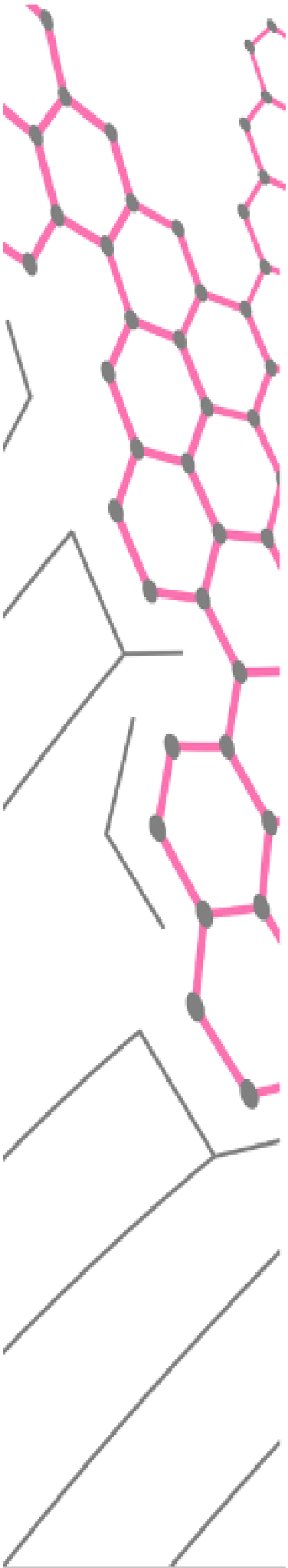

# The Longitudinal Relationship of Depressive Symptoms and Mental Well-Being: The Role of General Self-Efficacy as a Buffer? An Experience Sampling Study Among University Students

handed in by
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**Abstract**

**Objective:** The two-continua model proposes mental health as a complete state by considering psychopathology and mental well-being as being related but distinct constructs. While previous research has proven the model in cross-sectional studies between persons, there is less knowledge about the relationship between psychopathology and well-being within persons over time. In addition, recent studies have shown the potential of general self-efficacy to buffer against stressors and raised the interest to examine its protective mechanisms within the two-continua model. **Methods**: This study used experience sampling data from 25 university students (aged 19–32 years) reporting on 905 everyday-life situations over the course of two weeks (April 06 – April 19, 2020). Linear mixed models were used to examine the relationship between state depression and state mental well-being between and within persons. General self-efficacy was examined as a possible moderator of the overall association. **Results:** Findings revealed a moderate negative correlation between state depression and state mental well-being both between ($\beta = -.386$, $p < .001$) and within persons ($\beta = -.543$, $p < .001$). General self-efficacy did not significantly moderate the overall association. However, follow-up case analyses of single individuals with higher vs. lower levels on general self-efficacy showed tendencies towards the hypothesized protective role, that is, the association between depression and well-being was weaker for people high on general self-efficacy. **Conclusion**: This study gave a first insight into the two-continua model not only holding on the between-person but also on the within-person level. Study implications are discussed in three main contexts: promoting further within-person research of complete mental health, implementing knowledge of the two-continua model within persons in clinical settings, and further investigating protective factors for complete mental health in daily life, for example, by implementing interventions based on experience sampling method.

*Keywords:* two-continua model, well-being, depression, general self-efficacy, experience-sampling method

# The Longitudinal Relationship of Depressive Symptoms and Mental Well-Being: The Role of General Self-Efficacy as a Buffer?

## An Experience Sampling Study Among University Students

It is widely known that depression has a considerable influence on a person's quality of life, experienced mental well-being and mental health (Myin-Germeys et al., 2009). Previous findings from cross-sectional studies show that depressive symptomatology is especially highly prevalent among university students compared to the general population (Dahlin et al., 2005; Kessler & Walters, 1998; Stallman, 2010). Thus, understanding protective factors for depression and mental health among students is an important public health issue.

### Depression, Mental Well-Being and the Two-Continua Model

Traditionally, mental health has long been defined as the absence of psychopathology, such as depression. This traditional medical approach aims to reduce symptoms of mental illness but lacks any attention to investigating factors for mental well-being (Keyes, 2002, 2007). Recently, complete mental health has been conceptualized as not only the absence of mental illness but also the presence of well-being (Keyes, 2005; World Health Organization, 2005). Mental health has been defined as "a state of well-being in which the individual his or her own abilities, can cope with normal stresses of life, …, and is able to make a contribution to his or her community" (World Health Organization, 2005, p. 2). The conceptual relationship of mental illness and well-being is best described in the two-continua model (Keyes, 2002). According to the two-continua model, both factors are related, yet distinct dimensions. One continuum indicates the presence or absence of mental well-being, the other the presence or absence of mental illness (Keyes, 2002). Thus, people can be languishing, that is, experiencing low well-being, even in the absence of mental illness, while others may be mentally ill, but still have a comparably moderate level of mental health (Keyes, 2005). Using confirmatory factor analyses in a representative sample of the general population, Keyes (2005) showed that both factors moderately correlate but can be seen as distinct dimensions of mental health.

So far, the validity of the two-continua model has been proven in cross-sectional, single measurement studies (Keyes, 2005; Keyes et al., 2008; Kinderman et al., 2015). Such between-person data allows to reveal stable interpersonal associations, that is, across a set of individuals (Curran & Bauer, 2011). Yet, for applied psychologists in practice, it is more often of key interest how processes unfold within individuals over time (Hamaker, 2012). In turn, there is a tendency of statistical analyses falsely generalizing from group level to the

individual level in human subject research (Fisher et al., 2018). Concretely, the question if individuals experience less momentary well-being when they are more depressed *than others* (between-person association) differs from the question if individuals experience less momentary well-being when they are more depressed *than usual* (within-person association) (Curran & Bauer, 2011; Hamaker, 2012). Based on previous between-person data, it remains unclear how changes in state depression within persons affect the experience of momentary well-being in daily life. To prevent false generalization, it is therefore necessary to separate within-person from between-person associations as they are not inevitably the same (Hamaker, 2012). Thus, multiple measurement occasions within one individual are needed to inform about the relationship between state well-being and state depression in daily dynamics on the individual level.

**Experience Sampling Methodology in Mental Health**

One method that is particularly suitable to study the two-continua model in everyday life is experience sampling methodology (ESM). ESM is a within-day self-assessment design in which participants are prompted at certain intervals to report on their current, in-situ daily experiences (Larson & Csikszentmihalyi, 2014). It overcomes shortcomings of traditional data collection methods (Larson & Csikszentmihalyi, 2014) by a) repeated assessment of daily experiences, thereby enhancing ecological validity, b) minimizing retrospective bias, and c) allowing within-subject real time assessments. ESM hereby considers that variance on a within-person level is not an error but a relevant finding and shows that associations of phenomena can differ on whether you examine the between- or within-person level (Fisher et al., 2018; Yearick, 2017).

Nowadays, the availability of mobile devices enables ESM studies to be carried out via mobile phone applications (Raento et al., 2009). In the mental health context, several studies have used ESM, for example, to examine depressive symptomatology in daily life among young adults (e.g., Brown et al., 2011). Regarding the two-continua model, ESM therefore allows a fundamental extension to cross-sectional data, capturing the dynamic patterns as they unfold within individuals over time (Myin-Germeys et al., 2009).

**Linking Self-Efficacy With Depression and Well-Being**

Research on the two-continua model implicates that psychopathology and well-being are related but distinct, while the association can differ for different people (Keyes, 2005). This raises interest to underlying protective factors that might help people to feel in control of distress in daily life and to preserve their mental well-being. Here, especially self-efficacy is thought to be a key protective factor in regulating distress, such as depression (Bandura,

1991). Self-efficacy is concerned with people's beliefs in their capabilities to exercise control over their own level of functioning and over events that affect their lives (Bandura, 1991, 2006). According to the social cognitive theory, people's beliefs in their efficacy plays a pivotal role in the self-regulation of affective states (Bandura, 1997), in the vulnerability to depression (Bandura, 1991) and for emotional well-being (Bandura, 2006). As a relatively stable personality trait, general self-efficacy refers to a broad sense of personal competence to deal with a variety of stressful situations (Bandura, 2006; Schwarzer, 1994; Sherer et al., 1982).

General self-efficacy has great utility for predicting both affective and behavioral outcomes and has received much attention, specifically, in psychological research. Findings from cross-sectional studies show that general self-efficacy is negatively correlated with psychological distress and depressive symptomatology (Brouwers & Tomic, 2000; Gallagher et al., 2011), also among college students (Jo & Lee, 2008; Quimby & O'Brien, 2006). On the opposite side, high levels of self-efficacy are found to contribute to well-being (Bandura, 2006). Tong and Song (2004) found that students with a stronger general self-efficacy reported higher levels of well-being.

While general self-efficacy plays an important role in preventing depression (Jo & Lee, 2008; Quimby & O'Brien, 2006), it might also function as a protective factor when dealing with stressful circumstances and negative emotions. It is said to have a regulatory function which helps to create and maintain positive affective states (Luszczynska et al., 2005). General self-efficacy has been found as a moderating factor, functioning as a buffer, with higher self-efficacy weakening the effects of stress on well-being (Bandura, 1997). A cross-lagged study (Schönfeld et al., 2019) found that the effect of daily stress on well-being was reduced by self-efficacy. Even though a full mediation was not obtained, this study supports the role of perceived self-efficacy as a protective factor for mental health.

In the context of a repeated measurements design, a moderation model allows for examining whether interindividual differences in the level of general self-efficacy play a role in influencing the strength of the association between psychopathology and well-being over time. People will experience depressive symptomatology from time to time, but their beliefs in their capabilities of regulating distress differ from one another. Thus, this factor of general self-efficacy may influence the degree of how much depressive symptomatology affect their mental well-being. Considering the high prevalence of depressive symptoms in students, examining the role of general self-efficacy in daily dynamics of psychopathology and momentary well-being will be of interest for detecting such protective factors.

### Aim of This Study

As stated above, studies on the dynamics of depressive symptomatology and the impact on momentary well-being on the within-person level throughout daily life are scarce. Therefore, the current study used experience sampling data from 25 participants (aged 19–32 years), having reported on over 900 everyday-life situations, to zoom into the relationship between depressive symptoms and momentary well-being within persons. An additional focus was placed on the role of general self-efficacy as a potential buffer in the overall relationship. Given the lack of within-person research on the two-continua model, it was examined in an exploratory fashion whether state depression is negatively associated with state mental well-being, not only on the between-person but also on the within-person level. In line with prior research, it was hypothesized that interindividual differences in general self-efficacy moderate the overall relationship between state depression and state well-being. Specifically, higher general self-efficacy is expected to function as a buffer, that is, higher levels of self-efficacy will weaken the relationship whereas lower levels will strengthen it.

## Methods

### Participants

This study concerns a secondary analysis of previously collected data from a research project at the University of Twente, the Netherlands. Convenience sampling was used in this study. As a type of nonrandom sampling, it allows to recruit researching subjects that are easily accessible to the researcher, available at a given time and willing to participate (Etikan et al., 2016). Inclusion criteria were (1) availability of a smartphone, (2) sufficient level of the English language and (3) being enrolled in university. From the total sample of university students ($N$ = 34), 25 were included in the current study. Following reasons led to exclusion from the final study sample: (a) participants who did not fill out the baseline questionnaire ($N$ = 3), and (b) participants with a participation rate under the cut-off score of 50% of all daily measures ($N$ = 6). A cut-off score of 50% is in line with literature recommendations on analyses of ESM data (Conner & Lehman, 2012).

An a priori power analysis was not conducted because it is difficult to perform for multilevel modeling (Snijders, 2005). Power analyses for multilevel modeling are complex as the needed sample size depends on many parameters including the level of research interest, expected effect size, intra-class correlations, and because for these models power is not a linear function (Scherbaum & Pesner, 2019). This study's sample size is, however, in line with earlier ESM research practice (van Berkel et al., 2018).

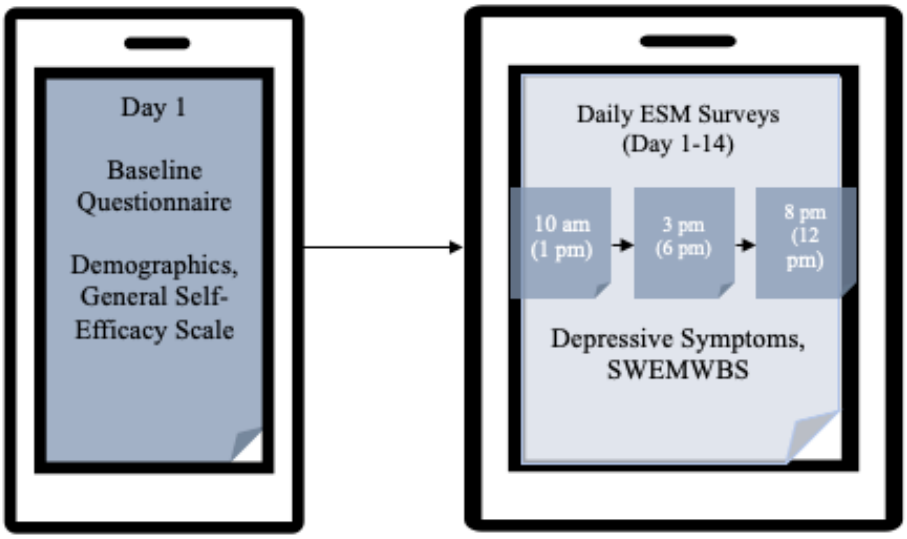
**Design and Procedure**

This study was approved by the Ethics Committee of Behavioural, Management and Social sciences from the University of Twente (#191314). It was designed and carried out by using the application Ethica Data (https://ethicadata.com). Ethica Data allows gathering data in real-world contexts, has full offline support and can be used on Android and iOS (see https://ethicadata.com). Before starting data collection, the study was pilot tested for feasibility and possible technical issues. Data collection for the study itself took place between April 06 – April 19, 2020. This study duration is in line with the median study duration of 14 days reported in literature on ESM studies on mobile devices (van Berkel et al., 2018). Participants were invited through Ethica Data via email. During the registration process, participants were asked to download the application on their smartphone and to give online consent in the app.

The study itself included two types of questionnaires, which is typical for ESM (Yearick, 2017): the baseline questionnaire and the daily surveys. The baseline questionnaire was sent to the participants on the first day of the study as a one-time assessment, taking about 10 minutes to complete. To allow some flexibility, it was possible to complete the questionnaire within that moment or at any other time during the study. The daily ESM surveys (appr. 2–3 minutes per measurement occasion) were sent to the participants based on a fixed timing schedule, also known as interval-contingent sampling, allowing for multiple measurement points per day randomly within fixed time ranges (Conner & Lehmann, 2012). A method specific challenge in ESM is to decide for an appropriate frequency of daily surveys as both the targeted within-person phenomenon and the participants' burden needs to be considered (Yearick, 2017). For this study, a signal frequency of three times per day for a study duration of two weeks was chosen. This is in line with literature recommendations for typical tradeoffs, reporting an average ESM study duration of 10 days with about three signals per day (Yearick, 2017). As some distance between time intervals for the daily surveys is recommended (Conner & Lehman, 2012), the daily questionnaires were sent as follows: in the morning (between 10 am – 1 pm), in the afternoon (between 3 – 6 pm), and in the evening (between 8 – 12 pm). The design choice of a fixed timing schedule enabled participants to include the questionnaires into their daily routines and may increase response rates (Conner & Lehmann, 2012). In addition, reminders are highly recommended in ESM literature to increase participants' compliance (Yearick, 2017). If participants did not react to the fixed push surveys, notifications were sent as a reminder after 90 minutes via the Ethica Data app. For a visualization of the study design, see Figure 1.

**Figure 1**

*Design and Materials of the Study*




*Note.* The time points in brackets (ESM surveys) indicate maximum availability of surveys. Only study-relevant measures are illustrated in the figure. ESM = Experience Sampling Methodology; SWEMWBS = Short Warwick-Edinburgh Mental Well-being Scale (Stewart-Brown et al., 2009).

## Measures

As the data were collected for different research projects, a range of variables were included in the study. In this method section, only study-relevant variables for the current thesis are described. Demographics were assessed in the baseline questionnaire, including age, gender, nationality, and educational level.

### *State Depression*

State depression was measured by one single-item visual-analogue scale (VAS) focusing on the momentary mood in the daily surveys ("To what extent do you feel down right now?"). It was self-reported by the participants ranging from 0 (*not down at all*) to 100 (*extremely down*). A study by Lesage and colleagues (2012) highlights the discriminative sensitivity and construct validity of the VAS, reporting a correlation of .45 with the depression subscale of the Hospital Anxiety and Depression Scale.

### *State Mental Well-Being*

For assessing mental well-being at state level, the Short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS; Stewart-Brown et al., 2009) was used in the daily surveys. The short form of the questionnaire has been preferred due to its good psychometric

properties and its convenience for assessing well-being (Smith et al., 2017). It is highly correlated ($r$ = .95) with its original 14-item version (Fat et al., 2017) and shows good internal consistency (Cronbach's α = .89; Vaingankar et al., 2017). Participants indicated their agreement on seven statements (e.g., "I've been feeling optimistic about the future", "I've been dealing with problems well") on a 5-point Likert scale ranging from 1 (*none of the time*) to 5 (*all of the time*). The 7 items of the SWEMWBS referred to reporting on a state over the past 2 hours. They were summed up to form the dimension score for momentary well-being for each person's measurement point. Higher sum scores are indicative for higher mental well-being, with a range from 7 to 35. The scale in this sample showed good internal consistency for the repeated measurement data (Cronbach's α = .83).

***General Self-Efficacy***

The General Self-Efficacy Scale (GSE; Schwarzer & Jerusalem, 1995) was utilized in the baseline questionnaire to measure the participants' general level of perceived self-efficacy. The GSE consists of 10 self-descriptive statements about feelings and thoughts in various situations, referring to people's overall, trait-like, perception of self-efficacy. Exemplary statements of the scale are "I can always manage to solve difficult problems if I try hard enough" or "I can remain calm when facing difficulties because I can rely on my coping abilities". Participants indicated their agreement with each statement on 4-point Likert scales ranging from 1 (*not at all true*) to 4 (*exactly true*). High reliability, stability, and construct validity of the GSE scale were shown in earlier studies (Leganger et al., 2000). The general score for self-efficacy was calculated as the mean of relevant items from the baseline questionnaire. A higher score represents a higher level of perceived general self-efficacy. The scale in this sample showed good internal consistency (Cronbach's α = .87).

**Data Analysis**

The data from Ethica were imported to R (R Core Team, 2018) for all statistical analyses. Both the ESM and the baseline datasets were merged with the dplyr package (Wickham et al., 2018) by persons' ID code and the study-relevant variables extracted to a new data frame. Not fully completed ESM surveys (participants clicked on the survey but did not fill it out), were removed. First, descriptive statistics were investigated. Raw data were then plotted (e.g., spaghetti and scatter plots) for visualization purposes.

The main hypotheses were then tested by using multilevel modeling with the nlme package (Pinheiro et al., 2021). Multilevel models (MLM) are particularly useful for providing more robust statistical inferences about within-person associations (intraindividual covariation) and between-person differences therein (Bolger & Laurenceau, 2013). MLM

appropriately consider the measurements nested within participants. Such models additionally allow to disaggregate between- and within-person variants (Myin-Germeys, 2009), in this case to distinguish between the between- and within-person covariate of state depression (Curran & Bauer, 2011). Compared to classical analyses procedures, MLM can handle the complexity involved in ESM data, for example, large numbers of randomly missing data (Myin-Germeys, 2009).

Two-level models were computed with repeated measurements (level 1) nested within individuals (level 2) by the following steps. First, the Intraclass Correlation (ICC) was estimated based on a random intercept-only model with state well-being as dependent variable. As the ratio of the random intercept variance (between-person) to the total variance (between- and within-person; Bolger & Laurenceau, 2013), the ICC computes the level of nonindependence to justify multilevel models. Concretely, it aims to ensure that there is enough within-person variance to model (Bolger & Laurenceau, 2013). To disaggregate within- and between-person variability of the predictor variable state depression, the person means (PM) and person-mean centered (PMC) scores of the variable were computed as a second step (Curran & Bauer, 2011). All continuous variables were also z-standardized. This allowed to compare the different scales of state depression and state well-being and to obtain standardized regression estimates for the MLMs. Next, for examining the research question, both covariates of the predictor state depression, that is, the PM and PMC scores, were included into the model as fixed effects. Here, the PM depression score represented the between-person association and the PMC depression score the within-person association with state well-being. A random intercept fixed slope model was compared with a more complex random intercept plus random slope model allowing the effect of the person-mean centered parameter to vary across persons. The more complex model was chosen as it showed a better fit, $x^2$ (2) = 36.31, $p$ <.001.

For testing the hypothesis, the main effects of state depression, general self-efficacy and their interaction (state depression x general self-efficacy) were included into the model as fixed effects. Again, the more complex random intercept random slope model yielded a better fit than the model with a random intercept only, $x^2$ (2) = 35.91, $p$ = <.001, allowing the effect to vary across persons.

For all mixed models, the first-order Autoregressive structure, AR(1), was used to specify a covariance structure. It was decided for this type, based on (1) its assumption of homogeneous variances and correlations that decline exponentially with distance (Kincaid, 2005), (2) comparing the absolute log-likelihood values of the AR(1) structure versus the

compound symmetry structure and (3) making the models as parsimonious as possible. 95%-confidence intervals are reported for the estimates of all main results. Additionally, assumptions were checked for multilevel modeling. Here, a variation of the Levene's Test was run to check for homogeneity of variance. This test considers the multilevel data structure (see Palmeri, n.d., for an overview). Concretely, the model residuals were extracted and their absolute value was squared. Then, an analysis of variance of the between subject residuals was run to check for homogeneity of variance (i.e., $p > .05$).

For visualizing the association of state depression and state well-being over time, plots for the group level and for specific individuals were computed as follows: First, estimated marginal means (EM means) were calculated from the MLM by using the function emmeans from the emmeans package (Lenth et al., 2021). For plotting the EM means per timepoint, time was included as a fixed factor in the model. For the exploratory case analyses, the same steps were followed to plot the fluctuation of state depression and state well-being for specific individuals. Here, time and the persons' ID was included as fixed factors. A correlation was also run on all measurements for these persons separately to support the visualization with the Pearson correlation coefficient.

## Results

### Preliminary Analyses

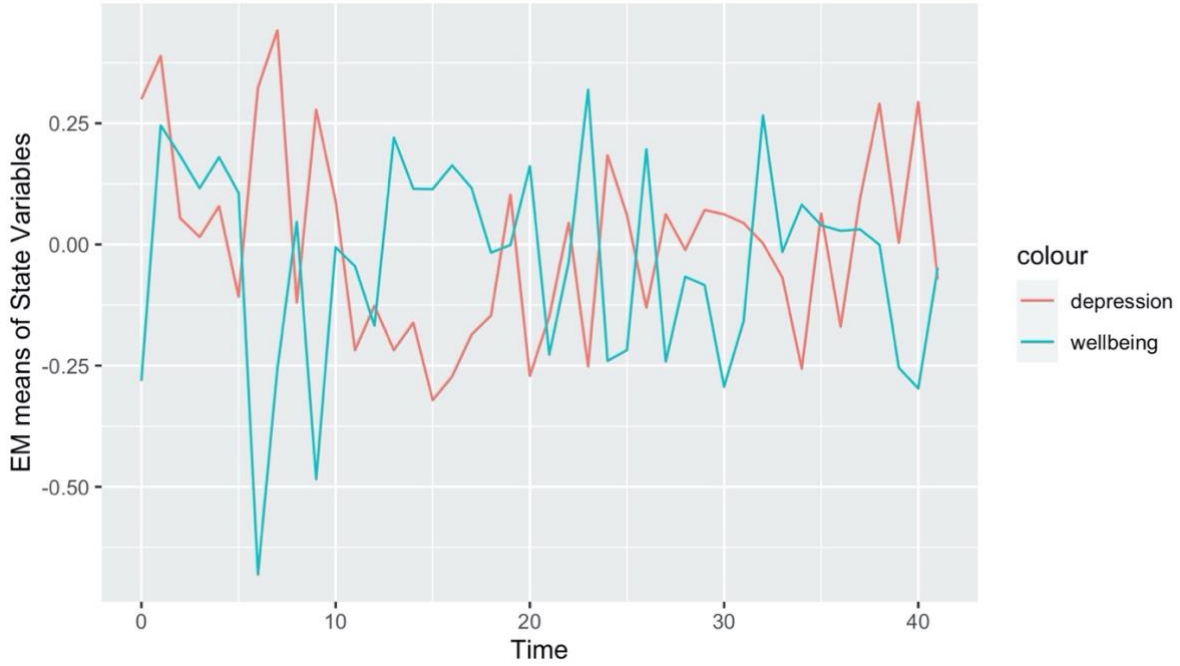
The participants ranged in age from 19 to 32 ($M$ = 23.52, $SD$ = 2.82) years and 56% were women. In total, 40% of participants had already obtained a bachelor's degree and 60% a high school degree. In the data, a total of 905 fully completed daily questionnaires were included. Out of a maximum of 39 available surveys per person (13 days x three surveys per day), averagely 36.21 surveys were completed per person. When exploring the distribution of the variables state depression and state well-being over time, overall high well-being scores ($M$ = 25.35, $SD$ = 3.66, range: 14–32) and rather low depression scores ($M$ = 16.49, $SD$ = 14.59, range: 0–62) were obvious. Compared with representative scores for the German version of the General Self-efficacy scale (Schwarzer et al., 1997), the average level of general self-efficacy was quite high ($M$ = 30.76, $SD$ = 3.66, range: 25–38).

### Visual Exploration of State Depression and State Well-Being

A visualization of the overall fluctuation between the main study-relevant variables state depression and state well-being over time can be found in Figure 2. The plot suggests an overall negative association between both variables across individuals over time.

**Figure 2**

*Fluctuation of State Depression and State Well-Being Across Participants Over Time*




*Note.* EM means = Estimated marginal means. The EM means were calculated from the z-standardized state variables. Time represents the multiple measurement points over the period of two weeks (April 06 – April 19, 2020).

**Association between State Depression, State Well-Being and General Self-Efficacy**

The assumptions for the tested LMM were partly fulfilled. Visual inspections of the QQ plots indicated that the residuals were normally distributed. A variation of the Levene's Test for multilevel structures, however, showed that an equal variance of the residuals across groups, i.e., the subject level, could not be assumed, all $F$s (1, 903) > 6.103, all $p$s < .014. An inspection of plotting the model-predicted values against the observed ones indicated that the assumption of linearity was not fulfilled (see Appendix A, Figures A1 – A4 for all plots). Although the assumptions for MLM were only partly fulfilled, this master project relied on the general belief that estimates of the fixed effect part of the multilevel model are quite robust to violations of assumptions (Maas & Hox, 2004).

All results for the multilevel models are found in Table 2. Regarding the research question, a significant negative association was found both for the within-person and between-person level parameters of depressive symptoms and well-being. For the between-person level, higher rates of depressive symptomatology compared to the average group level were moderately associated with a decrease in state mental well-being (β = –.386 [–.571, –.201], $p$ < .001).

**Table 2**

*Multilevel Analyses of the Relationship between State Depression, State Well-Being and General Self-Efficacy (*N *= 25)*

| Predictor | β | SE | 95% CI | | *t* | *p* |
|---|---|---|---|---|---|---|
| | | | LL | UL | | |
| Model 1: Fixed effects of covariates | | | | | | |
| State depression | | | | | | |
| Between-persons association | –.386 | 0.089 | –.571 | –.201 | –4.314 | <.001 |
| Within-person association | –.543 | 0.053 | –.648 | –.438 | –10.147 | <.001 |
| Model 2: Interaction | | | | | | |
| State depression | –.647 | 0.063 | –.771 | –.523 | –10.234 | <.001 |
| General self-efficacy | .190 | 0.264 | –.356 | .736 | 0.720 | .479 |
| State depression*general self-efficacy | –.011 | 0.172 | –.349 | .326 | –0.066 | .947 |

*Note*. The analyzed multilevel models for both hypotheses are shown. In the first model, the variable state depression was disaggregated into the person mean and person-mean centered score to indicate the between-persons and the within-person level, respectively. State depression, general self-efficacy and state well-being were z-standardized. The estimates represent the standardized beta regression coefficients. SE = Standard Error; CI = Confidence Interval; LL = Lower Limit; UL = Upper Limit.

Regarding the within-person association, a higher level of state depression at the time of signal compared to the individual person's average level was strongly associated with a decrease in state mental well-being (β = –.543 [–.648, –438], $p < .001$). The main effect of this within-person association is visualized in Figure 3. It is visible that an individual higher level of state depression (as a deviation from the participant's average) is clearly negatively associated with state well-being in this moment for most participants.

There was no interaction effect found for state depression and general self-efficacy. Accordingly, general self-efficacy did not moderate the relationship between the predictor variable state depression and mental well-being (β = –.011 [–.349, .326], $p = .947$). Against the hypothesis, the aggregated relationship between state depression and state mental well-being was not weakened by higher levels of participants' general self-efficacy.

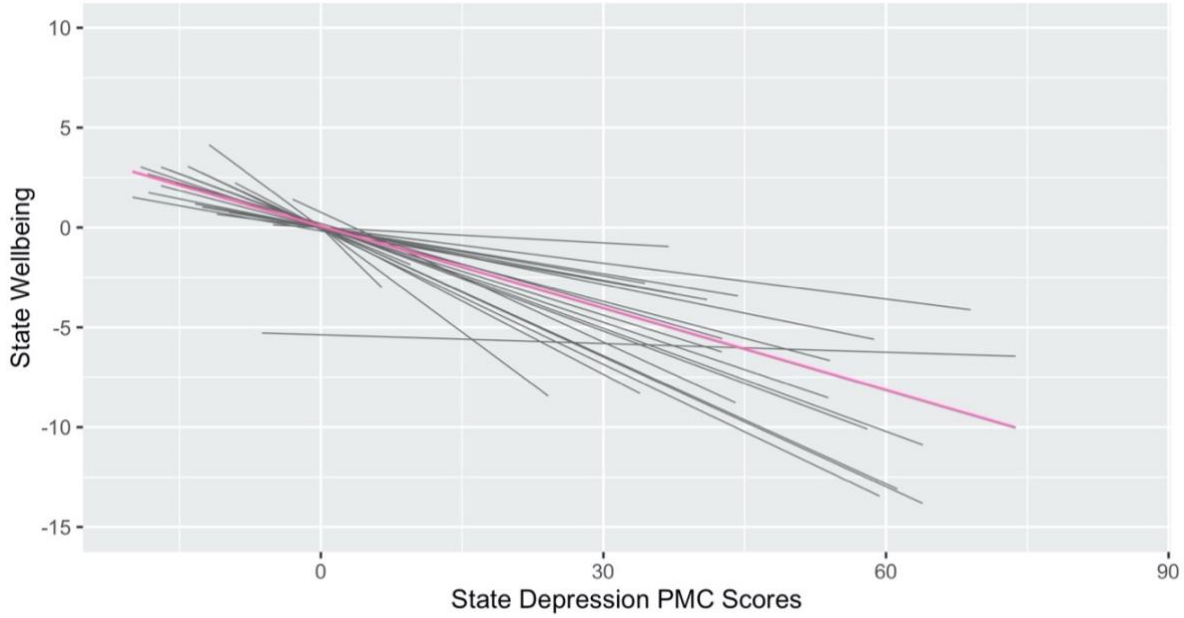
**Follow-up Analyses: Zooming Into Individuals Low vs. High on General Self-Efficacy**

Although the interaction effect was not significant at the group level, exploratory case analyses were carried out for two participants with very high levels of general self-efficacy in

the sample (> 0.5 z-score) and three participants with the lowest levels of self-efficacy (< 0.5 z-score). EM Means of both state variables depression and well-being were plotted for each of them. The regression coefficient was determined to support the visualization.

**Figure 3**

*Within-Person Association of State Depression and State Well-Being*



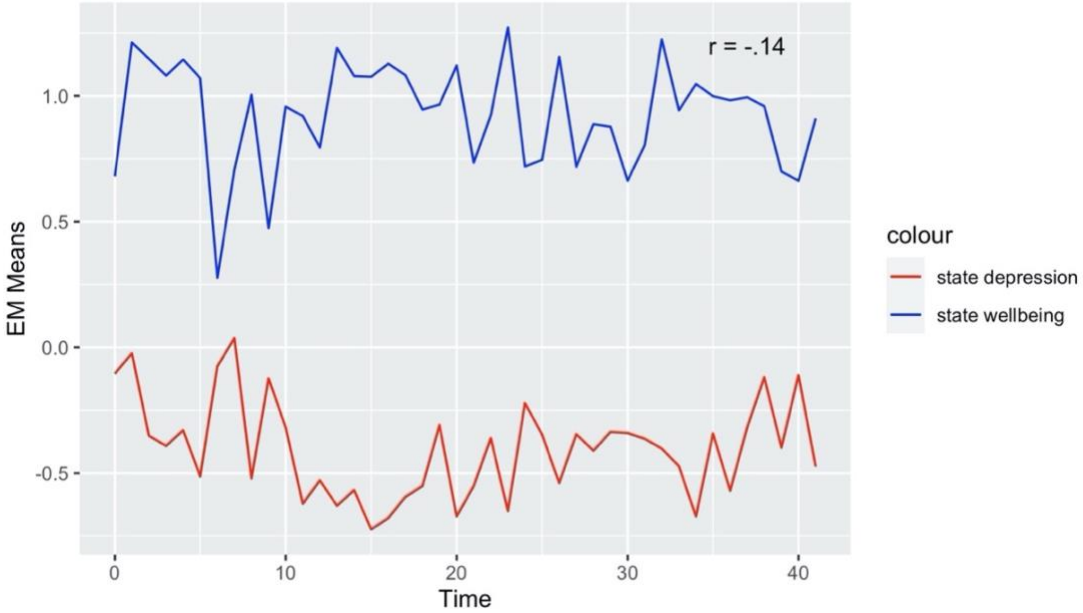

*Note*. The main effect for the person mean-centered (PMC) parameter of the within-person association between state depression and state well-being is visualized. For this figure, PMC scores were calculated for both outcome and predictor variable. Each line represents one participant.

For the two individuals with high levels of general self-efficacy, the graphs visualize a small negative correlation according to Cohen ($r = –.14$, $r = –.23$; see Figure 5 and 6). For example, the graph for individual 25830 (Figure 6) shows fluctuation with sometimes a clear negative association between both state variables (e.g., measurement 8 and between 20–30), sometimes no visual association (e.g., measurements 35–38) and sometimes even a positive association (e.g., measurements 0–3).

For the three individuals with the lowest levels of self-efficacy, however, the graphs visualize a large correlation between state depression and well-being according to Cohen ($r = –.65$, $r = –.79$, $r = –.87$; see Figure 7, 8 and 9). The lines are very symmetrical while both state variables still differ in their fluctuation between individuals, for example, when comparing the graph of individual 25835 (Figure 7) and individual 25824 (Figure 9).

**Figure 5**

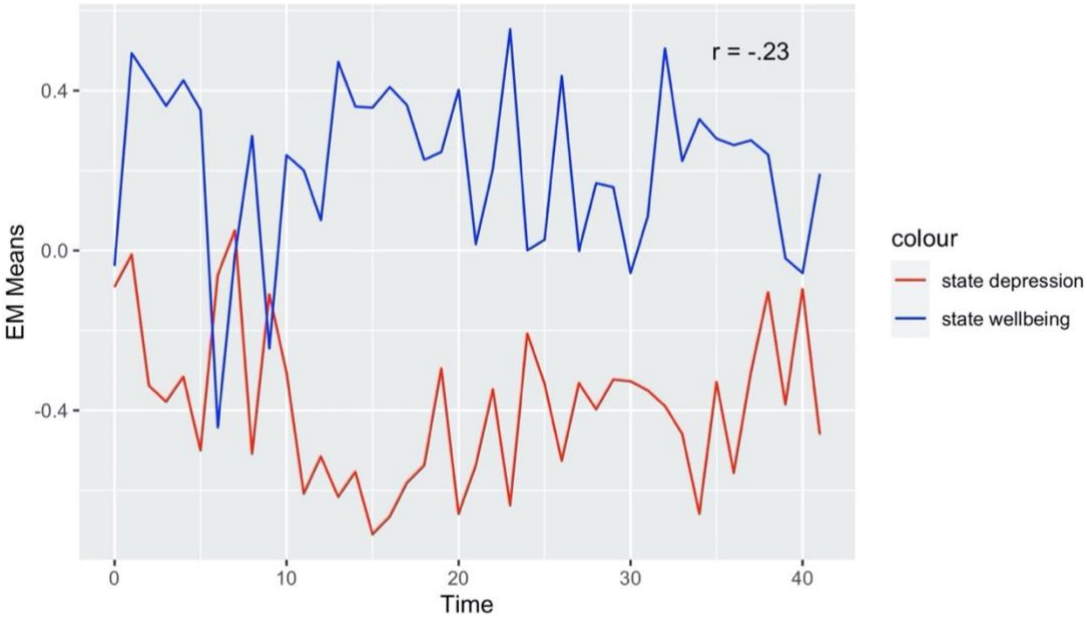
*Case Visualization for Individual ID = 25840 with High Level of General Self-Efficacy*




*Note.* EM Means of well-being and depressive state per measurement point are shown. The EM means were calculated from the z-standardized state variables. A high level of general self-efficacy is indicated by > 0.5 z-score across the study sample.

**Figure 6**

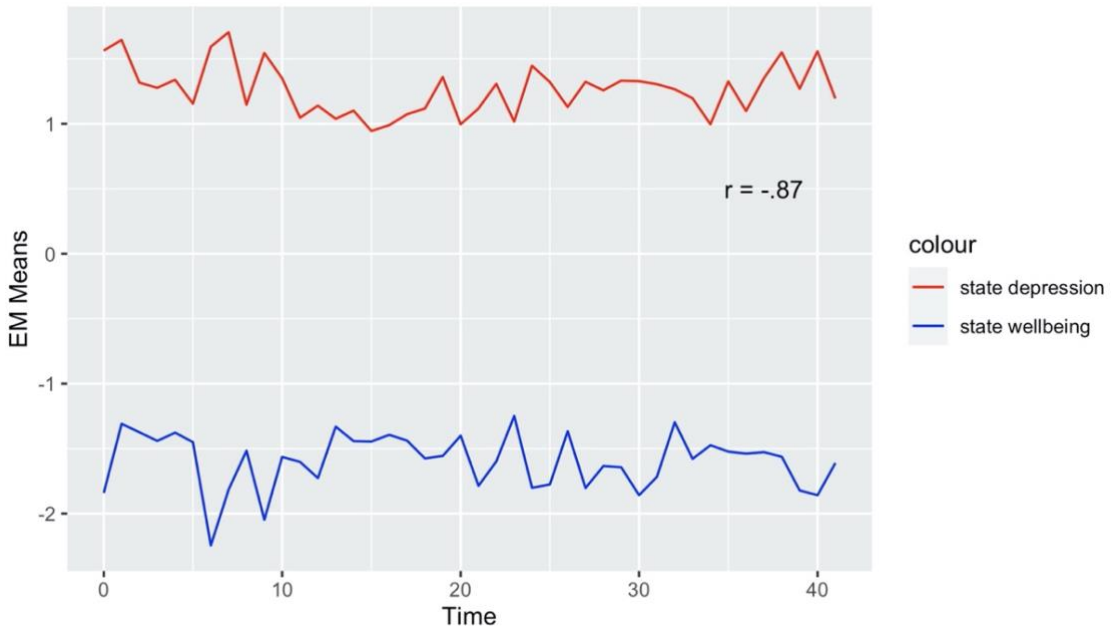
*Case Visualizations for Individual ID = 25830 with High Level of General Self-Efficacy*




*Note.* EM Means of well-being and depressive state per measurement point. The EM means were calculated from the z-standardized state variables. A high level of general self-efficacy is indicated by > 0.5 z-score across the study sample.

**Figure 7**

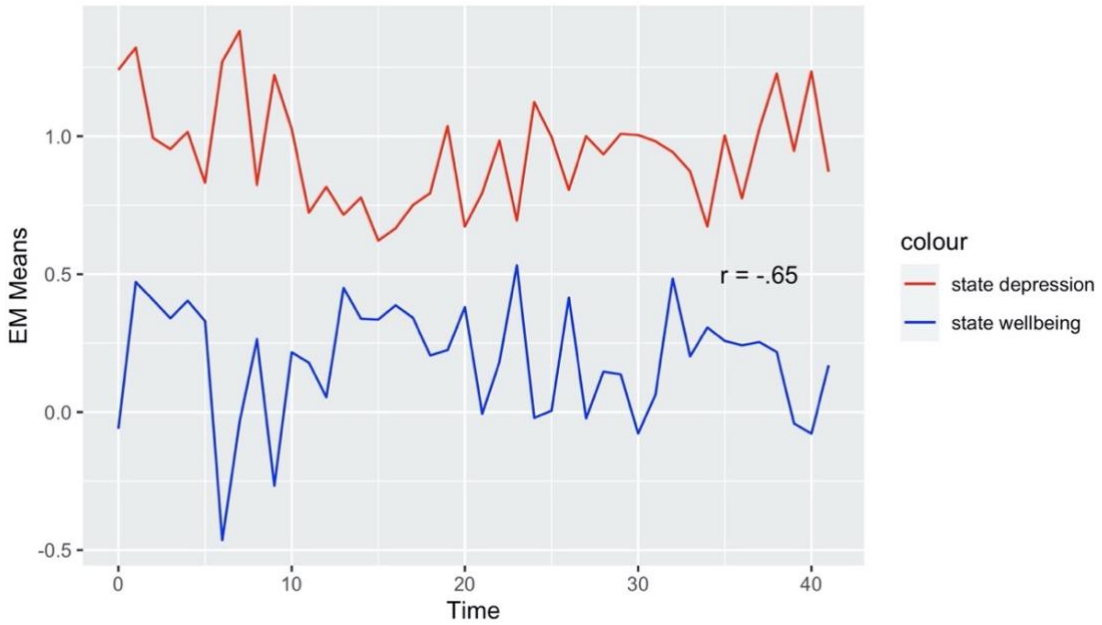
*Case Visualization for Individual ID = 25835 with Low Level of General Self-Efficacy*




*Note.* EM Means of well-being and depressive state per measurement point. The EM means were calculated from the z-standardized state variables. A low level of general self-efficacy is indicated by < 0.5 z-score across the study sample.

**Figure 8**

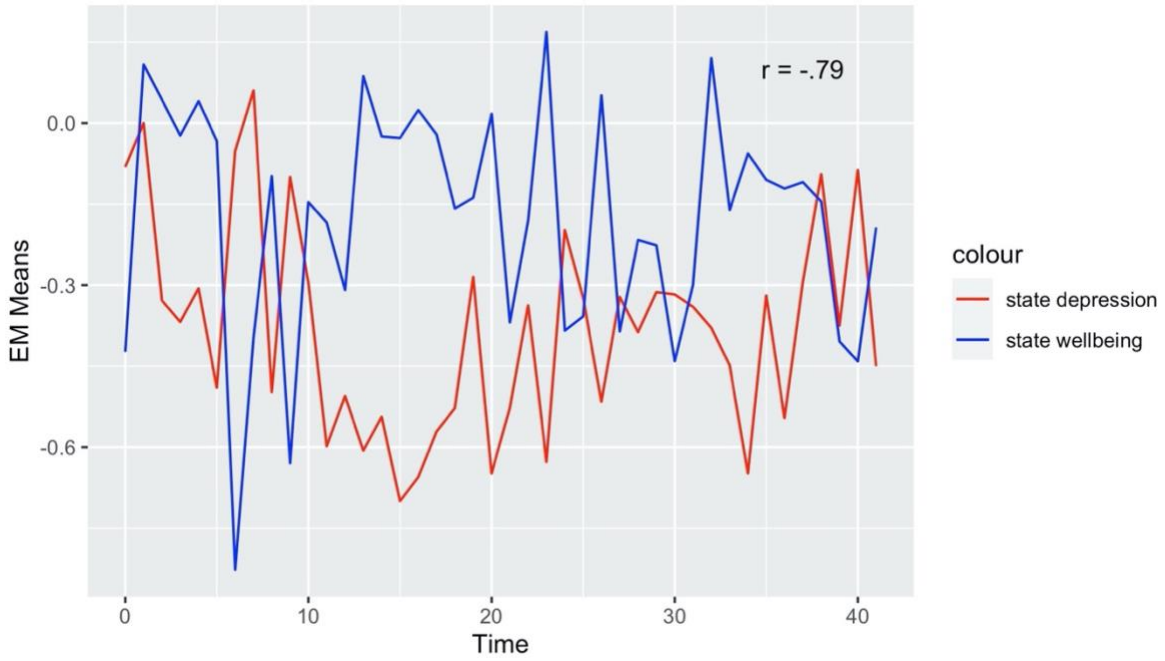
*Case Visualizations for Individual ID = 25808 with Low Level of General Self-Efficacy*




*Note.* EM Means of well-being and depressive state per measurement point. The EM means were calculated from the z-standardized state variables. A low level of general self-efficacy is indicated by < 0.5 z-score across the study sample.

**Figure 9**

*Case Visualizations for Individual ID = 25824 with Low Level of General Self-Efficacy*




*Note.* EM Means of well-being and depressive state per measurement point. The EM means were calculated from the z-standardized state variables. A low level of general self-efficacy is indicated by < 0.5 z-score across the study sample.

## Discussion

The present study examined the relationship between state depression and state mental well-being in daily life of university students. While previous cross-sectional studies have given strong support for the two continua-model on the between-person level (Keyes, 2005; Kinderman et al., 2015), research lacks knowledge about its validity for within-person processes. To prevent false generalization in this context (Fisher et al., 2018), this study aimed to zoom into the intraindividual level to examine how psychopathology and well-being are associated within individuals over time. An additional focus in this study was placed on the role of general self-efficacy as a possible protective factor in the overall relationship.

### The Two-Continua Model Between and Within Persons

For the exploratory research question, a negative association was found between state depression and state mental well-being both across participants (i.e., between-person effect) and within participants (i.e., within-person effect). For the between-person level, it means that a higher state depression in general serves as a moderate predictor for a decreased state well-being at the group level. This goes in line with previous literature on the two-continua model. This research line supports the idea that mental health and mental illness make related-yet-

distinct contributions to our understanding of complete mental health (Keyes, 2005, 2007). The absolute strength found on the between-level in our repeated measurement design ($\beta = -.386$) is a little weaker than the one reported ($\beta = -.53$) in the confirmatory factor analysis of the two-factor structure by Keyes (2005) from representative cross-sectional data. Another replication of the hypothesized two-continua structure from cross-sectional data reports a quite similar strength of association compared to our findings ($\beta = -.33$; Keyes et al., 2008). Our finding can also be integrated into previous research of validating the two-continua model on the group level among students (Renshaw & Cohen, 2014).

The negative association between state depression and state well-being within persons indicates that an individual's higher state of feeling depressed than his or her usual level serves as a strong predictor for a decrease in mental well-being in this moment. Here, the strong, though not perfect, association of depressive symptoms and momentary well-being within persons gives first insight into the two-continua model also holding within persons over time. Both continua are seen as related but not that strongly correlated to assume that mental health and mental illness are two ends of one continuum (Keyes, 2005).

Interestingly, the findings reveal that the association within participants was clearly stronger (strong correlation according to Cohen, 2013), as opposed to the moderate between-person association. The discrepant magnitudes of association between and within persons might be explained by the fact that between-person associations do not capture individual differences and the subtle processes taking place within persons (Hamaker, 2012; Snippe et al., 2016), such as self-regulatory processes within individuals. For instance, in a state of depression, individuals are said to get stuck in a self-regulatory cycle which is associated with excessive self-focus (Mor & Winquist, 2002). Here, findings from a previous ESM study show that momentary self-focus is associated with concurrent levels of negative affect within persons (Mor et al., 2010). This might, in turn, hinder to maintain a high level of well-being in this moment. The other way round, our findings revealed individual differences, by showing that the association between psychopathology and well-being differed for different individuals as well as within them over time. This perspective may be integrated into previous research on dynamics in affective states and their regulation within persons over time (e.g., Hamaker, 2012; Röcke & Brose, 2013). A key assumption is that emotion regulation helps to recover from stressors and return to individual baseline levels (Kuppens et al., 2010; Röcke & Brose, 2013). On the one hand, momentary well-being might decrease in a moment when as a person feels more depressed than usual. On the other hand, it means that momentary well-being is not meant to be completely determined by an individual's momentary depressive mood. It

might be also sensitive toward rewarding environmental cues or other psychological variables. Here, studies using multiple measurement designs are still lacking on the two-continua model. Concurrently, an ESM study, examining fluctuations of depression within persons over time, suggests that physical and social behaviors have positive affective implications for mental health within individuals with depression (Snippe et al., 2016).

Given the overall strong negative association on the within-person level, our finding reveals the importance of taking a more nuanced look at how psychopathology and well-being are related within individuals over time. This level analysis is highly valuable and inevitable, especially when aiming to integrate the two-continua model in daily work with individuals (Curran & Bauer, 2011, Hamaker, 2012).

**The Role of General Self-Efficacy as a Protective Factor?**

In contrast to our hypothesis, general self-efficacy was not found to be a moderator in the association between state depression and state well-being on the group level. Hence, a higher level of general self-efficacy did not reduce the effect of depression on mental well-being. There may be several reasons for not revealing a moderating role. First, the variable general self-efficacy was found to have a rather small variance in the study's sample population compared to representative scores of the General Self-efficacy scale in a sample of German university students (Schwarzer et al., 1997). A small sample variance tends to substantially diminish the statistical power for detecting moderating effects (Memon et al., 2019). Secondly, the distribution of both state variables depression and well-being could most probably not be approximated by the normal. The study's sample showed overall rather low levels of depression and quite high levels of momentary mental well-being (see Appendix B, Figures B1 and B2). This may lead to limited informative value of the main statistical analyses including an interaction effect for state depression and general self-efficacy. Third, from a theoretical perspective, there is an ongoing debate questioning the role of general self-efficacy and its universal protective effects (Bandura, 2012). A line of argumentation states that persons with high levels of self-efficacy may invest less into resources and self-care due to a lower discrepancy between planned goals and perception of own strengths (Powers, 1991). A person with high perceived self-efficacy might therefore be less prepared to use those optimistic self-beliefs for maintaining mental well-being, or in turn, weakening the effects of depressive symptomatology.

However, interestingly, the post-hoc case analyses showed tendencies towards the hypothesized protective effect of general self-efficacy. In detail, the association between state depression and state well-being was shown to be weaker for two individuals with the highest

level of general self-efficacy from the sample and stronger for three individuals with the lowest score on general self-efficacy. This means that general self-efficacy might have a buffering function for the effect of depression predicting well-being. Even though there cannot be drawn any statistically based conclusions from the case analyses, those exploratory findings go in line with literature on the protective mechanisms of general self-efficacy for mental well-being (Bandura, 1997; Schönfeld et al., 2019). Thus, to detect a potential moderation of general self-efficacy in multilevel analysis, this study was possibly underpowered and a power analysis for a required sample size will be needed in future studies. For statistical power, moderation analyses need at least three to four times the sample size sufficient for main effects (Shieh, 2009; Shieh & Jan, 2015).

**Strengths and Limitations**

There are several strengths of the current study. A main strength is the use of experience-sampling data that compromise reports on over 900 everyday-life situations with an average of respective 36.21 surveys per person covering both negative and positive mental health states. By using this multiple measurement design, this ESM study was able to take a closer look at psychological processes that unfold within individuals over time in their daily lives. In this context, the additional statistical benefit of distinguishing the intraindividual from the interindividual level of data analysis adds to the study's strengths (Curran & Bauer, 2011). Another strength is that the scales SWEMWBS and GSES showed good internal consistency for the study's sample. In addition, the current study showed a quite high response rate of about 92% of the participants in the final sample. A review on ESM reveals 80% as a response rate of participants within a study (Yearick, 2017).

Nevertheless, certain limitations should be mentioned when it comes to interpreting the results. First, the results are limited to only allow correlational interpretations but no causal explanations of the effects due to the naturalistic design. Second, the study sample was quite small in comparison with literature on ESM practice, reporting a mean sample size of 53 (van Berkel et al., 2018). Regarding the violated assumptions of the multilevel analyses, a sample size of > 100 groups at level 2 would have been preferable for a more robust estimation of the models (Maas & Hox, 2004). Third, the convenience sampling strategy may come with a likelihood of selection biases and is therefore not supposed to best represent a population (Etikan et al., 2016). For instance, the findings might be biased in terms of cultural background of participants as a German students' sample only. Cross-cultural assessments of the general self-efficacy scale show cultural differences in average self-efficacy scores (Schwarzer et al., 1997). Additionally, the sample could be biased in terms of the mental

health condition. People with higher levels of mental illness might have been less likely to participate in this study because of the relatively time-consuming and burdensome approach of an ESM study (Palmier-Claus et al., 2019). Therefore, the findings of the study cannot be generalized to general students' population. At last, it needs to be mentioned that the data were collected at the beginning of the Covid-19 pandemic. Studies on mental health during the first lock down of Covid-19 report higher levels of depressive symptoms and lower levels of well-being among the general population (e.g., Jung et al., 2020). Those special circumstances might have strengthened the negative effect of depression on mental well-being, for instance, as the students were confronted with the need of developing new adaptation and coping strategies.

**Study Implications**

In general, several study implications may be considered for both future research and practice. Our findings underline the claim that mental health needs to be considered as a complete state allowing to foster both on decreasing psychopathology but also increasing well-being (Iasiello et al., 2020; Keyes, 2002, 2005). By studying the model between and within persons, this makes it possible to derive and concretize relevant implications of previous cross-sectional research to applied psychological settings.

If the two-continua model holds within persons, it implies that starting points for interventions can either be to decrease depressive states or to focus on increasing momentary well-being. For giving personalized treatment advice, a clinician or student counselor may work with daily diary methods to explore a clients' individual stressors and sources for moments of well-being. Possible indicators for increasing well-being states could be, for example, when being with friends (i.e., social support; Awang et al., 2014) or when having a good sleep (i.e., sleep hygiene; Ridner et al., 2016). An example of integrating within-person knowledge into practice can be seen in a recent study investigating ESM-derived feedback in the treatment of depression (Kramer et al., 2014). It is an example of how ESM can be used to assess ecological momentary interventions with real-life assessments (ESM-I). By providing depressed patients with insights into individual patterns of positive affect, ESM-I served as a therapeutic tool to decrease depressive symptomatology (Kramer et al., 2014).

ESM-derived feedback could also be used to further study the protective role of general self-efficacy for mental health in an experimental design. Accordingly, previous research suggests that self-efficacy can be increased by giving positive feedback about one's performance (see, e.g., Zinken et al., 2008). ESM-I could therefore be used to investigate how feedback on one's own performance may function as a buffer to ameliorate or maintain

momentary mental well-being. A possible study could, for example, include an experimental group receiving add-on ESM-derived feedback concerning self-efficacy beliefs, a pseudo-experimental group participating in ESM without feedback and a control group. Such research design may give detailed insights into the effect of self-efficacy for mental health, as it can still be seen as an important target for psychological interventions to protect mental health (e.g., Jimenez et al., 2012).

Further, our findings showed a strong association between psychopathology and well-being within persons over time at the one hand, while individual differences within this association were revealed on the other hand. Thus, it also seems to be relevant to further examine protective factors that might come into play on the intraindividual level. That is, not all people with higher depressive symptoms than their usual level equally experience lower levels of mental well-being in each and every moment. It would be of interest, for example, to gain a deepened understanding of individuals' capabilities of emotion regulation. A meta-analysis by Kraiss and colleagues (2020) reports promising findings on the role of emotion regulation strategies for improving well-being in people with mental disorders. Here, individual time-series analyses may be helpful to reveal which strategies or coping styles might weaken the predicted effect of depression on well-being within specific individuals over time. The fact, that such individual differences exist highlights the need to further study this level of interest. This knowledge might improve clinical decision making and help to inform on which patient would benefit from what type of intervention (Snippe et al., 2016).

While our findings support future research into person-tailored applications in therapy, a challenge is to implement such research knowledge in clinical mental health care. Especially new technological designs are nowadays shown to be widespread in research while their implementation in mental health care is limited (Trull & Ebner-Priemer, 2013). Therefore, future examination of useful individualized interventions based on the two-continua model needs to ensure research utilization (see Brown & Rodger, 1999). This means to find ways to translate and make such newly technological designs adaptable for practical settings. Ways to achieve research utilization in this research field might be to conduct clinical trials or to integrate the knowledge base of clinicians and their understanding of complete mental health.

**Conclusion**

The current experience sampling study zoomed into university students' daily experiences of depressive symptoms and momentary mental well-being in over 900 unique measurement occasions. Findings give first support for the two-continua model not only

holding between but also within persons over time. For further validation, multiple measurement studies are needed that examine the model within persons in the general population. Despite a non-significant moderation effect, case analyses additionally revealed higher levels of general self-efficacy as a potential buffer against depressive symptoms and call for further investigation of its claimed protective role for mental health. Finally, this study corroborates to examine complete mental health on the level of key interest for mental health care, which is understanding processes within persons in daily life. Given the comprehensive findings, both researchers and practitioners are encouraged to think in both directions when caring about individual and general mental health – specifically, with the focus on both ameliorating psychological distress and cultivating mental well-being.

**References**

Awang, M. M., Kutty, F. M., & Ahmad, A. R. (2014). Perceived social support and well being: First-year student experience in university. *International Education Studies*, *7*(13), 261–270.

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, *50*, 248–287.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. Freeman.

Bandura, A. (2006). Guide for constructing self-efficacy scales. *Self-Efficacy Beliefs of Adolescents*, *5*(1), 307–337.

Bandura, A. (2012). On the functional properties of perceived self-efficacy revisited. *Journal of Management*, *38*(1), 9–44. https://doi.org/10.1177/0149206311410606

Bolger, N., & Laurenceau, J.-P. (2013). Fundamentals of intensive longitudinal data. In *Intensive longitudinal methods—An introduction to diary and experimental sampling research* (pp. 27–39). Guildford Press.

Brouwers, A., & Tomic, W. (2000). A longitudinal study of teacher burnout and perceived self-efficacy in classroom management. *Teaching and Teacher Education*, *16*(2), 239–253. https://doi.org/10.1016/S0742-051X(99)00057-8

Brown, G. T., & Rodger, S. (1999). Research utilization models: Frameworks for implementing evidence-based occupational therapy practice. *Occupational Therapy International*, *6*(1), 1–23. https://doi.org/10.1002/oti.85

Brown, L. H., Strauman, T., Barrantes-Vidal, N., Silvia, P. J., & Kwapil, T. R. (2011). An Experience-sampling study of depressive symptoms and their social context. *The Journal of Nervous and Mental Disease*, *199*(6), 403–409. https://doi.org/10.1097/NMD.0b013e31821cd24b

Cohen, J. (2013). *Statistical power analysis for the behavioral sciences*. Academic Press.

Conner, T. S., & Lehman, B. (2012). Getting started: Launching a study in daily life. In M. R. Mehl & T. S. Conner (Eds.), *Handbook of research methods for studying daily life* (pp. 89–107). Guildford Press.

Curran, P. J., & Bauer, D. J. (2011). The disaggregation of within-person and between-person effects in longitudinal models of change. *Annual Review of Psychology*, *62*, 583–619. https://doi.org/10.1146/annurev.psych.093008.100356

Dahlin, M., Joneborg, N., & Runeson, B. (2005). Stress and depression among medical students: A cross-sectional study. *Medical education*, *39*(6), 541–644. https://doi.org/10.1111/j.1365-2929.2005.02176.x

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *Armican Journal of Theoretical and Applied Studies*, *5*(1), 1–4. https://doi.org/10.11648/j.ajtas.20160501.11

Fat, L., Scholes, S., Boniface, S., Mindell, J., & Stewart-Brown, S. (2017). Evaluating and establishing national norms for mental wellbeing using the short Warwick–Edinburgh Mental Well-being Scale (SWEMWBS): Findings from the Health Survey for England. *Quality of Life Research*, *26*, 1129–1144. https://doi.org/10.1007/s11136-016-1454-8

Fisher, A. J., Medaglia, J. D., & Jeronimus, B. F. (2018). Lack of group-to-individual generalizability is a threat to human subjects research. *Proceedings of the National Academy of Sciences*, *115*(27), E6106–E6115. https://doi.org/10.1073/pnas.1711978115

Gallagher, D., Mhaolain, A. N., Crosby, L., Ryan, D., Lacey, L., Coen, R. F., Walsh, C., Coakley, D., Walsh, J. B., Cunningham, C., & Lawlor, B. A. (2011). Self-efficacy for managing dementia may protect against burden and depression in Alzheimer's caregivers. *Aging & Mental Health*, *15*(6), 663–670. https://doi.org/10.1080/13607863.2011.562179

Hamaker, E. L. (2012). Why researchers should think „within-person": A paradigmatic rationale. In M. R. Mehl & T. S. Conner (Eds.), *Handbook of research methods for studying daily life* (pp. 43–61). The Guilford Press.

Iasiello, M., van Agteren, J., & Cochrane, E. M. (2020). Mental health and/or mental illness: A scoping review of the evidence and implications of the dual-continua model of mental health. *Evidence Base*, *2020*(1), 1–45. https://doi.org/10.21307/eb-2020-001

Jimenez, P. J., Melendez, A., & Albers, U. (2012). Psychological effects of Tai Chi Chuan. *Archives of Gerontology and Geriatrics*, *55*(2), 460–467. https://doi.org/10.1016/j.archger.2012.02.003

Jo, K.-H., & Lee, H. J. (2008). Relationship between self-efficacy, depression, level of satisfaction and death attitude of college students. *Journal of Korean Academy of Nursing*, *38*(2), 229–237. https://doi.org/10.4040/jkan.2008.38.2.229

Jung, S., Kneer, J., & Krueger, T. (2020). The German COVID-19 Survey on mental health: Primary results. *MedRxiv*, 2020.05.06.20090340. https://doi.org/10.1101/2020.05.06.20090340

Kessler, R. C., & Walters, E. E. (1998). Epidemiology of DSM-III-R major depression and minor depression among adolescents and young adults in the national comorbidity

survey. *Depression and Anxiety*, *7*(1), 3–14. https://doi.org/10.1002/(SICI)1520-6394(1998)7:1<3::AID-DA2>3.0.CO;2-F

Keyes, C. L. M. (2002). The mental health continuum: From languishing to flourishing in life. *Journal of health and social behavior*, *43*, 207–222. https://doi.org/10.2307/3090197

Keyes, C. L. M. (2005). Mental illness and/or mental health? Investigating axioms of the complete state model of health. *Journal of Consulting and Clinical Psychology*, *73*, 539–548. https://doi.org/10.1037/0022-006X.73.3.539

Keyes, C. L. M. (2007). Promoting and protecting mental health as flourishing: A complementary strategy for improving national mental health. *American Psychologist*, *62*(2), 95–108. https://doi.org/10.1037/0003-066X.62.2.95

Keyes, C. L. M., Wissing, M., Potgieter, J. P., Temane, M., Kruger, A., & Rooy, S. van. (2008). Evaluation of the mental health continuum–short form (MHC–SF) in setswana-speaking South Africans. *Clinical Psychology & Psychotherapy*, *15*(3), 181–192. https://doi.org/10.1002/cpp.572

Kincaid, C. (2005). Guidelines for selecting the covariance structure in mixed model analysis. In *Proceedings of the thirtieth annual SAS users group international conference* (Vol. 30, pp. 198–130). SAS Institue Inc Cary NC.

Kinderman, P., Tai, S., Pontin, E., Schwannauer, M., Jarman, I., & Lisboa, P. (2015). Causal and mediating factors for anxiety, depression and well-being. *The British Journal of Psychiatry*, *206*(6), 456–460. https://doi.org/10.1192/bjp.bp.114.147553

Kraiss, J. T., Klooster, P. M. ten, Moskowitz, J., & Bohlmeijer, E. T. (2020). The relationship between emotion regulation and well-being in patients with mental disorders: A meta-analysis. *Comprehensive Psychiatry*, *102*, 152189. https://doi.org/10.1016/j.comppsych.2020.152189

Kramer, I., Simons, C. J. P., Hartmann, J. A., Menne-Lothmann, C., Viechtbauer, W., Peeters, F., Schruers, K., Bemmel, A. L. van, Myin-Germeys, I., Delespaul, P., Os, J. van, & Wichers, M. (2014). A therapeutic application of the experience sampling method in the treatment of depression: A randomized controlled trial. *World Psychiatry*, *13*(1), 68–77. https://doi.org/10.1002/wps.20090

Kuppens, P., Tuerlinckx, F., & Oravecz, Z. (2010). Feelings change: Accounting for individual differences in the temporal dynamics of affect. *Journal of Personality and Social Psychology*, *99*(6), 1042–1060. https://doi.org/10.1037/a0020962

Larson, R., & Csikszentmihalyi, M. (2014). The experience sampling method. In M. Csikszentmihalyi (Eds.), *Flow and the foundations of positive psychology: The*

*collected works of Mihaly Csikszentmihalyi* (pp. 21–34). Springer Netherlands. https://doi.org/10.1007/978-94-017-9088-8_2

Leganger, A., Kraft, P., & R∅ysamb, E. (2000). Perceived self-efficacy in health behaviour research: Conceptualisation, measurement and correlates. *Psychology & Health*, *15*(1), 51–69. https://doi.org/10.1080/08870440008400288

Lenth, R., Buerkner, P., Herve, M., Love, J., Riebl, H., & Singmann, H. (2021). *Emmeans: Estimated Marginal Means. R package version 1.6.1*. https://cran.r-project.org/web/packages/emmeans/emmeans.pdf

Lesage, F.-X., Berjot, S., & Deschamps, F. (2012). Clinical stress assessment using a visual analogue scale. *Occupational Medicine*, *62*(8), 600–605. https://doi.org/10.1093/occmed/kqs140

Luszczynska, A., Scholz, U., & Schwarzer, R. (2005). The general self-efficacy scale: multicultural validation studies. *The Journal of Psychology*, *139*(5), 439–457. https://doi.org/10.3200/JRLP.139.5.439-457

Maas, C. J. M., & Hox, J. J. (2004). The influence of violations of assumptions on multilevel parameter estimates and their standard errors. *Computational Statistics & Data Analysis*, *46*(3), 427–440. https://doi.org/10.1016/j.csda.2003.08.006

Memon, M., Hwa, C., Ramayah, T., Ting, H., Chuah, F., & Cham, T. H. (2019). Moderation analysis: Issues and guidelines. *Journal of Applied Structural Equation Modeling*, *3*. https://doi.org/10.47263/JASEM.3(1)01

Mennin, D. S., Holaway, R. M., Fresco, D. M., Moore, M. T., & Heimberg, R. G. (2007). Delineating components of emotion and its dysregulation in anxiety and mood psychopathology. *Behavior Therapy*, *38*(3), 284–302. https://doi.org/10.1016/j.beth.2006.09.001

Mor, N., Doane, L. D., Adam, E. K., Mineka, S., Zinbarg, R. E., Griffith, J. W., Craske, M. G., Waters, A., & Nazarian, M. (2010). Within-person variations in self-focused attention and negative affect in depression and anxiety: A diary study. *Cognition and Emotion*, *24*(1), 48–62. https://doi.org/10.1080/02699930802499715

Mor, N., & Winquist, J. (2002). Self-focused attention and negative affect: A meta-analysis. *Psychological Bulletin*, *128*(4), 638–662. https://doi.org/10.1037/0033-2909.128.4.638

Myin-Germeys, I., Oorschot, M., Collip, D., Lataster, J., Delespaul, P., & Os, J. van. (2009). Experience sampling research in psychopathology: Opening the black box of daily life. *Psychological Medicine*, *39*(9), 1533–1547. https://doi.org/10.1017/S0033291708004947

Palmeri, M. (n.d.). *Testing the assumption of multilevel models*. A language, not a letter: Learning statistics in R. Retrieved June 18, 2021 from https://ademos.people.uic.edu/Chapter18.html

Palmier-Claus, J., Haddock, G., & Varese, F. (2019). *Experience sampling in mental health research*. Routledge.

Pinheiro, J., Bates, D., DebRoy, S., Sarkar, D., & R Core Team. (2021). *nlme: Linear and nonlinear mixed effects models. R package version 3.1-152*. https://CRAN.R-project.org/package=nlme.

Powers, W. T. (1991). Commentary on Bandura's „human agency." *American Psychologist*, *46*(2), 151–153. https://doi.org/10.1037/0003-066X.46.2.151.b

Quimby, J. L., & O'Brien, K. M. (2006). Predictors of well-being among nontraditional female students with children. *Journal of Counseling & Development*, *84*(4), 451–460. https://doi.org/10.1002/j.1556-6678.2006.tb00429.x

R Core Team. (2018). *R: A language and environment for statistical computing* (R foundation for statistical computing) [Computer software]. https://www.R-project.org

Raento, M., Oulasvirta, A., & Eagle, N. (2009). Smartphones: An emerging tool for social Scientists. *Sociological Methods & Research*, *37*(3), 426–454. https://doi.org/10.1177/0049124108330005

Renshaw, T. L., & Cohen, A. S. (2014). Life satisfaction as a distinguishing indicator of college student functioning: Further validation of the two-continua model of mental health. *Social Indicators Research*, *117*(1), 319–334. https://doi.org/10.1007/s11205-013-0342-7

Ridner, S. L., Newton, K. S., Staten, R. R., Crawford, T. N., & Hall, L. A. (2016). Predictors of well-being among college students. *Journal of American College Health*, *64*(2), 1 16–124. https://doi.org/10.1080/07448481.2015.1085057

Röcke, C., & Brose, A. (2013). Intraindividual variability and stability of affect and well-being. *GeroPsych*, *26*(3), 185–199. https://doi.org/10.1024/1662-9647/a000094

Scherbaum, C. A., & Pesner, E. (2019). Power analysis for multilevel research. In S. E. Humphrey & J. M. LeBreton (Eds.), *The handbook of multilevel theory, measurement, and analysis* (pp. 329–352). American Psychological Association. https://doi.org/10.1037/0000115-015

Schönfeld, P., Brailovskaia, J., Zhang, X. C., & Margraf, J. (2019). Self-efficacy as a mechanism linking daily stress to mental health in students: A three-wave cross-lagged study. *Psychological Reports*, *122*(6), 2074–2095.

https://doi.org/10.1177/0033294118787496

Schwarzer, R. (1994). Optimism, vulnerability, and self-beliefs as health-related cognitions: A systematic overview. *Psychology & Health*, *9*(3), 161–180. https://doi.org/10.1080/08870449408407475

Schwarzer, R., Bäßler, J., Kwiatek, P., Schröder, K., & Zhang, J. X. (1997). The assessment of optimistic self-beliefs: Comparison of the German, Spanish, and Chinese versions of the general self-efficacy scale. *Applied Psychology*, *46*(1), 69–88. https://doi.org/10.1111/j.1464-0597.1997.tb01096.x

Schwarzer, R., & Jerusalem, M. (1995). General self-efficacy scale. In J. Weinman, S. Wright, & M. Johnston (Eds.), *Measures in health psychology: A user's portfolio. Causal and control beliefs* (pp. 35–37). Nfer-Nelson.

Sherer, M., Maddux, J., Mercandante, B., Prentice-Dunn, S., Jacobs, B., & Rogers, R. W. (1982). The self-efficacy scale: Construction and validation. *Psychological Reports*, *51*, 663–671. https://doi.org/10.2466/pr0.1982.51.2.663

Shieh, G. (2009). Detecting interaction effects in moderated multiple regression with continuous variables power and sample size considerations. *Organizational Research Methods*, *12*(3), 510–528. https://doi.org/10.1177/1094428108320370

Shieh, G., & Jan, S.-L. (2015). Power and sample size calculations for testing linear combinations of group means under variance heterogeneity with applications to meta and moderation analyses. *Psicológica*, *36*, 367–390.

Smith, O. R. F., Alves, D. E., Knapstad, M., Haug, E., & Aarø, L. E. (2017). Measuring mental well-being in Norway: Validation of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS). *BMC Psychiatry*, *17*(1), 182. https://doi.org/10.1186/s12888-017-1343-x

Snijders, T. A. B. (2005). Power and sample size in multilevel modeling. In B. S. Everitt & D. C. Howell (Eds.), *Encyclopedia of statistics in behavioral science* (Vol. 3, pp. 1570–1573). Chicester.

Snippe, E., Simons, C., Hartmann, J., Menne-Lothmann, C., Kramer, I., Booij, S., Viechtbauer, W., Delespaul, P., Myin-Germeys, I., & Wichers, M. (2016). Change in daily life behaviors and depression: Within-person and between-person associations. *Health Psychology*, *35*, 433–441. https://doi.org/10.1037/hea0000312

Stallman, H. M. (2010). Psychological distress in university students: A comparison with general population data. *Australian Psychologist*, *45*(4), 249–257. https://doi.org/10.1080/00050067.2010.482109

Stewart-Brown, S., Tennant, A., Tennant, R., Platt, S., Parkinson, J., & Weich, S. (2009). Internal construct validity of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS): A rasch analysis using data from the Scottish Health Education Population Survey. *Health and Quality of Life Outcomes*, *7*(1), 15. https://doi.org/10.1186/1477-7525-7-15

Tong, Y., & Song, S. (2004). A study on general self-efficacy and subjective well-being of low SES-college students in a Chinese university. *College Student Journal*, *38*(4), 637.

Trull, T. J., & Ebner-Priemer, U. (2013). Ambulatory assessment. *Annual Review of Clinical Psychology*, *9*, 151–176. https://doi.org/10.1146/annurev-clinpsy-050212-185510

Vaingankar, J. A., Abdin, E., Chong, S. A., Sambasivam, R., Seow, E., Jeyagurunathan, A., Picco, L., Stewart-Brown, S., & Subramaniam, M. (2017). Psychometric properties of the short Warwick Edinburgh mental well-being scale (SWEMWBS) in service users with schizophrenia, depression and anxiety spectrum disorders. *Health and Quality of Life Outcomes*, *15*(1), 153. https://doi.org/10.1186/s12955-017-0728-3

van Berkel, N., Ferreira, D., & Kostakos, V. (2018). The experience sampling method on mobile devices. *ACM Computing Surveys*, *50*(6), 1–40. https://doi.org/10.1145/3123988

Wickham, H., Francois, R., Henry, L., & Müller, K. (2018). *Dplyr: A grammar of data manipulation. R package version 0.7.6.* https://CRAN.R-project.org/package=dplyr

World Health Organization. (2005). *Promoting mental health: Concepts, emerging evidence, practice.* WHO.

Yearick, K. A. (2017). *Experience sampling methods (ESM) in organizations: A review* [Master Thesis, University of Illinois]. https://www.ideals.illinois.edu/bitstream/handle/2142/97635/YEARICK-THESIS-2017.pdf?sequence=1&isAllowed=y

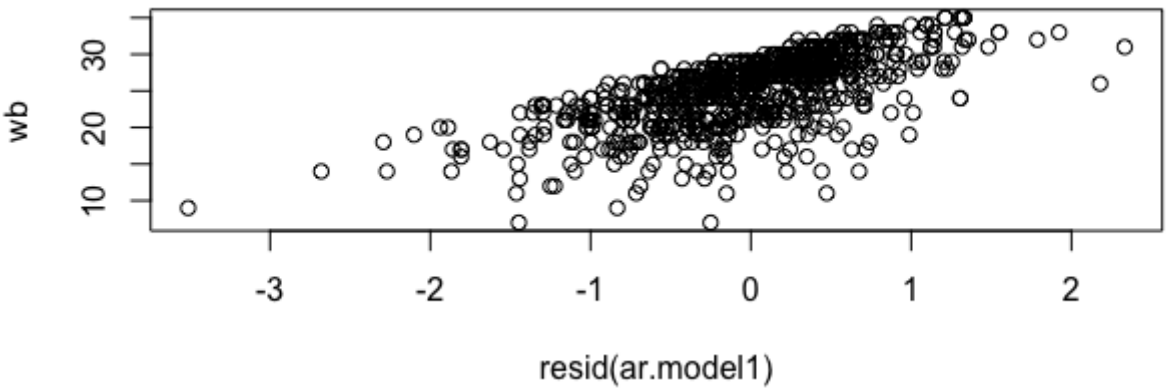
Zinken, K. M., Cradock, S., & Skinner, T. C. (2008). Analysis system for self-efficacy training (ASSET): Assessing treatment fidelity of self-management interventions. *Patient Education and Counseling*, *72*(2), 186–193. https://doi.org/10.1016/j.pec.2008.04.006

## Appendix A

## Assumptions for Mulilevel Models

**Figure A1**

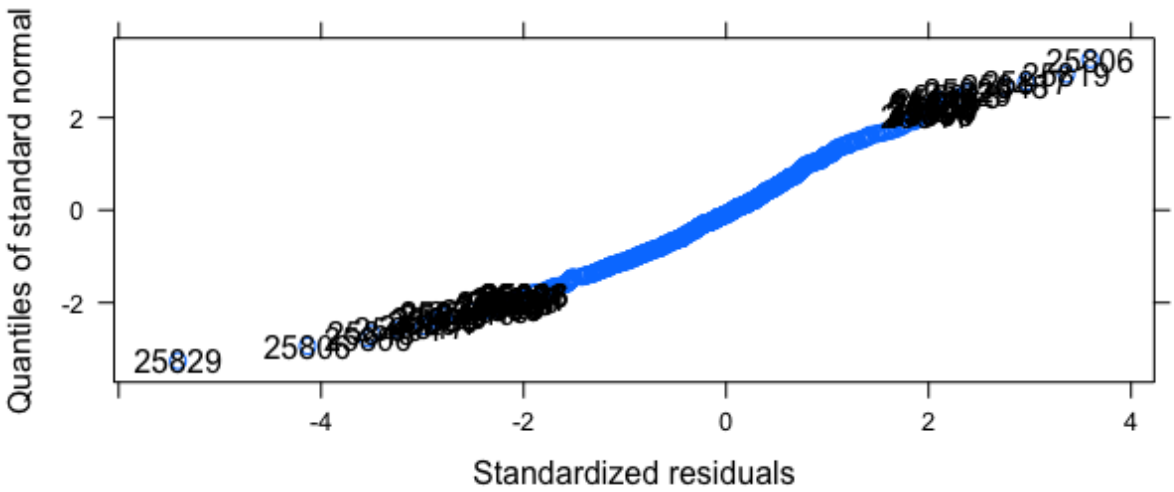
*Model 1: Model Residuals Versus Predictor*




*Note.* Assumption of linearity is not fulfilled for model 1 (analysis of first research question).

**Figure A2**

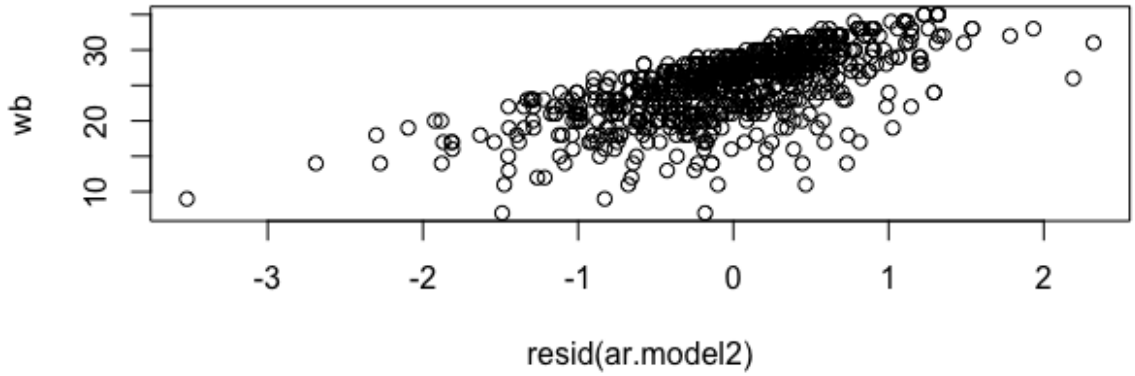
*Model 1: Inspection of QQ Plot*




*Note*. The distribution of the residuals was acceptable for model 1 (with some deviation from the expected line of normal distribution).

**Figure A3**

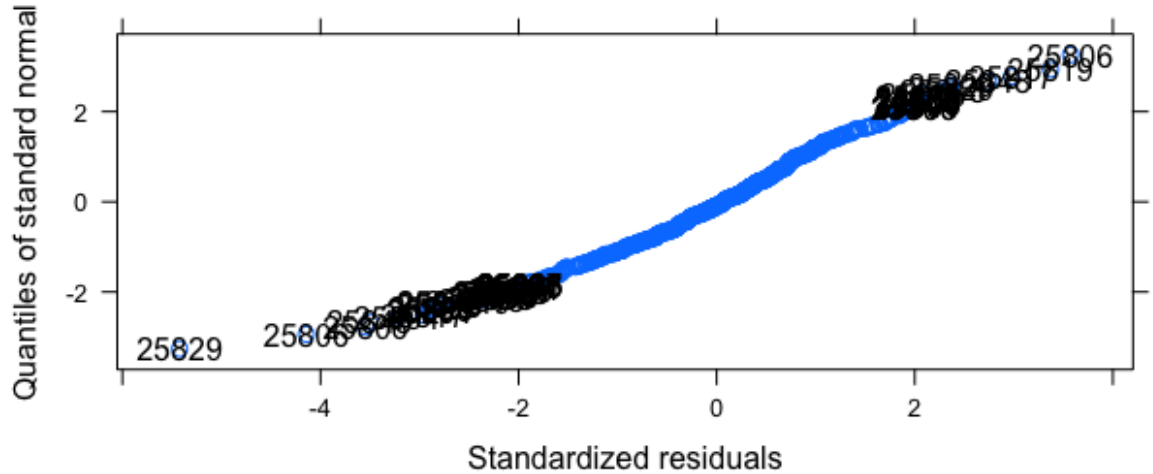
*Model 2: Model Residuals Versus Predictor*




*Note.* Assumption of linearity is not fulfilled for model 2 (analysis of the hypothesis).

**Figure A4**

*Model 1: Inspection of QQ Plot*



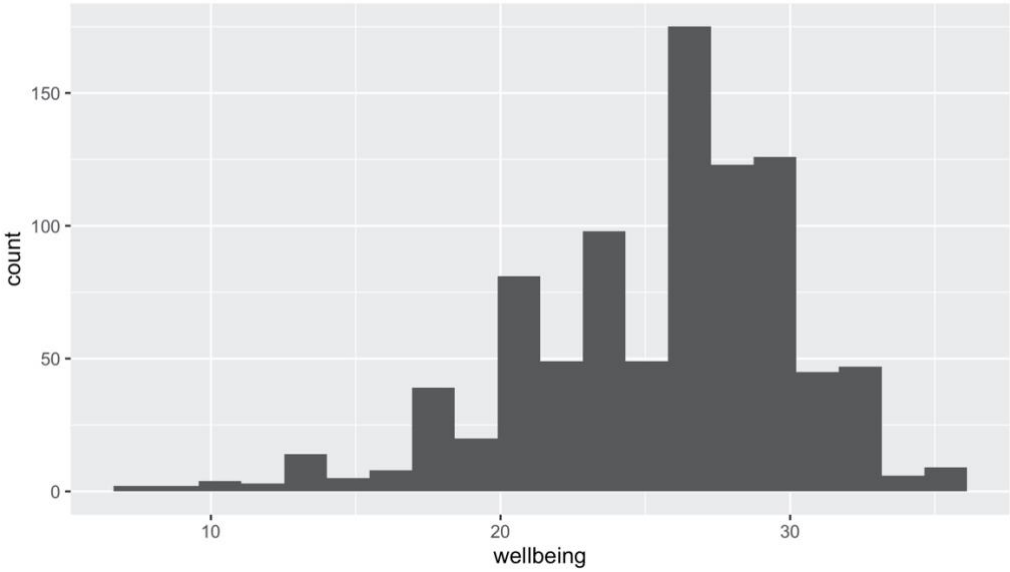

*Note*. The distribution of the residuals was acceptable for model 2 (with some deviation from the expected line of normal distribution).

## Appendix B

## Distribution of Outcome Variable State Well-Being and Predictor State Depression

**Figure B1**

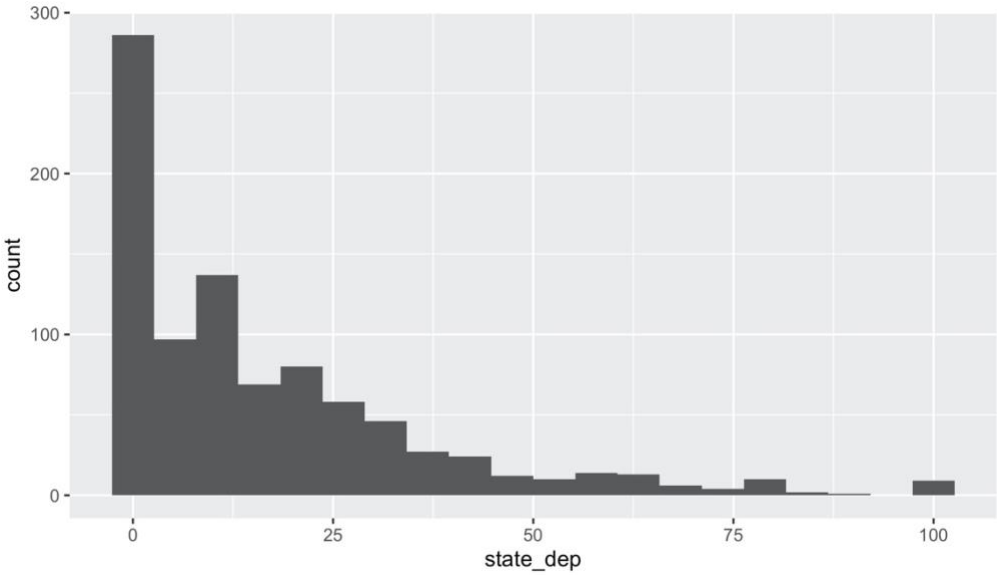
*Distribution of the State Variable Mental Well-being Across the Sample*




*Note.* The histogram indicates a left skewed distribution for the state variable mental well-being across the study sample.

**Figure B2**

*Distribution of the State Variable Depression Across the Sample*




*Note.* The histogram indicates a right skewed distribution for the state variable depression across the study sample.

**Declaration of Academic Integrity**

I hereby confirm that this thesis on The Longitudinal Relationship of Depressive Symptoms and Mental Well-being: The Role of General Self-efficacy as a Buffer? An Experience Sampling Study Among University Students is solely my own work and that I have used no sources or aids other than the ones stated. All passages in my thesis for which other sources, including electronic media, have been used, be it direct quotes or content references, have been acknowledged as such and the sources cited.

August 09, 2021 M. Kohlmann

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I agree to have my thesis checked in order to rule out potential similarities with other works and to have my thesis stored in a database for this purpose.

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