Square	F	p	$\eta^2$
TH	64.311	2	32.156	.999	.376	.038
TA	32.867	2	16.433	.632	.536	.025
SH (PM)	.400	2	.200	.870	.425	.034
SA (PM)	2.460	2	1.230	5.778	<b>.006</b>	.188

*Notes.* TH = Trait Happiness, TA = Trait Anger, SH (PM) = State Happiness Person Mean, SA (PM) = State Anger Person Mean; N (student) = 19, N (student&working) = 17, N (other) = 17.

As the samples of both periods of data collection show no significant differences regarding trait happiness, trait anger and state happiness (PM) and are both normally distributed the samples will be aggregated throughout the further data analysis. Differences between state anger (PM) and possible explanations for this will be kept in mind and handled with care while analysing and interpreting the data.

### Psychometric Properties

To estimate construct validity, a factor analysis was conducted for the trait items of happiness and anger (Table 5). Trait happiness items and trait anger items should be incorporated by a different factor each. However, the respective screeplot (Appendix 4) supports the approach to extract three factors. The maximum likelihood method was applied with a Varimax rotation, that allows the interpretation of the factor loadings. Results are presented in table 5. Factor one incorporates all trait happiness items, except for item 17 “I am filled with doubts about things”, that loads higher and in a negative direction on factor three. Factor two incorporates all trait anger items, except for item 3 “I sometimes feel like a powder key ready to explode” and item 5 “Some of my friends think I'm a hothead”, that load higher and positively on construct three. Factor three, on which two of the seven trait anger items and one of the 10 trait happiness items load highest, is discussed in the context of impulsivity below.

Correlations of trait and state (PM) scores were calculated to consider the criterion validity of the state items (Table 6). Assumed criterion validity is given, trait and state (PM) scores of each emotion should show significant correlations. Trait anger is defined as the tendency to experience state anger more frequently and with higher intensity. However, it needs to be respected that trait happiness is defined as the tendency to experience state happiness more

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frequently, but not necessarily with high intensity. Therefore, the correlation does not need to be as strong. For happiness a significant correlation of  $r = .339$  ( $p = .013$ ) could be shown. For anger no significant correlation could be shown ( $r = .263$ ,  $p = .057$ ).

Table 5

*Factor Matrix*

	Factor		
	Trait Happiness	Trait Anger	Construct 3
1. I flare up quickly but get over it quickly	-.095	<b>.691</b>	-.130
2. When frustrated I let my irritation show	-.107	<b>.735</b>	.275
3. I sometimes feel like a powder keg ready to explode	-.099	.559	<b>.574</b>
4. I am an even-tempered person	-.282	<b>.331</b>	.157
5. Some of my friends think I'm a hothead	.021	.010	<b>.994</b>
6. Sometimes I fly off the handle for no good reason	-.270	<b>.602</b>	.050
7. I have trouble controlling my temper	.012	<b>.600</b>	.433
8. I seldom feel blue	<b>.604</b>	-.082	-.066
9. I feel comfortable with myself	<b>.558</b>	-.281	.041
10. I adapt easily to new situations	<b>.681</b>	-.019	-.121
11. I look at the bright side of life	<b>.371</b>	-.125	-.196
12. I am sure of my ground	<b>.859</b>	-.066	-.142
13. I often feel blue	<b>.512</b>	-.027	.066
14. I worry about things	<b>.454</b>	-.175	-.210
15. I feel threatened easily	<b>.292</b>	-.085	-.046
16. I dislike myself	<b>.668</b>	-.132	.040
17. I am filled with doubts about things	.283	-.056	<b>-.365</b>

Extraction Method: Maximum Likelihood.

A reliability analysis was conducted in to estimate the internal consistency of the trait happiness and the trait anger scale. For trait happiness a Cronbach's alpha of .811 was found. Exclusion of none of the items could increase this value (see Appendix 5), including the suspicious trait happiness item 10 "I am filled with doubts about things". Cronbach's alpha if

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item deleted ranged from .784 to .807.

For the trait anger scale a Cronbach's alpha of .805 was estimated. Exclusion of trait anger item 4 “When frustrated I let my irritation show” increases Cronbach's alpha very slightly about .002 (see Appendix 6), which can therefore be disregarded. Exclusion of the suspicious items “I sometimes feel like a powder keg ready to explode” (trait anger item 3) and “Some of my friends think I'm a hothead” (trait anger item 5) do not lower Cronbach's alpha. Values if item deleted ranged from .745 to .807.

Reliability for the state items was estimated by using the Spearman Brown Test to calculate the split-half reliability. For both state items good results could be shown ( $\rho_{SH} = .701$ ;  $\rho_{SA} = .759$ ).

### Correlations (H1-H3)

Correlations of trait happiness, trait anger, state happiness (PM) and state anger (PM) can be found in table 6. It shows high multicollinearity as four out of the six correlations were found to be significant. Trait happiness shows a significant correlation with all variables. The correlation with trait anger is negative and weak, the correlation with state anger (PM) negative and moderately strong and the correlation with state happiness (PM) positive and weak. For state anger (PM) and state happiness (PM) a strong negative and highly significant correlation can be shown.

Table 6

*Pearson Correlation Matrix of (raw) trait and state scores with p-values*

	1.	2.	3.	4.
1. Trait Happiness	-			
p-value				
2. Trait Anger	<b>-.361**</b>	-		
p-value	.008			
3. State Happiness PM	<b>.339*</b>	-.248	-	
p-value	.013	.073		
4. State Anger PM	<b>-.410**</b>	.263	<b>-.763**</b>	-
p-value	.002	.057	.000	

*Notes.* \**p*-value significant at .05 margin, \*\**p*-value significant at .01 margin; *N*=53.

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It is shown that individuals who are more prone to experience state happiness are less likely to experience state anger, individuals who score high on trait happiness are less likely to experience state anger, more likely to experience state happiness and more likely to score lower on trait anger. The visualization of the weak, but highly significant negative association between trait anger and trait happiness, which is presented in table 6 can be found in figure 1.

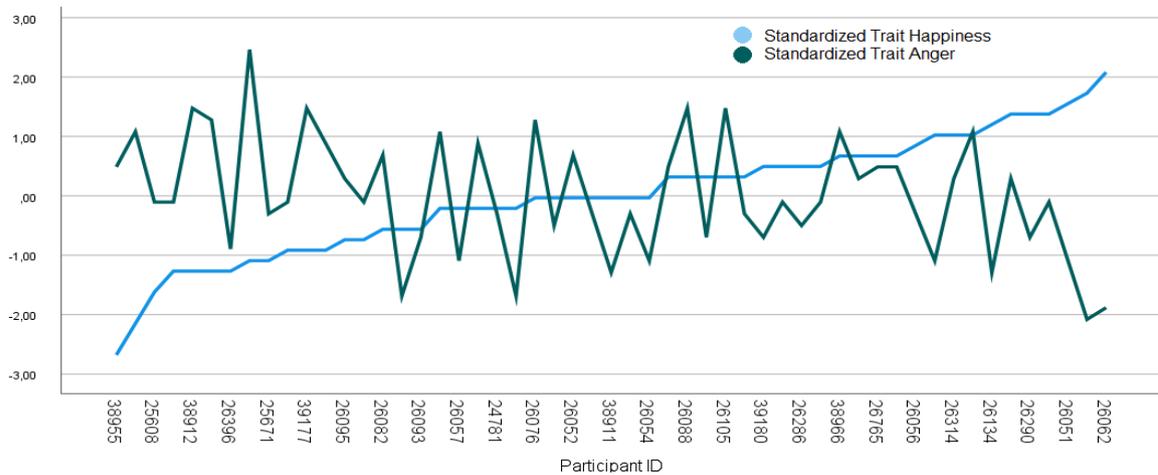


Figure 1. Standardized scores for trait happiness (in blue) and trait anger (in green) per participant sorted by trait happiness score.

### Regression Model (H4)

A single-linear regression was conducted to predict trait happiness based on state anger (PM) and state anger (AC). The correlation for trait happiness and state anger (PM) has already been shown. For state anger (PM) a significant regression equation was found ( $F(1, 51) = 10.33$ ,  $p = .002$ ), with an  $R^2$  of .17. Participants' trait happiness changed  $-.410$  for each point of state anger (PM).

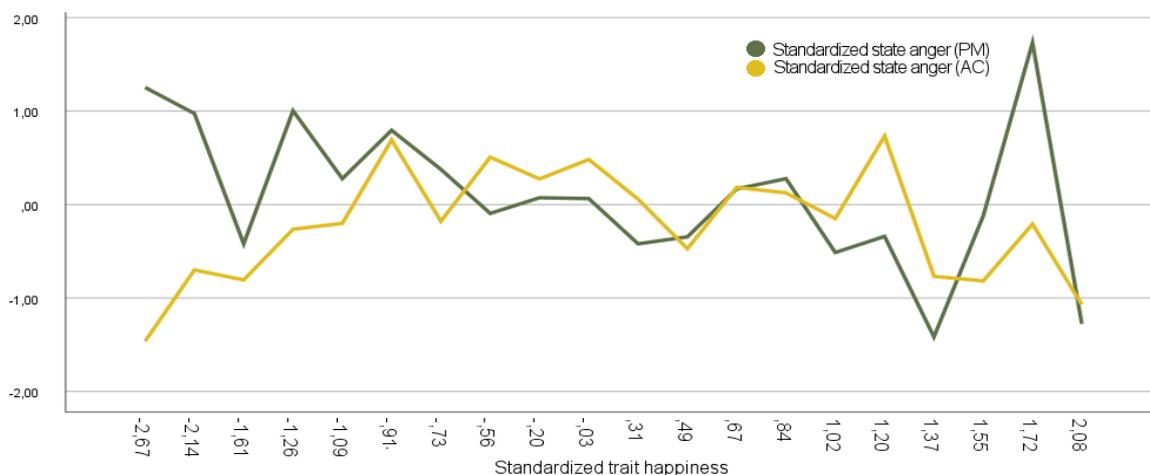


Figure 2. Association between standardized trait happiness and standardized state anger (PM) (in green) and standardized trait happiness and standardized state anger (AC) (in yellow).

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For state anger (AC) no significant regression equation was found ( $F(1, 48) = .018, p = .894$ ) with an  $R^2$  of .00. Next, the association between trait happiness and state anger (AC) was tested in a cubic regression model to see whether this model can describe the association in a more appropriate way. (as indicated in Figure 2). However, the analysis conducted with trait happiness as dependent variable and state anger (AC) as independent variable indicated no significant result ( $F(3,46) = 2.35; p = .085$ ) with an  $R^2$  of .13.

### Linear Mixed Model (H5)

In order to test whether state anger is better predicted by average state happiness in a trait-like and between-subject association or by state happiness as a state-like and within-subject association, a LMM was tested in which standardized state anger was set as dependent variable and standardized state happiness (PM) and state happiness (PMC) as fixed independent variables. Results indicate that the association between anger and happiness is both a between-subject (trait-like) effect ( $\beta = -.42, SE = .022, p < .001, CI_{95}[-.46; -.38]$ ) and a within-subject (state-like) effect ( $\beta = -.45, SE = .023, p < .001, CI_{95}[-.49; -.41]$ ). No difference between the predictors could be shown. This means that individuals with higher state anger (PM) than others, have lower state happiness scores than others (trait-like association, visualized in figure 3). If an individual has a higher state anger score than his own average at a given timepoint this is also associated with a lower state happiness score at that time point (state-like association).

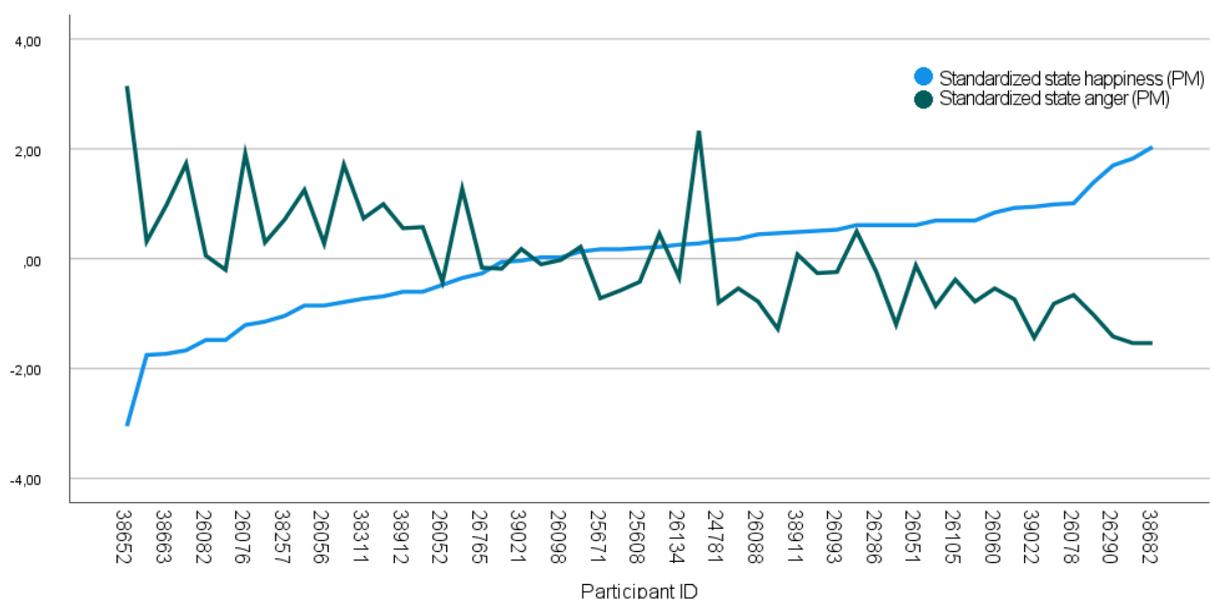


Figure 3. Standardized scores of state happiness (PM) (in blue) and state anger (PM) (in green) per participant sorted by state happiness (PM).

### Discussion

The intention of the present study was to investigate the association of happiness and anger in daily life by respecting both state and trait dimension. Hypothesis 1 and 3 could be confirmed, while hypotheses 2, 4 and 5 could not be supported. Findings for each hypothesis will be set into context and discussed in detail below.

The first hypothesis stated a negative association between trait anger and trait happiness. The findings support this hypothesis by showing a weak, but significant correlation for trait anger and trait happiness (conceptualized as hedonic happiness). This is in line with previous findings by Hong and Giannakopolous (1994), who showed a negative relation for trait anger and trait happiness (conceptualized as eudaimonic happiness).

The second hypothesis stated a negative association for trait anger and average state happiness. The hypothesis could not be supported as no significant correlation could be found. This result is surprising, especially in the context of the shown significant negative correlation of trait anger and trait happiness. Average state happiness should approximate to trait happiness because trait happiness is defined as the tendency to experience state happiness more frequently (Diener et al., 1991). However, the experienced intensity of state happiness is not estimated as relevant in this definition. Therefore, trait happiness does not equal the average of state anger, which is also supported by Russel et al. (1999 as cited in Williams, 2017) who state that trait and state emotions are estimated to reflect different processes. This is in line with the relation of average state happiness and trait happiness in this study, which shows a significant, but only weak correlation. However, the just weak correlation might also be the result of a memory bias for the trait component (Conner & Feldman Barrett, 2012). Furthermore, specific personal characteristics that influence the report of certain emotions might be overrepresented in the sample, which can also affect the measurements. Sample characteristics will be discussed below. Another explanation for the failure of showing a correlation for trait anger and average state happiness lies in the possibility that momentary environmental factors during the data collection might have influenced the experience of state happiness among the total sample (both 2020 and 2021). Environmental factors will be discussed below.

The third hypothesis stated a negative association for trait happiness and average state anger. This hypothesis could be confirmed by showing a significant moderately strong association. At first sight is in line with the findings of hypothesis one. Unlike in the trait definition for happiness, trait anger is defined as the tendency to experience state anger more often, but also higher in intensity (Deffenbacher et al., 1996; Quinn et al., 2014). Therefore, trait anger and average state anger should resemble. Surprisingly, this could not be shown for

the present study. No association between trait anger and average state anger was found. This could be the results of a possible memory bias for the trait measurements (Conner & Feldman Barrett, 2012). However, the samples of 2020 and 2021 also showed a significant difference in the report of experienced state anger. It cannot be assured that this is due to the different time periods of data collection, because the samples differed relevantly in their demographics as well. In case the significant difference in state anger can be explained by period of data collection environmental factors could be a potential explanation, that would also explain the missing correlation of average state anger and trait anger. Environmental factors, as well as possibly influencing characteristics of the sample will be discussed below. Nonetheless, the fact that a negative association for trait happiness and average state anger could be shown just like for trait happiness and trait anger, while average state anger did not correlate with trait anger is a powerful indicator that supports the assumption of state and trait emotions to reflect different processes (Russel et al., 1999 as cited in Williams, 2017).

The fourth hypothesis stated that state anger autocorrelation predicts trait happiness in a negative direction and better than average state anger which also predicts trait happiness in a negative direction. The hypothesis could not be supported. While average state anger was shown to significantly predict trait happiness in a negative direction, state anger autocorrelation could not be shown to predict trait happiness. The persistence to state anger and therefore the immediate emotion regulation of state anger does not seem to be crucial in understanding the anger - trait happiness relation. The visualization of state anger autocorrelation and trait happiness gave reason to further investigate the association. An additional cubic regression model was tested. In line with hypothesis three and the finding of average state anger predicting trait happiness it was assumed that low state anger autocorrelation of high state anger scores would result in higher average state anger scores that could be associated with low trait happiness, while low state anger autocorrelation of low state anger scores would result in low average state anger scores that could be associated with high trait happiness. For the defined significance level the assumption needed to be rejected, but would have indicated a significant model at the 0.05 significance level, which leaves the chance to confirm the model with a bigger sample in the future.

Hypothesis five states that state anger is better predicted by average state happiness as a trait-like (between-subject) association than by state happiness as a state-like (within-subject) association. This hypothesis was not supported in all parts, because average state happiness could not be shown to predict state anger better than state happiness. For both predictors significant models could be estimated, that did not differ relevantly in strength. Regarding the

state-like association findings of Harmon- Jones and colleagues (2009) could be confirmed. Trampe et al. (2015) emphasize the possibility to experience more than one emotion simultaneously. The present findings indicate that simultaneous experience of state happiness and state anger is unlikely. Elevated levels of state happiness are associated with lower levels of state anger. Therefore, the fluctuation of state happiness also affects the fluctuation of state anger. Regarding the between-person association the present findings indicate that people with higher average state happiness are less prone to experience state anger. Therefore, elevated levels of average state happiness can be seen as a protection against the experience of elevated state anger. Due to the poor or rather missing associations of trait and average state scores in this study, the term 'trait-like' should be handled with care though. If state anger and state happiness have an inverse relationship, a person who experiences state happiness more often and therefore has higher average state happiness, has less opportunity to experience state anger angry. The conclusion that higher trait happiness is a protection against the experience of state anger can therefore not be drawn.

### **Latent State-Trait Theory**

The previously introduced latent state-trait theory (Steyer, Schmitt, & Eid, 1991) can help to set the present findings into context. It states that state emotions depend on characteristics of the person (traits), the situation and the interaction of both.

#### **Characteristics of the Person**

It can be assumed that participants who took part tend to score high on agreeableness as they did not receive remarkable benefits for their participation (Graziano & Tobi, 2009; except for only few participants of sample 1 who received SONA points). A link between agreeableness and volunteering could also be shown by Carlo et al. (2005). Furthermore, participants are likely to score high on conscientiousness as participation in the present study asked the commitment for a whole week and engagement at four time points per day. Participants who were willing to take part and actually delivered the requested amount of data needed to be highly conscientious to stay tuned (Roberts et al., 2014).

#### **Characteristics of the Situation**

Data of both samples were collected in a worldwide state of emergency, caused by the Covid-19 pandemic. During the data collection for the first partial sample in 2020 the pandemic had just started and most of the European countries had just commanded the first lockdown. During the data collection for the second partial sample in 2021 people had already lived in the exhausting situation for a whole year.

### **Practical Utility**

The previous findings can contribute to (clinical) mental health care and the development of effective communication strategies that need to convey potentially upsetting messages.

#### **(Clinical) mental health care**

Increased levels of anger and difficulties in controlling anger are a major problem in several mental diseases like mentioned earlier. In this regard, disorders like bipolar disorder or borderline, antisocial, narcissistic and paranoid personality disorder can be mentioned (Williams, 2017). Due to the inverse relation of state anger and state happiness, techniques to actively increase state happiness can serve as a technique to also lower the experience of state anger. The inverse relation of trait anger and trait happiness, which has been conceptualized as subjective well-being in this study, can function as a starting point to develop techniques to reduce trait anger levels. Subjective well-being is estimated to be improvable (Miao et al., 2013). Increasing subjective well-being, respectively trait happiness, should therefore result in a decrease of trait anger levels. Psychotherapy, counselling and coaching can benefit from the present findings by integrating them into their methods and techniques regarding anger management.

#### **Communication strategies and mediation**

In the current situation of the worldwide Covid-19 pandemic it has become visible how especially in politics sometimes messages need to be conveyed that involve the risk of evoking state anger. For example, when lockdowns had to be extended several times, anger responses in the population increased. The inverse state anger – state happiness relation can be utilized to formulate a certain message as less anger provoking as possible. If several features of the message also promote state happiness, state anger should become less intense. This communication strategy is not just possibly relevant in politics, but in any situation in which people need to communicate problematic contents, for example in negotiations or relationship problems. Professionals who offer help in these situations, for example mediators or couples' therapists can benefit from these findings as well.

### **Strengths**

The happiness-anger relation still remained uninvestigated for the greater part. Therefore, the present study partly fills a gap in the research landscape by contributing to the understanding of the relation of both emotions on trait and state dimension. It can be seen as innovative, though overdue, which points out its relevance. The sample size of  $N = 53$  can be

seen as relatively high and perfectly matching the mean of sample sizes in ESM on mobile devices in a literature analysis of ESM studies by van Berkel et al. (2017), which accounts for another strength of the present study. Psychometric properties could be shown to be good. There are practical application possibilities for the studies findings, which points out its utility. Concrete and potentially spurring recommendations for future research can be made based on the present study, which will be outlined in detail below.

### **Limitations and Implications for Future Research**

#### **Sample characteristics**

A limitation of the study lies in actual and possible sample characteristics. Firstly, mainly female participants were included. This is especially relevant, because it could be shown that men and women differ in anger expression (Nunn & Thomas, 1999), which might also affect the report of anger experiences. Therefore, it is suggested to repeat the research with a sample that represents all gender and allows for comparison to investigate if the findings can be generalized.

Secondly, the personality traits of agreeableness and conscientiousness are likely to be overrepresented in the present sample(s), which therefore might have influenced the data scores in specific ways. Agreeableness correlates positively with the inhibition of anger (Meier & Robinson, 2004), while disagreeableness correlates positively with state anger (Bresin et al., 2012). Jensen-Campbell et al. (2007) showed different results, emphasizing the role of conscientiousness in the context of self-control. They found a positive relation of agreeableness and anger (but not aggression), but only if levels of conscientiousness were low. For conscientiousness a negative association with anger could be shown (Jensen-Campbell et al., 2007), while it significantly predicts positive affect as in trait happiness (Kobylinska et al., 2020). Especially the combination of agreeableness and conscientiousness seems to have greater impact regarding the happiness-anger relationship. Therefore, relatively low levels of anger in the present study can possibly be explained by common trait characteristics of the sample. However, it is not possible to confirm or refuse this assumption. It is suggested to additionally measure levels of agreeableness and conscientiousness in future research to estimate the impact of these traits and to control for it in the analysis.

#### **Situational Circumstances**

Data was collected in the situational context of the worldwide pandemic of Covid-19. Several studies report the increase of anger (next to other conditions) in this context. For example, Perez-Fuentes et al. (2020) report an increase of anger for the Spanish population and

Trnka and Lorencova (2020) report the same for the Czech population. It is likely that the Covid-19 pandemic has influenced the data scores. It is also possible that even though the happiness scores are quite elevated in the present sample, participants might have been affected in their experience of happiness as well. Next to the already discussed possible explanations for the missing associations of trait scores and average state scores, it might be possible that average state scores are not representative for the typical trait score due to the extraordinary situation. Even though it is likely that the general kind and direction of associations stay the same, the study needs to be repeated after the end of the given situation to ensure applicable results. In this case, future research might even profit from this study, if results of the within-pandemic study can be compared to the after-pandemic study, which can possibly give insight to how emotion scores of happiness and anger change in states of emergency.

### **Different periods of time for data collection**

The data collection at two different periods of time is problematic in the context of the Covid-19 pandemic. The partial samples differed significantly in state anger scores, identified in an analysis of variance (ANOVA, Girden, 1992). This could have been explained by the time periods of data collection and more specifically by the progression of the pandemic. However, the samples differed in certain demographics (age and occupation) as well. In an ANOVA differences in state anger could also be indicated for different status of occupation. Because of its contribution, age could not be subdivided into different groups that would have allowed for a respective ANOVA. Therefore, it is not possible to retrace whether significant differences in the measurements of state anger stand in relation to the different periods of data collection or to the specific sample demographics. It is suggested to repeat the study at only one timepoint, including an appropriate number of participants for all age groups and occupations.

### **State items**

The utilization of self-constructed state items is an innovation that can stimulate future research. Even though good reliability could be shown, the low or rather missing correlations of trait scores and average state scores failed to validate the state measures. For a single-item scale designed to measure happiness, Abdel-Khalek (2006) could show good validity. However, this item asked for general happiness and not for momentary happiness like the present study did. For anger no previous research on the validity of a single-item scale could be found, however Elo et al. (2003) could show good validity of a single-item scale for stress experience, which also measures negative affect just like anger. These findings make it seem likely that single-item/short scales are applicable in collecting valid data for state emotions. The state happiness item is formulated unambiguous (“I feel happy at the moment”) and indicates good

face validity. The state anger items however might leave room for misunderstandings. “I am mad right now” could possibly be understood in a sense of “I am crazy right now” while “I am irritated right now” could also indicate a state of annoyance. This could be the reason why no correlation could be found for average state anger and trait anger at all while for average state happiness and trait happiness at least a weak correlation could be shown.

Nevertheless, it cannot clearly be estimated whether average state scores and trait scores did not show the expected relationships because of missing validity of the state items or because average state scores do not reflect trait scores conceptually (Russel et al., 1999 as cited in Williams, 2017). Looking back to the conceptualization of trait happiness as subjective well-being the latter is likely. Subjective well-being incorporates not just high amounts of positive affect and low levels of negative affect, which refers to the tendency to show higher average state happiness. It also incorporates the experience of high general life satisfaction (Diener et al., 2009), which goes beyond that. It is suggested to further investigate psychometric properties of the used state-items, but also to further investigate the state – trait relation of emotions in general and happiness and anger in particular.

### **Emotion Regulation**

The present study was not able to shed new light on the roles of emotion regulation and emotional stability in understanding beneficial consequences of anger and its relation to happiness. The missing link between state anger autocorrelation and trait happiness cannot be interpreted in a way that does not concede important roles for emotion regulation and emotional stability.

The factor analysis could show that nearly all respective items of a certain scale load highest on the same construct. However, one item of the trait happiness scale and 2 items of the trait anger scale were shown to load higher on an additional and yet unknown construct 3, that should be further considered. The respective items are item 3 “I sometimes feel like a powder keg ready to explode”, item 5 “Some of my friends think I'm a hothead” that load positively on construct 3 and item 17 “I am filled with doubts about things”, that loads negatively on construct 3. This construct possibly reflects impulsivity, which is at trait level defined as “the tendency to act spontaneously and without deliberation” (Carver, 2006, p.313 as cited in Tomko et al., 2014). The tendency to act spontaneously can be represented by item 3 and 5, while doubts as described in item 17 are a cognitive process of deliberation, which can therefore explain the inverse loading.

Impulse control (as the opposite of impulsivity) and emotion control are the two subcategories of emotional stability as defined by Caprara et al. (1993), which in turn is defined

as the opposite of neuroticism, which is related to dysfunctional emotion regulation (Purnamingsih, 2012). Fujita (2011) describes self-control as the executive function that enables the inhibition of impulses, which is required for individual goal attainment. Goal attainment has likewise been discussed in the context of anger earlier (Mahler et al., 1975; Kohut, 1977 as cited in Williams, 2017). As the factor, which possibly represents impulsivity, could be shown to load on trait anger, but also on trait happiness, it can be assumed that impulsivity or respectively emotion regulation is key in understanding the happiness-anger relationship. It is suggested to further investigate this in previous research by directly measuring emotion regulation strategies and emotional stability and subsequently comparing the happiness-anger relationship for different strategies or levels of emotional stability.

### **Further Recommendations**

To adapt the findings and make use of its practical utility, applied research should be conducted to develop concrete methods and techniques that make use of the anger-happiness relation for (clinical) health care and communication contexts. Additionally, a drop-out-analysis is recommended for future research, which can shed light on participant's reasons to quit their participation. This can help to improve the data collection by adjusting it. Furthermore, characteristics of a typical dropout-participant can be detected, which can give insight to which groups may not be represented and how they could be incorporated by adjusting the way of data collection.

### **Conclusion**

Referring back to Ralph Waldo Emerson (1803-1882), his statement that “for every angry minute you lose 60 seconds of happiness” could be confirmed. The present study could show an inverse relationship of happiness and anger on both state and trait dimension. It could also point out that state anger is predicted by happiness in a between-person association as well as in a within-person association. Findings can find practical utility in mental health care, counselling, coaching and communication techniques, that are required in negotiations or solving relationship problems and can further be tailored by mediators and couples therapists. State anger autocorrelation could not be shown to predict trait happiness. It is advised to investigate the role of state anger persistence for trait happiness by directly incorporating measurements for emotion regulation and emotional stability. Trait scores could not be shown to represent a reflection of average state scores, which might be due to the independence of state and trait dimension or due to missing validity of state items. Other factors like possibly overrepresented trait characteristics of the sample like agreeableness or conscientiousness or

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situational factors could also be a possible explanation. With regard to situational factors the worldwide pandemic of Covid-19 during which the study took part accounts for a major limitation of the study, which calls for a replication of the study. Nevertheless, the relevance and utility of the present study can be pointed out as it fills a gap in the previous research landscape and gives several impulses for future research.

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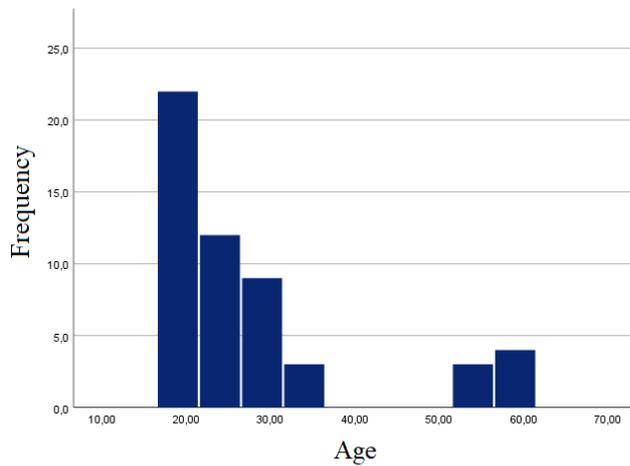
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**Appendices**

**Appendix A:**

Figure A

*Age contribution among total sample*

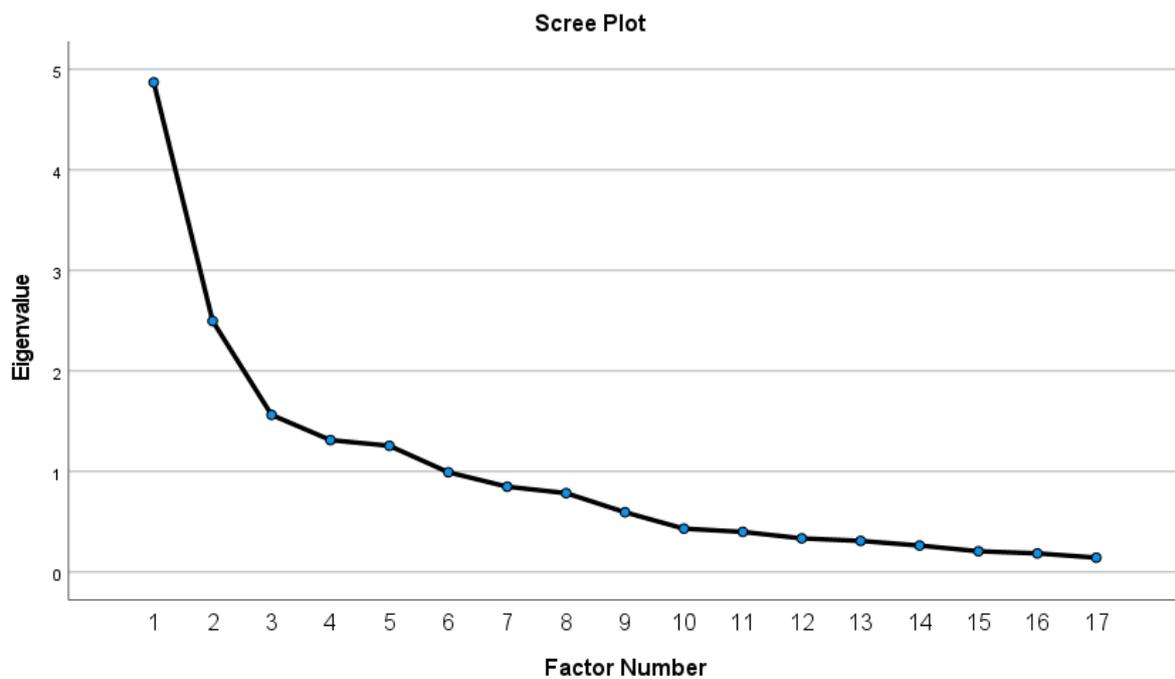


*Note.* N=53.

**Appendix B:**

Figure B

*Screeplot of eigenvalues including all 17 items*



*Note.* Figure includes all 7 trait anger items and 10 trait happiness items.

**Appendix C: Reliability Analysis**

Table C1

*Reliability Analysis Trait Happiness Items*

	Cronbach's Alpha if Item Deleted
Trait Happiness Item 1	.784
Trait Happiness Item 2	.786
Trait Happiness Item 3	.785
Trait Happiness Item 4	.799
Trait Happiness Item 5	.769
Trait Happiness Item 6	.802
Trait Happiness Item 7	.796
Trait Happiness Item 8	.814
Trait Happiness Item 9	.792
Trait Happiness Item 10	.807

Table C2

*Reliability Analysis Trait Anger Items*

	Cronbach's Alpha if Item Deleted
Trait Anger Item 1	.799
Trait Anger Item 2	.751
Trait Anger Item 3	.745
Trait Anger Item 4	.807*
Trait Anger Item 5	.802
Trait Anger Item 6	.787
Trait Anger Item 7	.753

Notes.\*Cronbach's Alpha improved if Item Deleted.