The Effect of a Self-Monitoring Intervention Using ESM on Mentalising, Well-Being and the Experience of Somatic Symptoms: A Pilot Study

Christin Thesing (s2546515)

Faculty of Behavioural, Management, and Social Sciences
Department of Psychology, University of Twente
202000384: BSc Thesis Psychology

First Supervisor: Dr. Jorge Piano Simões
Second Supervisor: Dr. Jannis T. Kraiss
February 19, 2024
Word count:.4986

Abstract

Background: Previous research has found that self-monitoring positively affects well-being and somatic complaints., but no self-monitoring using ESM has been conducted yet in this context. Furthermore, practising self-monitoring was suggested to improve mentalising, leading to the aim of investigating the effect of an intervention using ESM on mentalising as a protective skill.

Methods: Experience Sampling Methodology was used to perform a self-monitoring intervention over 14 consecutive days to positively affect mentalising, well-being and somatic symptoms. Baseline and post scores were measured using the CAMSQ-20, WEMWBS-14 and PHQ-15. The ESM items were questions chosen from the previously mentioned questionnaires based on high factor loadings. The mean and sum scores of the baseline and post scores were calculated for visualisation. Linear mixed models were used to analyse the data. A total of n = 50 participants were recruited, but only n = 22 participants were analysed due to not participating in the intervention or incomplete post-questionnaires.

Results: Analyses revealed that the intervention had a significant effect on well-being *(b* = 3.0, *p* = .025) and no significant effect on mentalising *(b* = 0.12, *p* = .17) or somatic symptoms *(b* = -0.78, *p* = .173)

Conclusion: The results suggest that the self-monitoring intervention using ESM has a significant positive effect on well-being, while no significant effect was found on mentalising and somatic symptoms. However, the generalizability of these results is limited due to the unrepresentative sample and the lag of a control group.

Keywords: ESM, Experience Sampling Method, self-monitoring, mentalising, somatic symptoms, well-being, university students

The Effect of a Self-Monitoring Intervention Using ESM on Mentalising, Well-Being and the Experience of Somatic Symptoms: A Pilot Study

Central to optimal health and well-being are healthy habits, encompassing the development of coping mechanisms, problem-solving skills, and effective interpersonal interactions, alongside the proficient management of emotions (WHO, 2021). Not possessing these skills and being subjected to stress may compromise well-being (Folkman, 2011). Consequently, individuals who do not possess these skills cannot reach this complete "state of happiness and contentment, with low levels of distress, overall good physical and mental health and outlook, or good quality of life" (APA, 2022). The lag in coping skills, in combination with the experience of stress, does not only affect mental but also physical health. It could specifically surface in heightened levels of somatic symptoms. These may involve physical symptoms predominantly created or explained by mental rather than physical causes (Burton, 2003). Nevertheless, the person affected genuinely experiences symptoms like headaches, digestive issues and pain, which can cause significant distress and disable them in multiple ways (Sirri &Fava, 2013). The gravity of compromised well-being and somatic symptoms can be seen in their association with poor academic or work performance, low quality of life, burnout and use of addictive substances (Gavurova et al., 2022). Thus, investigating concepts with the potential to foster well-being and prevent somatic symptoms is imperative to be able to implement interventions that help clinically vulnerable populations deal with mental struggles in daily life.

Mentalising

One concept that researchers have been increasingly interested in to foster healthy habits and prevent the previously mentioned symptoms is Mentalising. As defined by Fonagy et al. (2008), mentalising is "the ability to understand one's mental state and that of others". In other words, it is a mental activity that requires imagination to perceive and interpret human behaviour in terms of intentional mental states (e.g., needs, desires, beliefs, purpose, feelings, goals, and reason) (Allen et al., 2008). It is multifaceted, and due to its complex nature, it includes processes such as self-monitoring (cognitive awareness of the self), mindfulness (emotional states in other people) and theory of mind (understanding other people's beliefs or perspectives) (Choi-Kain & Gunderson, 2008; Schwarzer et al., 2021). Adaptive mentalising allows for

integrating these processes to understand the self and others (Luyten et al., 2020). By utilising mentalising, a sense of predictability and meaning is given to behaviour, as it is cultivated by mental states (Fonagy et al., 2002). According to the Childhood Appraisal of Mentalising the skill to mentalise is developed through a combination of biological predisposition and environmental influences, including social interactions and relationships. Key factors include parental attunement to the child's mental states, secure attachment, and opportunities for reflective dialogue. As children grow, they refine these skills through experiences that challenge their understanding and perspective-taking abilities, gradually building a sophisticated understanding of their own and others' mental states (Bateman et al., 2023). Later on, the ability to mentalise is acquired by being exposed to other people mentalising and personally practising mentalising, leading to an understanding of the importance of mental states for both interpersonal and intrapsychic processes (Fonagy et al., 2008; Fonagy & Allison, 2014; Schwarzer et al. et al., 2021). Generally, adaptive mentalising was found to provide resilience and have a beneficial effect on coping behaviour (Schwarzer et al., 2022). Thereby allowing individuals to cope with daily stressors effectively. Mentalising is thus a mental process inherent to most human's processing of interactions in daily life impacting mental health.

Mentalising, Somatic Complaints and Well-Being

The beneficial effects of mentalisation are corroborated by manifold studies. In a non-clinical population, early interventions facilitating mentalisation have been identified as a protective capacity to lower the impact of distressing factors and increase resilience (Schwarzer et al., 2021; Bugnera et al., 2020). This was supported by a longitudinal study of adolescents that showed better well-being scores if they possessed adaptive mentalising abilities even eight years later (Borelli et al., 2019). Studies by Schwarzer (2019) and Ballespi et al. (2019) further supported the importance of mentalising as they found higher levels to be associated with a decreased frequency of previously mentioned somatic complaints and the negative effect associated with stress. Individuals who possess functional mentalisation abilities are supposedly able to engage with and process their experiences of suffering genuinely. Meanwhile, others who are not able to mentalise emotional suffering rather resort to more dysfunctional behaviour such as distraction, repression or somatisation (Ballespi et al., 2019). Taking these arguments into account, mentalisation should be utilised and trained to provide individuals with coping strategies and increase their resilience when, e.g., experiencing somatic complaints.

Target Population

A population of particular interest are university students, considering the many life changes and stressors of that time. In addition to their individual welfare, they are of interest due to their significance and influence in contemporary society, as they are part of the future workforce and consumers of social and health services (Office for Students, 2019). College and university are periods often regarded as foundational steps towards adulthood, marked by newfound independence and opportunities for personal exploration. Nevertheless, this phase of life is also often characterised by challenges such as academic pressure, economic uncertainties, and social stressors (Mofatteh, 2020). For instance, students may live away from home for the first time and experience stress or isolation caused by many study hours (Mofatteh, 2020). Often, they have to balance studies with employment and worry about the growing costs of living and how to manage their student loans (Beiter et al., 2015; Ladejo, 2021; Mofatteh, 2020; Mohamad et al., 2021).

These stressors can affect the well-being of both students with mental health conditions as well as those with otherwise good mental health, leading to an increasing number of college students facing mental health issues and seeking help (Mofatteh, 2020; Office for Students, 2019). In school and college students in the US, it has been found that more than 42% felt persistently sad or hopeless, and 29% experienced poor mental health (CDC, 2021). Further studies on medical students in the Czech Republic during the COVID-19 epidemic reported physical symptoms and reduced well-being, showing a prevalence of somatic complaints with up to 72.2%, followed by 40.3% anxiety and 52% depression (Sperling et al., 2023). Similar results were found in Korea and Slovakia, showing a prevalence of 69.5% of students experiencing somatic symptoms (Kim Donnelly, 2021; Sperling et al., 2023). As such, addressing college and university students' well-being and somatic complaints should be an imperative concern, given its implications for both individual flourishing and broader societal welfare.

Self-Monitoring

In response to the high demand for treatments and the deficiency in available support, self-monitoring interventions using the Experience Sampling Method (ESM) presents an easily accessible and cost-effective approach (Simons et al., 2017; van Os et al., 2017). As introduced previously, self-monitoring is one of the processes involved in mentalising. It includes systematically observing and reflecting target behaviour, such as emotional response,

dysfunctional thought and problem behaviour (Orji et al., 2018). Thereby, it is assumed to promote health and well-being, as it allows awareness of problematic behaviours and a better understanding of their mental states. This, in turn, provides a sense of intrinsic motivation, which enables long-term change to more positive thinking and behaviour patterns, facilitating well-being and supposedly decreasing somatic complaints (Kauer et al., 2012).

Research focusing on momentary sampling techniques further demonstrated that enhanced self-monitoring can lead to generally favourable changes in behaviour, associated with an increase in healthy habits (Abueg et al., 1985; Ewart, 1978; Kazdin, 1974; Kauer et al., 2012). A similar study focusing on self-monitoring and emotional self-awareness showed positive results in targeting symptoms in the early stages of depression. Furthermore, previous research has found self-monitoring to be effective in increasing awareness of emotions and thereby treating early stages of depression (Kauer et al., 2012).

Experience Sampling Method

A contemporary approach to self-monitoring is the Experience Sampling Method, as it is easily accessible via smartphone applications, which almost every student possesses. In previous research, the effectiveness of ESM interventions in promoting behavioural change has been emphasised (Snippe et al., 2016). Through repeated assessments, participants gain personalised insights into their behaviours, contributing to an improvement in daily depressive symptoms. This underscores the practical utility of ESM in fostering self-awareness and facilitating positive psychological outcomes. Further supporting this notion, Kramer et al. (2014) advocated for the context-sensitive application of ESM as a tool to optimise environmental interactions and enhance coping strategies and abilities. This aligns with the broader notion that ESM goes beyond mere data collection; it can serve as an active intervention method, aiding individuals in understanding and adapting to their (internal processes) and surroundings. Research on the effect of a change in daily life behaviours on depression conducted via ESM has found it to be an effective method, further supporting this approach (Snippe et al., 2015).

Aim of the Present Study

Despite the positive implications of the influence of self-monitoring on well-being, somatic symptoms and mentalising, as well as the benefits of ESM, research has yet to investigate the implementation of these methods as an intervention on the previously presented concepts. Therefore, this study aimed to investigate the effect of a self-monitoring intervention

using ESM on mentalising, well-being and somatic complaints in the scope of a pilot study. Considering the high prevalence of complaints and their relevance to society, university students were the target population. Therefore, the overall research question of this study is: "*What is the effect of the self-monitoring intervention via ESM for two weeks on mentalising, well-being and somatic symptoms in university students?*

H1: The self-monitoring intervention has a positive effect on self-reported mentalising.
H2: The self-monitoring intervention has a positive effect on self-reported well-being.
H3: The self-monitoring intervention has a positive effect on self-reported somatisation.

Methods

Design

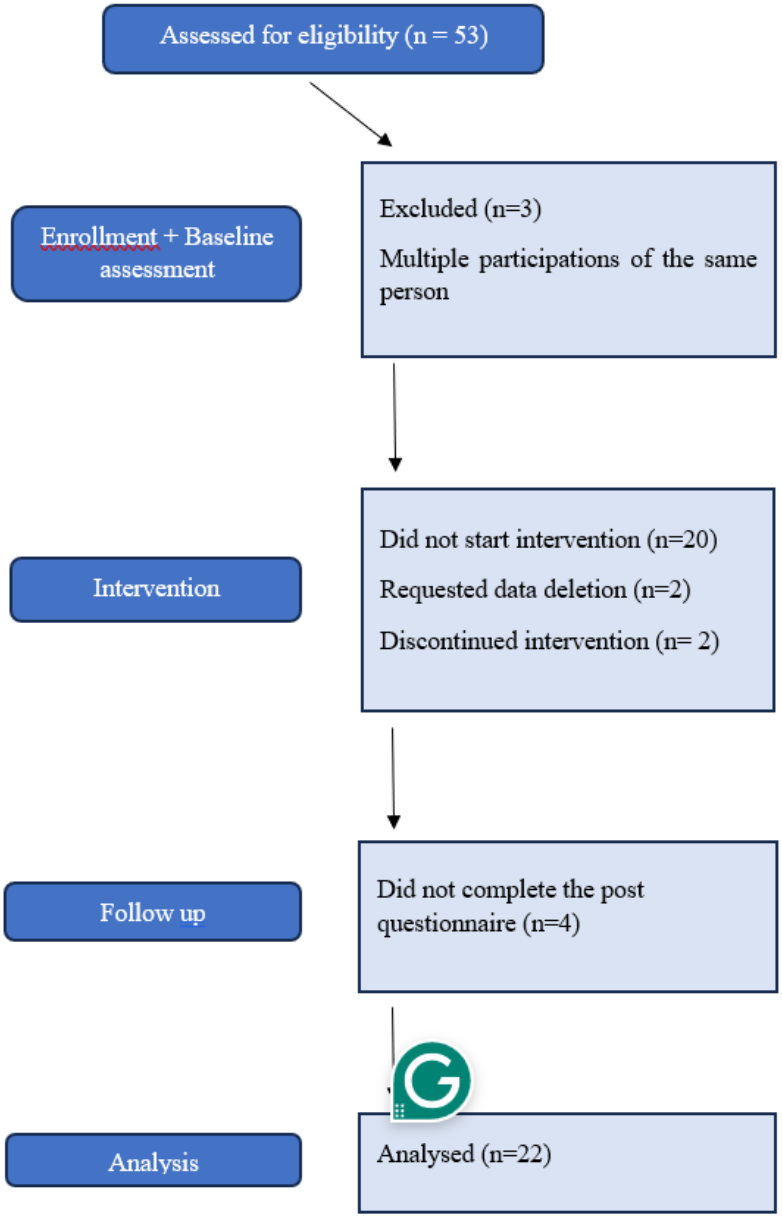
To test the effect of self-monitoring using ESM on mentalising, well-being and the experience of somatic symptoms, an open-pilot study was conducted testing for a pre-post contrast among all participants (and correlation between the concepts).

Participants

A total of n = 50 participants took part in the study (female = 28, male = 22. A mixed approach of convenience and volunteer sampling was used to recruit the participants. The volunteer sampling was executed via the SONA system of the University of Twente, and students received credits. Students at the University of Twente must acquire 15 credits; therefore, it is a method to incentivise participation. Other participants recruited via snowball sampling received an email with the most essential information about the study and a direct link to the first Qualtrics questionnaire (Appendix C). They did not receive any compensation. The inclusion criteria required the participants to be proficient in English and own a smartphone. Furthermore, data was categorised as incomplete and excluded when participants did not complete the pre- and/or post-questionnaire and less than 1/3 of the ESM intervention. This cut-off point was chosen as a low response rate suggests that participants only completed a questionnaire when it was convenient, possibly decreasing the effect of the ESM intervention (Viechtbauer & López-López, 2022). The removal of incomplete data resulted in a total of N=22 participants (see Figure 1).

Figure 1

Consort Flowchart



Measures

The study consists of two types of questionnaires, including the pre-, post-questionnaire and intervention questionnaires. The baseline and post questionnaires were compiled from socio-demographic questions (incl. age, gender, and nationality), the Patient Health Questionnaire 15 (PHQ-15), the Warwick-Edinburgh Mental Well-Being Scale (WEMWBS), as well as the Certainty About Mental States Questionnaire (CAMSQ) and performed via the online test environment Qualtrics. The ESM self-monitoring intervention was conducted via the Avicenna

application and consisted of items chosen from PHQ-15, TAS-20, CAMSQ-20, and WEMWBS based on the factor loading of the individual items (see Table 1). In addition to the mentioned constructs, demographical data, including age, gender, and nationality, were assessed, as well as socio-demographic data, including employment status and highest level of education completed (see Appendix B).

Somatisation (PHQ-15)

The Patient Health Questionnaire 15 (PHQ-15) is an open-access screening instrument for somatisation syndromes. It includes the most prevalent DSM-IV somatisation disorder somatic symptoms. Subjects were asked to rate the severity of 15 symptoms for the last 2 weeks as 0 (“not bothered at all”), 1 (“bothered a little”), or 2 (“bothered a lot”). The questionnaire scores range from 0 to 30, and scores can be categorised into mild (≥5), moderate (≥10), and severe (≥15) levels of somatisation. Throughout multiple studies, it has been found that the reliability and validity of the PHQ-15 are high in clinical and occupational healthcare settings as well as in the general population (Kocalevent et al., 2013; Vroege et al., 2011; Kroenke et al., 2002; Kroenke et al., 2010). For this sample, the reliability of the questionnaire was assessed using Cronbach’s Alpha. The questionnaire demonstrated good internal consistency, with a Cronbach's Alpha of 0.72 for the pre- and 0.68 for the post-questionnaire.

Well-Being (WEMWBS)

The Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) measures mental well-being, encompassing 14 items covering both hedonic and eudaimonic dimensions of mental health. Participants were asked to state their experience over the past two weeks using a 5-point Likert scale. The scale represents a score from 1 to 5 (none of the time, rarely, some of the time, often, all of the time). All items add up to a minimum score of 14 and a maximum score of 70. A higher score indicates a higher level of mental well-being. The questionnaire provides high validity and reliability as well as no ceiling effect, resulting in the assumption that it is a promising tool for accurately measuring mental well-being at a population level (Tennant et al., 2007). This was supported by a Cronbach’s Alpha of 0.87 for the pre-and 0.89 for the post-questionnaire in this sample.

Mentalising (CAMSQ-20)

The Certainty About Mental States Questionnaire (CAMSQ) assessed individuals' certainty about mental states. The items are scored using a 7-point frequency scale ranging from

1 (“*never”)* to 7 (“*always”).* The intermediate response options included *almost never, sometimes, half of the time, often*, and *almost always* (Bocklish et al., 2012). About half of the items pertain to interpreting one's own mental states (e.g. Item 1: “I know my innermost wishes and desires"), while the other half pertained to interpreting others mental states (e.g. Item 2: “I can tell whether another person is at peace with themselves”). According to Müller et al. (2023), the CAMSQ performed well regarding convergent and discriminant validity, internal consistency, test-retest reliability, and measurement invariance. The Cronbach’s Alpha of 0.82 for the pre-and 0.89 for the post-questionnaire supports these findings.

Intervention ESM

The experience sampling method (ESM) is a structured data collection method designed to gather insights into participants’ experiences and behaviours within natural settings. As described by Delespaul (1995), this method requires participants to respond to randomly timed repeated assessments, occurring up to approximately 10 times per day over a specified period, typically ranging from 10 days to extensions of up to 1 year. In this study, we chose to assess the participants 6 times per day over the period of 2 weeks. This is in accordance with van Berkel et al. (2017) recommendation of utilising a two-week period for conducting ESM studies, as they resulted in good compliance. Especially significant about ESM is the insight into the expected experiences and behaviour of participants while eliminating the memory bias of retrospective observations and using the benefits of self-monitoring (Verhagen et al., 2016; van Os et al., 2017). To operationalise ESM in this study, a questionnaire was compiled from individual items extracted from established scales, including CAMSQ-20, PHQ-15, WEMWBS and Toronto Alexithymia Scale (TAS-20). Items were selected based on high factor loadings, ensuring the questionnaire effectively captures relevant aspects of participants’ experiences and behaviours (see Table 1) and adapted for the context of ESM to capture the momentary impressions of participants. The ESM was implemented using the Avicenna application (Avicenna Research., 2024)

Table 1

Description of ESM items

Topic	Items	Response options
Context	What are you doing	Working, Studying, Relaxing, Physical activity, Socialising

	Who are you with right now	Family, Friend, Romantic partner, Co-worker/fellow student, Unknown people/ others I am alone
	I like this company	1 “not at all” to 7 “very much”
	I’d rather be alone	1 “not at all” to 7 “very much”
	I do not want to be alone	1 “not at all” to 7 “very much”
Mentalising	I understand why certain things make me happy right now I understand my feelings right now I know the reason for my behaviour I currently feel like I can tell when other people don't give their honest opinion I currently feel like I know when other people are hiding their thoughts I currently feel like I know how a person feels when I look at their face	1 “not at all” to 7 “very much”
Well-being	I’m feeling optimistic right now I’m feeling useful right now I’m feeling relaxed right now I’m dealing with problems well right now I’m thinking clearly right now I’m feeling close to other people right now I’m able to make up my own mind about things right now	1 “not at all” to 7 “very much”
Somatisation	To what extend do you feel down right now? How anxious do you feel right now? How stressed do you feel right now?	1 “not at all” to 7 “very much”
Alexithymia	I am confused about what emotions I am	

	feeling right now	
	I have feelings that I can't quite identify right now	
	I don't know what is going on inside me right now	
	I'm able to describe my feelings easily right now	1 "not at all" to 7 "very much"
	I prefer talking to people about their daily activities rather than their feelings right now	
	It is difficult for me to reveal my innermost feelings, even to close friends right now	

Procedure

Before recruiting the participants, ethical approval was obtained by the ethical committee of the BMS Faculty of the University of Twente (Approval code 231289).

Data collection lasted eight weeks, and participants could join flexibly on any day from December 1st to January 15th. Participants were able to start the study by clicking the link that was either provided in the invitation email or on Sona. Subsequently, the participant was forwarded to Qualtrics, which provided a brief description of the study and its procedure, as well as information on the confidentiality of the data and the purpose of the study. Furthermore, the participant was informed that participation in the study was voluntary and that withdrawal was possible at any moment. Lastly, the participant was asked to agree to the informed consent form. If the participants did not agree, they were not forwarded to the pre-questionnaire.

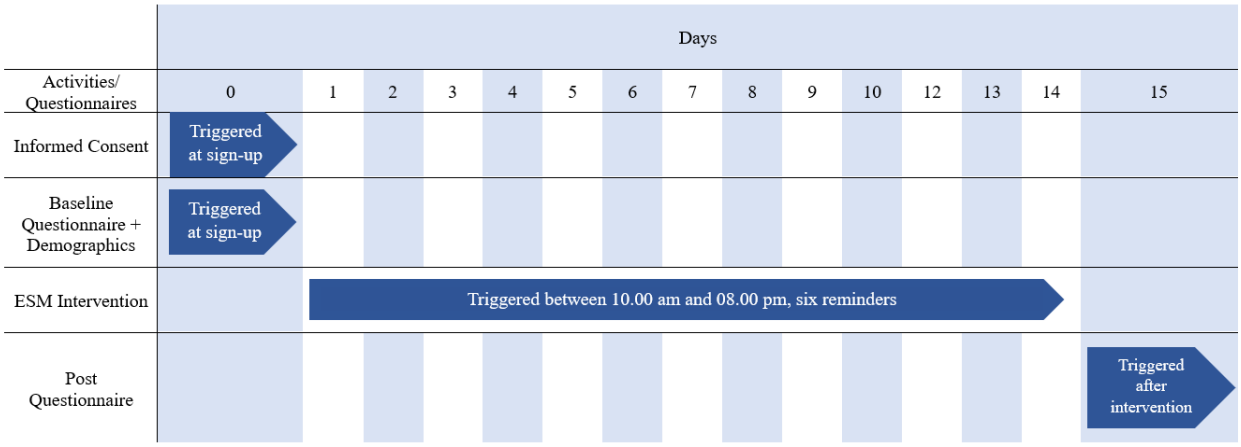
The pre-questionnaire asked the participant to complete the TBD, PHQ-15, CAMSQ-20, and the WEMWBS to assess the baseline scores. It took approximately 20 minutes to complete.

After completing the pre-questionnaire in Qualtrics, the participant was sent an email containing a description of the ESM intervention and access to the Avicenna app (see Appendix C). In Avicenna, participants first had to agree to the informed consent form (see Appendix A). Then, for the following two weeks, participants were notified at 6 fixed times daily between

10:00 AM and 08:00 PM to complete a questionnaire that took approximately 1 minute to complete (see Appendix D). Each notification was about 2 hours apart, and the questionnaires expired after 15 min. After completing the second step, the participant received an email containing a brief description of the remaining third step (see Appendix C). This last step consisted of a post-questionnaire including the items from the PHQ-15, CAMSQ-20 and WEMWBS (see Appendix B). In Figure 2, an overview of the study's schedule can be seen.

Figure 2

Overview of the study's schedule



Data Analysis

After downloading the dataset from Avicenna and Qualtrics, analyses were performed using R Statistical Software (v4.3.0; R Core Team, 2023). Assumptions (incl. linearity, independence, homoskedasticity and normality) were tested to ensure no model violations. Descriptive statistics, namely demographic data, mean, standard deviations, and Cronbach's alpha of the PHQ-15, CAMSQ-20, and WEMWBS, were computed. Additionally, each participant's mean scores of the pre-and post-test measures of PHQ-15, CAMSQ-20 and WEMWBS were calculated. No outliers were identified. In the final analysis, data from 22 participants was included.

Afterwards, inferential statistics were performed. The hypotheses were tested using a linear mixed model (LMM) to account for the nested structure and the missing values of the data (Myin-Germeys et al., 2018). The first hypothesis (H1) was tested using an LMM to test whether the self-monitoring intervention produced a relationship between the independent variable (IV) time and dependent variable (DV) mentalisation. Time was coded using dummy variables for the

pre- and post-data. To test H2, another LMM was utilised to test the relationship between time (IV) and well-being (DV). Lastly, another LMM was applied to test the relationship between time (IV) and somatisation (DV) in H3. To apply the models and compute the regression tables, the lme4 (Bates et al., 2015) and lmerTest (Kuznetsova, 2017) were used. Lastly, additional analyses were performed.

Results

The final sample included 22 respondents (Table 1). The sample consisted of 12 (55%) female and 10 (45%) male participants. 19 participants reported being between the ages of 20 and 24, while 4 reported being between 25 and 29. The highest level of education completed ranged from 15 participants stating having completed a high school diploma or equivalent, while 8 said they had completed a bachelor's degree.

Table 1

Sample Characteristics (N=22)

Demographics	Categories	N	%
Gender	Male	10	45
	Female	12	55
	Non-binary	0	0
Age	20-24	18	81.8
	25-29	4	18.2
Nationality	German	18	82.1
	Dutch	2	9.1
	Finnish	1	4.5
	U.S. American	1	4.5

Highest level of education completed	High school diploma	14	64
	Bachelor	8	36
Employment status	Student	8	36.4
	Student and working	11	50.0
	Working full-time	2	9.1
	Working part-time	1	4.5

Note. N= Number of participants for each category. % = Percentage of participants for each category.

Descriptive statistics for the three questionnaires are presented in Table 2, providing an overview of the score's distributions for each questionnaire.

Table 2

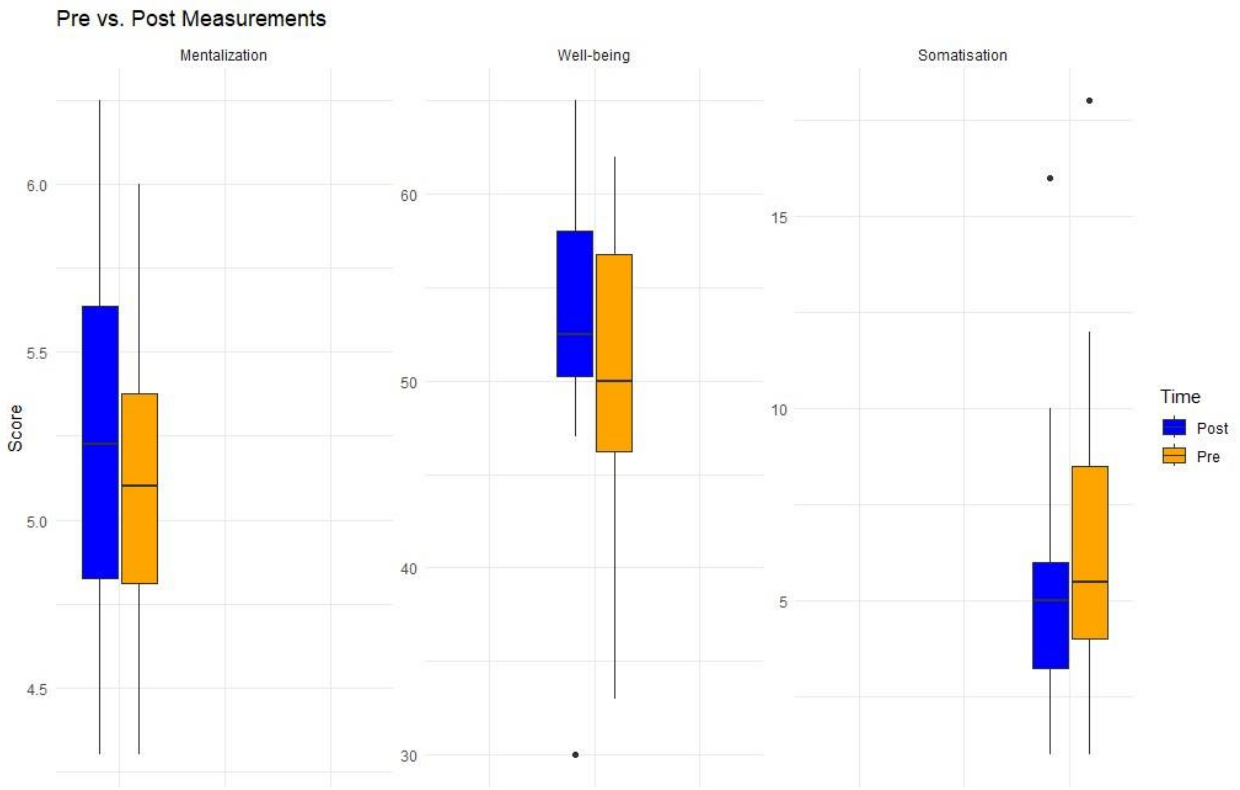
Descriptive Statistics of the Pre-and Post-Questionnaires

Questionnaires	Mean (SD) Pre-Test	Mean (SD) Post-Test	Cronbach's Alpha Pre-Test	Cronbach's Alpha Post-Test
PHQ-15	6.087 (3.98)	5.304 (3.20)	0.72	0.68
CAMSQ-20	5.08 (0.49)	5.2 (0.52)	0.82	0.87
WEMWBS	49.565 (8.06)	52.565 (7.43)	0.87	0.89

Note. PHQ-15 = Somatic Symptoms. CAMSQ-20 = Mentalization. WEMWBS = Well-being. Min. = Minimum scores. Max. = Maximum scores. SD = Standard deviation scores.

Figure 3

Pre- and Post-Scores of Mentalising, Somatic Symptoms and Well-Being



Note.

Effect of Self-Monitoring on Mentalising

To test H1, the association between the independent variable (IV) time and the dependent variable (DV) mentalisation was analysed using a linear mixed model (LMM) (see Table 3). The analysis indicated a non-significant association $b = 0.12$, $t(22) = 1.41$, $p = .17$, 95% *CI* [-0.05, 0.29], indicating that the self-monitoring intervention did not have a significant effect on mentalisation over time. Therefore, H1 was rejected.

Table 3

Summary of the LMM (H1), Including Fixed Effects of Time (IV) on Mentalization (DV)

						95% CI	
Parameter	*b*	*SE*	*df*	*t*	*p*	*LL*	*UL*

Intercept	5.08	0.11	30.27	48.31	<.001	4.87	5.29
Time	0.11	0.08	22.00	1.41	0.173	-0.05	0.29

Note. Intercept = Pre. Time = Post. SE = Standard Error. CI = Confidence Interval. LL = Lower Limit. UL = Upper Limit.

Effect of Self-Monitoring on Well-Being

In H2, the relationship between time (IV) and well-being (DV) was tested. The analysis revealed a significant effect $b = 3.0$, $t(22) = 2.41$, $p = .025$, 95% *CI* [0.49, 5.51] (see Table 4), indicating a possible effect of the self-monitoring intervention on well-being scores over time. Thus, H2 can be accepted.

Table 4

Summary of the LMM (H2), Including Fixed Effects of Time (IV) on Well-Being (DV)

						95% CI	
Parameter	*b*	*SE*	*df*	*t*	*p*	*LL*	*UL*
Intercept	49.57	1.61	29.43	30.66	<.001	46.30	52.83
Time	3.00	1.25	22.00	2.41	0.025	0.49	5.51

Note. Intercept = Pre. Time = Post. SE = Standard Error. CI = Confidence Interval. LL = Lower Limit. UL = Upper Limit.

Effect of Self-Monitoring on Somatisation

Hypothesis H3 was investigated by analysing the association between time (IV) and somatisation (DV). The non-significant effect $b = -0.78$, $t(22) = -1.41$, $p = .173$, 95% *CI* [-1.90, 0.34] (see Table 5) indicates that the self-monitoring intervention did not decrease the somatisation over time. Therefore, H3 was rejected.

Table 5

Summary of the LMM (H3), Including Fixed Effects of Time (IV) on Somatisation (DV)

						95% CI	
Parameter	*b*	*SE*	*df*	*t*	*p*	*LL*	*UL*
Intercept	6.08	0.75	28.77	8.09	<.001	4.57	7.61
Time	-0.78	0.55	22.00	-1.41	0.173	-1.90	0.34

Note. Intercept = Pre. Time = Post. SE = Standard Error. CI = Confidence Interval. LL = Lower Limit. UL = Upper Limit.

Discussion

In this study, we conducted a pilot study to investigate the effect of a self-monitoring intervention using ESM on mentalisation (H1), somatic complaints (H2), and well-being (H3) among university students. The three linear mixed models of each construct revealed that the self-monitoring intervention is associated with increased well-being. In contrast, no association with mentalisation or somatic symptoms can be assumed. Therefore, hypotheses 1 and 3 were rejected, while hypothesis 2 could be confirmed.

The data did not support Hypothesis 1. Contradictory to the assumption based on previous research, self-reported mentalising did not improve using a self-monitoring intervention. Even though it was indicated that sub concepts of mentalisation improved after self-monitoring interventions (Kauer et al., 2012), the umbrella concept itself did not. Several factors could contribute to this outcome. Firstly, the complexity of mentalisation as a construct might require more intensive or prolonged interventions than self-monitoring alone. Mentalisation involves deep cognitive and emotional processes, which may not be significantly impacted by a self-monitoring intervention's relatively brief and specific nature. Moreover, relevant literature suggests that mentalising is significantly developed through interactions and relationships, which self-monitoring might not adequately address alone (Fonagy et al., 2008; Allen et al., 2008). This discrepancy raises questions about the adequacy of self-monitoring as a sole strategy for enhancing mentalisation skills, suggesting a need for more comprehensive approaches that involve social interaction and reflection.

Hypothesis 2, on the other hand, was supported by the data. In line with the results of previous research, the conducted analysis indicated that the self-monitoring intervention via ESM is associated with an increase in well-being. This finding aligns with previous research indicating that self-monitoring can encourage reflective thinking, leading to intrinsic motivation and long-term behaviour change (Orji et al., 2018; Kazantzis et al., 2010). The improvement in well-being could be attributed to participants' increased awareness of their emotional states and thought patterns, fostering a more positive outlook and healthier coping mechanisms. This result underscores the potential of self-monitoring interventions to promote psychological well-being in non-clinical populations, particularly university students facing various stressors. It also supports

the argument that enhancing self-awareness and reflective capacity can serve as a protective mechanism against psychological distress.

Lastly, hypothesis 3 was not supported by the data. Contrary to the assumption based on the results of previous studies, the self-monitoring intervention was not found to be associated with a decrease in somatic complaints. This suggests that while self-monitoring may improve well-being, it does not directly reduce somatic complaints. This outcome could be due to the multifaceted nature of somatisation, which involves both psychological and physical components. Somatisation is often a complex process where psychological distress is expressed through physical symptoms, which may not be directly addressed through self-monitoring of emotional and cognitive states (Creed et al., P., 2011). Furthermore, the literature indicates that somatisation may require targeted interventions focusing on the mind-body connection, such as mindfulness-based therapies or cognitive-behavioural therapy, which address the underlying psychological factors contributing to physical symptoms (Kocalevent et al., 2013; Lakhan et al., 2013). Nevertheless, all previous interpretations must be stated with caution due to statistical and methodological limitations.

Strengths and Limitations

The primary strength of this study is that it is the first to investigate the effect of self-monitoring, using ESM, on mentalisation, well-being and somatic complaints. Thus, it contributes valuable information and feeds possible guidelines for future studies on self-monitoring and ESM interventions. Furthermore, reliable measures were used for well-being, somatic complaints and mentalisation (Müller et al., J., 2023; Kocalevent et al., 2013; Tennant et al., 2007), supporting the credibility of the findings.

Nevertheless, the study’s limitations highlight areas for future research enhancement. The sampling strategy, relying on convenience and snowball sampling, resulted in a sample not representative of the broader population, limiting the generalizability of the findings. The relatively small sample size of 22 further adds to this issue.

Additionally, the absence of a control group restricts the ability to attribute observed changes directly to the intervention, raising concerns about potential confounding factors. Despite the questionnaires' reliability, reliance on self-report measures for pre- and post-assessment introduces possibilities for bias and measurement errors.

Moreover, the study faced operational challenges, including a high dropout rate of 56% and partial data loss, which could bias the results and interpretation of the intervention's effectiveness. The delays in completing post-intervention questionnaires due to different used platforms may also have introduced bias. The lack of randomisation in ESM notifications is a further limitation.

Lastly, a significant limitation of the study is the missing analysis of mentalisation's self- and other-certainty scores. Analysing the score makes it possible to identify adaptive mentalising skills, as they are associated with high self-certainty scores and self-certainty scores that exceed other-certainty scores. This is crucial as lower scores were associated with personality dysfunction and symptom distress (Müller et al., 2023). In conclusion, while the study lays a foundational understanding of self-monitoring's impact on mentalisation and well-being, its limitations underscore the need for more comprehensive, methodologically robust research to build upon these initial findings.

Future implications

Future studies are encouraged to explore the impact of self-monitoring interventions using ESM on well-being, considering mentalisation as a mediating factor. Previous research has found significant results on a sub-concept of mentalising: emotional self-awareness (Kauer et al., 2012). The differences compared to the present study lay in the method used to implement self-monitoring and the dependent variable. It was conducted via a mobile phone application but not ESM and focused on depressive symptoms. Considering the significant correlation that was found between mentalising and well-being and previous research that further suggests its positive impact (Borelli et al., 2019; Schwarzer, 2019; Ballespi et al., 2019), this analysis would be an interesting objective. To ensure more reliable and generalizable results, future studies should aim for a more extensive sample and use random sampling to recruit participants. Furthermore, they should use only one application for the three steps of the intervention to simplify the process and increase compliance. It would also be beneficial to conduct an Intention-to-Treat analysis (ITT) and include participants who did not complete the intervention. This analysis presents results that are more representative of real-world practice in which patients and participants may participate irregularly or stop altogether (Andrade, 2022).

As also suggested by other research, including the previously mentioned study, incorporating participant feedback post-ESM intervention could provide valuable insights into

improving symptom management (Kauer et al., 2012; Verhagen et al., 2016; Riese et al., 2021), although it was beyond this study's scope due to resource constraints.

Conclusion

The present study found significant results of the self-monitoring intervention using ESM on well-being, as well as non-significant results of the intervention on mentalising and somatic complaints. Furthermore, a significant correlation between mentalising and well-being was found in the post-intervention data. These results are partially in line with research on the effect of self-monitoring on well-being while showing contradictory results regarding mentalising and somatic complaints. Considering these results, future research should investigate the effect of the intervention on well-being as well as mentalising as a mediating variable.

References

aan het Rot, M., Hogenelst, K., & Schoevers, R. A. (2012). Mood disorders in everyday life: A systematic review of experience sampling and ecological momentary assessment studies. Clinical Psychology Review, 32, 510–523. https://doi.org/10.1016/j.cpr.2012.05.007

Ader, R., & Cohen, N. (1975). Behaviorally conditioned immunosuppression. Psychosomatic Medicine, 37(4), 333–340. https://doi.org/10.1097/00006842-197507000-00007

Allen, J. G., Fonagy, P., & Bateman, A. W. (2008). Mentalising in Clinical Practice. American Psychiatric Publishing.

Andrade C. (2022). Intent-to-Treat (ITT) vs Completer or Per-Protocol Analysis in Randomized Controlled Trials. Indian journal of psychological medicine, 44(4), 416–418. https://doi.org/10.1177/02537176221101996

Avicenna Research. (2024). https://avicennaresearch.com/

Ballespí, S., Vives, J., Alonso, N., Sharp, C., Ramírez Jiménez, M., Fonagy, P., & Barrantes-Vidal, N. (2019). To know or not to know? Mentalization as protection from somatic complaints. PLOS ONE, 14(1), e0215308. https://doi.org/10.1371/journal.pone.0215308

Bateman, A., Campbell, C., Fonagy, P., Luyten, P., & Debbané, M. (2023). Cambridge Guide to Mentalization-Based Treatment (MBT). Cambridge University Press.

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed-Effects Models Using lme4 [Computer software]. Journal of Statistical Software, 67(1), 1–48. https://doi.org/10.18637/jss.v067.i01

Barsky, A. J., Orav, E. J., & Bates, D. W. (2005). Somatization increases medical utilization and costs independent of psychiatric and medical comorbidity. Archives of General Psychiatry, 62(8), 903–910. https://doi.org/10.1001/archpsyc.62.8.903

Beiter, R., Nash, R., McCrady, M., Rhoades, D., Linscomb, M., Clarahan, M., & et al. (2015). The prevalence and correlates of depression, anxiety, and stress in a sample of college students. Journal of Affective Disorders, pp. 173, 90–96. https://doi.org/10.1016/j.jad.2014.10.054

Bocklisch, F., Bocklisch, S. F., & Krems, J. F. (2012). Sometimes, often, and always: Exploring the vague meanings of frequency expressions. Behaviour Research Methods, 44(1), 144–157.

Burton, C. (2003). Beyond somatisation: A review of the understanding and treatment of medically unexplained physical symptoms (MUPS). The British Journal of General Practice, 53(488), 231–239.

CDC. (2021). https://www.cdc.gov/healthyyouth/data/yrbs/pdf/YRBS_Data-Summary-Trends_Report2023_508.pdf

Choi-Kain, L. W., & Gunderson, J. G. (2008). Mentalization: Ontogeny, assessment, and application in the treatment of borderline personality disorder. American Journal of Psychiatry, 165, 1127–1135. https://doi.org/10.1176/appi.ajp.2008.07081360

Creed, F., Henningsen, P., & Fink, P. (Eds.). (2011). Medically Unexplained Symptoms, Somatisation and Bodily Distress: Developing Better Clinical Services. Cambridge University Press.

Csikszentmihalyi, M., & Larson, R. (1987). Validity and reliability of the experience-sampling method. Journal of Nervous and Mental Disease, 175, 526–536. http://dx.doi.org/10.1097/00005053-198709000-00004

Delespaul, P. (1995). Assessing schizophrenia in daily life: The experience sampling method (Ph.D. Thesis). Maastricht University Medical Centre.

Folkman, S. (Ed.). (2011). The Oxford Handbook of Stress, Health, and Coping. Oxford University Press.

Fonagy, P., Gergely, G., Jurist, E. L., & Target, M. (2008). Affect Regulation, Mentalization, and the Development of the Self. Other Press.

Gavurova, B., Ivankova, V., Rigelsky, M., Mudarri, T., & Miovsky, M. (2022). Somatic Symptoms, Anxiety, and Depression Among College Students in the Czech Republic and Slovakia: A Cross-Sectional Study. Frontiers in Public Health, 10. https://doi.org/10.3389/fpubh.2022.859107

Hollon, S. D., Muñoz, R. F., Barlow, D. H., Beardslee, W. R., Bell, C. C., Bernal, G., Clarke, G. N., Franciosi, L. P., Kazdin, A. E., Kohn, L., Linehan, M. M., Markowitz, J. C., Miklowitz, D. J., Persons, J. B., Niederehe, G., & Sommers, D. (2002). Psychosocial intervention development for the prevention and treatment of depression: Promoting innovation and increasing access. Biological Psychiatry, 52(6), 610–630. https://doi.org/10.1016/S0006-3223(02)01384-7

Jarrett, R. B., & Nelson, R. O. (1987). Mechanisms of change in cognitive therapy of depression. Behavior Therapy, pp. 18, 227–241. http://dx.doi.org/10.1016/S0005-7894(87)80017-5

Kauer, S. D., Reid, S. C., Crooke, A. H., Khor, A., Hearps, S. J., Jorm, A. F., Sanci, L., & Patton, G. (2012). Self-monitoring using mobile phones in the early stages of adolescent depression: Randomized controlled trial. Journal of Medical Internet Research, 14(3), e67. https://doi.org/10.2196/jmir.1858

Kim Donnelly, H., Richardson, D., & Solberg, S. V. (2021). Understanding somatic symptoms associated with South Korean adolescent suicidal ideation, depression, and social anxiety. Behavioral Sciences, 11(151). https://doi.org/10.3390/bs11110151

Kocalevent, R. D., Hinz, A., & Brähler, E. (2013). Standardization of a screening instrument (PHQ-15) for somatization syndromes in the general population. BMC Psychiatry, 13, 91. https://doi.org/10.1186/1471-244X-13-91

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2002). The PHQ-15: Validity of a new measure for evaluating the severity of somatic symptoms. Psychosomatic Medicine, 64, 258–266.

Kroenke, K., Spitzer, R. L., Williams, J. B., et al. (2010). The Patient Health Questionnaire somatic, anxiety, and depressive symptom scales: A systematic review. General Hospital Psychiatry, 32, 345–359.

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). lmerTest Package: Tests in Linear Mixed Effects Models [Computer software]. Journal of Statistical Software, 82(13), 1–26. https://doi.org/10.18637/jss.v082.i13

Ladejo, J. (2021). A thematic analysis of the reported effect anxiety has on university students. Education and Urban Society. https://doi.org/10.1177/00131245211062512

Lakhan, S. E., & Schofield, K. L. (2013). Mindfulness-based therapies in the treatment of somatization disorders: A systematic review and meta-analysis. PLOS ONE, 8(8), e71834.

Mofatteh, M. (2020). Risk factors associated with stress, anxiety, and depression among university undergraduate students. AIMS Public Health, pp. 8, 36–65. https://doi.org/10.3934/publichealth.2021004

Mohamad, N. E., Sidik, S. M., Akhtari-Zavare, M., & Gani, N. A. (2021). The prevalence risk of anxiety and its associated factors among university students in Malaysia: A national

cross-sectional study. BMC Public Health, 21, 438. https://doi.org/10.1186/s12889-021-10440-5

Myin-Germeys, I., Kasanova, Z., Vaessen, T., Vachon, H., Kirtley, O., Viechtbauer, W., & Reininghaus, U. (2018). Experience sampling methodology in mental health research: New insights and technical developments. World Psychiatry, 17(2), 123–132. https://doi.org/10.1002/wps.20513

Müller, S., Wendt, L. P., & Zimmermann, J. (2023). Development and validation of the Certainty About Mental States Questionnaire (CAMSQ): A self-report measure of mentalizing oneself and others. Assessment, 30(3), 651–674. https://doi.org/10.1177/10731911211061280

Office for Students (OfS). (2019). Mental health: Are all students being properly supported? https://www.officeforstudents.org.uk/publications/mental-health-are-all-students-being-properly-supported/

Orji, R., Lomotey, R., Oyibo, K., Orji, F., Blustein, J., & Shahid, S. (2018). Tracking feels oppressive and 'punishy': Exploring the costs and benefits of self-monitoring for health and wellness. DIGITAL HEALTH, 4. https://doi.org/10.1177/2055207618797554

Riese, H., von Klipstein, L., Schoevers, R. A., et al. (2021). Personalized ESM monitoring and feedback to support psychological treatment for depression: A pragmatic randomized controlled trial (Therap-i). BMC Psychiatry, 21, 143. https://doi.org/10.1186/s12888-021-03123-3

Schwarzer, N. H., Nolte, T., Fonagy, P., et al. (2022). Self-rated mentalizing mediates the relationship between stress and coping in a non-clinical sample. Psychological Reports, 125(2), 742–762. https://doi.org/10.1177/0033294121994846

Schwarzer, N. H., Nolte, T., Fonagy, P., & Gingelmaier, S. (2022). The relationship between global distress, mentalizing, and well-being in a German teacher sample. Current Psychology, 42, 1239–1248. https://doi.org/10.1007/s12144-021-01467-3

Schwarzer, N. H. (2019). Mentalisieren als schützende Ressource? Eine Studie zur gesundheitserhaltenden Funktion der Mentalisierungsfähigkeit. Wiesbaden, Germany: Springer VS. https://doi.org/10.1007/978-3-658-25424-7

Simons, C. J. P., Drukker, M., Evers, S., et al. (2017). Economic evaluation of an experience sampling method intervention in depression compared with treatment as usual using data

from a randomized controlled trial. BMC Psychiatry, 17, 415. https://doi.org/10.1186/s12888-017-1577-7

Snippe, E., Simons, C. J. P., Hartmann, J. A., Menne-Lothmann, C., Kramer, I., Booij, S. H., 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(5), 433–441. https://doi.org/10.1037/hea0000312

Sirri, L., & Fava, G. A. (2013). Diagnostic criteria for psychosomatic research and somatic symptom disorders. International Review Of Psychiatry, 25(1), 19–30. https://doi.org/10.3109/09540261.2012.726923

Tennant, R., Hiller, L., Fishwick, R., et al. (2007). The Warwick-Edinburgh Mental Well-being Scale (WEMWBS): Development and UK validation. Health and Quality of Life Outcomes, p. 5, Article 63. https://doi.org/10.1186/1477-7525-5-63

van Berkel, N., Ferreira, D., & Kostakos, V. (2017). The experience sampling method on mobile devices. ACM Computing Surveys (CSUR), 50(6), 1-40. https://doi.org/10.1145/3123988

van Os, J., Verhagen, S., Marsman, A., Peeters, F., Bak, M., Marcelis, M., Drukker, M., Reininghaus, U., Jacobs, N., Lataster, T., Simons, C., ESM-MERGE Investigators PhD, Lousberg, R., Gülöksüz, S., Leue, C., Groot, P. C., Viechtbauer, W., & Delespaul, P. (2017). The experience sampling method as an mHealth tool to support self-monitoring, self-insight, and personalized health care in clinical practice. Depression and Anxiety, 34(6), 481–493. https://doi.org/10.1002/da.22647

Verhagen, S. J., Hasmi, L., Drukker, M., van Os, J., & Delespaul, P. A. (2016). Use of the experience sampling method in the context of clinical trials. Evidence-based Mental Health, 19(3), 86–89. https://doi.org/10.1136/ebmental-2016-102418

Viechtbauer, W., & López-López, J. A. (2022). Location-scale models for meta-analysis. Research Synthesis Methods, 13(6), 697–715. https://doi.org/10.1002/jrsm.1562

WHO. (2021). https://www.who.int/news-room/fact-sheets/detail/adolescent-mental-health

Zhao, S., Grasmuck, S., & Martin, J. (2008). Identity construction on Facebook: Digital empowerment in anchored relationships. Computers in Human Behavior, 24, 1816–1836. https://doi.org/10.1016/j.chb.2008.02.012

Appendix A

Informed consent form

Dear Participant,

You are being invited to participate in a research study investigating the effects of self-monitoring on well-being.

The study consists of three parts
1. Initial Survey: Completed upon signing up to the study, which will take approximately 15 minutes;
2. Daily Diary: Starting after the initial survey, you will use the Avicenna app for self-monitoring. This involves responding to brief questionnaires (~ 45 seconds) sent randomly six times a day, for 14 consecutive days.
3. Final Survey: At the end of the 14 days, you'll complete another 15-minute questionnaire.

You will receive an email shortly after completing this initial survey (step 1) with instructions on how to access the Avicenna app and participate on the daily diary study (step 2). After 14 days, you will receive another email with an invitation for a final survey on Qualtrics. A minimum age of 18 is required to participate in this study. There are no known risks associated with participating in this study. The potential benefits of participating in this study include gaining a better understanding of yourself and others, as well as increased well-being, as a consequence of this better understanding. All information collected during this study will be kept confidential and stored in secure servers of the University of Twente. Your name will not be used in any reports or publications, and data will be anonymously stored. Participation in this study is voluntary, and you can withdraw from the study at any time without repercussions (please note that students who drop-out from the study will not receive SONA credit). The anonymised, aggregated data may be analysed and published in the Bachelor or Master thesis of Psychology students, or in scientific publications. If you have any questions or concerns about this study, you may contact one of the researchers listed below. If you have any questions or concerns, you may contact the BMS Ethics Committee (ethicscommittee-hss@utwente.nl). By signing below, you

acknowledge that you have read and understood the information provided above and voluntarily agree to participate in this study.

Thank you very much for participating in our study!

The research team

Christin Thesing (c.thesing@student.utwente.nl)
Kevin Paluschek (k.paluschek@student.utwente.nl)

I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.

Yes
No

Appendix B

Baseline Questionnaire

Demographics

1. Please enter your email to continue
2. How old are you?
3. What is your nationality
4. How would you describe yourself?
    a. Male
    b. Female
    c. Non-binary / third gender
    d. Prefer to self-describe
    e. Prefer not to say
5. What best describes your employment sataus over the last three months?
    a. Working full-time
    b. Working part-time

c. Unemployed and looking for work
d. A homemaker or stay-at-home parent
e. Student
f. Student and working
g. Retired
h. Other

6. What is the highest level of education you have completed
    a. Middle school (such as MBO, MTS, MEAO or Haupt- or Realschule)
    b. High school (such as HAVO, VWO, HBS or Gymnasium/Berufsschule/Berufscolleg)
    c. Bachelor
    d. Master
    e. PhD
    f. Other

CAMSQ

Participants were asked to answer the following questions on a Likert scale with the following format:

o Never o Almost never o Sometimes o Half of the time o Often o Almost always o Always

People regularly interpret the feelings, thoughts, and behaviors of themselves or others. In the following, various statements will be presented that can be used to describe oneself. For each statement, please evaluate which answer option best applies to you.

1. I know my innermost wishes and desires.
2. I can tell whether another person is at peace with themselves.
3. I know how other people will react to something.
4. I understand why certain things make me happy.
5. I know what I am trying to achieve with my behavior.
6. I can tell when a person in a group is feeling awkward.
7. I know why I am interested in certain things.
8. I can tell when other people don't give their honest opinions.
9. I understand my feelings.
10. I know when other people are hiding their thoughts.
11. I know what my virtues are.

12. I can tell when other people are just pretending to find something funny.
13. I know why I have a strong opinion on a subject.
14. When I'm in a bad mood, I know the reason why.
15. I know if a person is trustworthy.
16. I know the reasons for my behavior.
17. I can tell when other people are taking advantage of someone.
18. I can tell if another person is bored by what I am saying.
19. I know how a person feels when I look at their face.
20. I know what the best decision is for me in a difficult life situation.

WEMWBS

Participants were asked to answer the following questions on a Likert scale with the following format:

O None of the time o Rarely o Some of the time o Often o All of the time

Below are some statements about feelings and thoughts.

Please select the answer that best describes your experience of each over the last 2 weeks.

1. I've been feeling optimistic about the future
2. I've been feeling relaxed
3. I've had energy to spare
4. I've been thinking clearly
5. I've been feeling close to other people
6. I've been able to make up my own mind about things
7. I've been interested in new things
8. I've been feeling useful
9. I've been feeling interested in other people
10. I've been dealing with problems well
11. I've been feeling good about myself
12. I've been feeling confident
13. I've been feeling loved
14. I've been feeling cheerful

PHQ-15

Participants were asked to answer the following questions on a Likert scale with the following format:

O Not bothered at all o Bothered a little o Bothered a lot

Over the past two weeks, how much have you been bothered by the following physical symptoms?

Stomach Pain

1. Back Pain
2. Pain in arms, legs, or joints (knees, hips, etc.)
3. Headaches
4. Chest pain
5. Nausea, gas or indigestion
6. Feeling tired or having low energy
7. Trouble sleeping
8. Dizziness
9. Feeling your heart race or pound
10. Shortness of breath or trouble breathing
11. Constipation, loose bowels or diarreah
12. Menstrual cramps or other problems with your periods (if applicable)
13. Pain or problems during sexual intercourse
14. Fainting spells

Appendix C

First Email for participants who were Recruited via Convenience Sampling

Dear participant,

Thank you for participating in this study on the effect of self-monitoring on well-being. I am contacting you because you kindly agreed to participate in this study for my bachelor's Thesis project in Psychology at the University of Twente. In the following, you will find the most important information on the study and what the next steps will be.

Invitation to Participate in a Well-Being Study

Overview:

This study explores the impact of self-monitoring your thoughts and feelings on overall well-being. It involves two main components: completing online surveys on Qualtrics and daily diary entries via the Avicenna app (more information below).

Study Outline:

1. Initial Survey: Upon signing up (Qualtrics link via email or SONA for UT students), you'll complete an initial 15-minute questionnaire.
2. Daily Diary: Starting immediately after the initial survey, you'll use the Avicenna app for self-monitoring. This involves responding to brief questionnaires sent randomly six times a day, for 14 consecutive days. Each questionnaire takes about 1 minute to complete. We understand that certain situations may prevent timely responses; however, consistent participation is key for a comprehensive study.
3. Final Survey: At the end of the 14 days, you'll complete another 15-minute questionnaire.

Purpose:

This study aims to understand how regular self-reflection and awareness of one's and other's mental state can influence personal well-being.

Note: Participation is voluntary, and we appreciate your commitment to completing both the initial and final surveys, as well as the daily diary entries to the best of your ability.

Preparation and participation

First Step: Qualtrics

For UT students:

Please register for this study via the SONA system of the University of Twente (registration will be available from the 4. of December) and follow the link that is provided on the Website, it will automatically redirect you to the initial survey in Qualtrics.

Non-UT students:

In case you are not a student of the UT, please follow the link provided below and complete the survey as soon as possible.

https://utwentebs.eu.qualtrics.com/jfe/form/SV_4H0C96NoDctARU2

Upon completion of the survey, we will contact **all** participants within 24hrs and provide further instructions on the next steps.

Consent Form, Data Privacy, and Ethics Approval

In the initial survey conducted via Qualtrics, you will be asked to provide informed consent to participate in this study. It's important to note that your participation is entirely voluntary; you have the freedom to withdraw from the study at any point, without the need for justification. Similarly, should you choose, you can request the deletion of your data at any time, also without justification. Rest assured, all personal data collected during this study will be securely stored on the University of Twente's servers, ensuring your privacy and data security. We anticipate no harm to participants from being involved in this study. This study has received approval from the BMS Ethics Committee, under approval number XXXX, on (put date here), ensuring adherence to ethical research standards, including the principles of the Declaration of Helsinki regarding research practices and the protection of participants' rights and well-being.

Contact details

If you have any questions, you can contact one of the following students who are involved in data collection or the supervisors. The contact details can be found below.

Students

Christin Thesing (c.thesing@student.utwente.nl)

Kevin Paluschek (k.paluschek@student.utwente.nl)

Supervisors

Dr. Jorge Piano Simoes (j.pianosimoes@utwente.nl)

Dr. Jannis Kraiss (j.t.kraiss@utwente.nl)

Thank you for participating in this study.

Your contribution to our bachelor theses is greatly appreciated.

Kind regards, on behalf of the whole study team!

C2

Second Email for all participants

Dear Participant,

Thank you for completing the first part of this study. Now, in the second part, we ask you to self-monitor your thoughts and feelings using the Avicenna app.

Participation

Please follow the steps described below:

To participate in this part of the study, make sure to download the **Avicenna application** on your smartphone. Use your phone to click on the following links which will bring you to the app store.
Android:
https://play.google.com/store/apps/details?id=com.ethica.logger&hl=en_US&gl=US&pli=1
IOS: https://apps.apple.com/nl/app/ethica/id1137173052

Then follow these steps:

- Open the Avicenna application on your phone. **Please make sure to allow push notifications for the Avicenna app on your phone!**

- Click on “Sign up” and create an account.
- After you have signed up in Avicenna, log in to the Avicenna application using your username and password.
- After logging in, click on the following link on your phone: https://ethicadata.com/study/3576/
- Alternatively, you can also directly enter the registration code **3576** in the Avicenna application.
- On the next window click on “Register” to enroll in the study.
- The study should now be set up and you will receive the first questionnaire the next day.
- Please feel free to contact Kevin or Christin in case of questions on how to use the app

Contact details

If you have any questions, you can contact one of the following students who are involved in data collection or the supervisors. The contact details can be found below.

Students

Christin Thesing (c.thesing@student.utwente.nl)

Kevin Paluschek (k.paluschek@student.utwente.nl)

Supervisors

Dr. Jorge Piano Simoes (j.pianosimoes@utwente.nl)

Dr. Jannis Kraiss (j.t.kraiss@utwente.nl)

Thank you for participating in this study.

Your contribution to our bachelor theses is greatly appreciated.

Kind regards, on behalf of the whole study team!

C3

Third Email for all participants

Dear Participant,

Thank you for completing the first two steps of our study that explores the impact of self-monitoring your thoughts and feelings on overall well-being. As a last step, please complete the final 15min-survey and follow the link provided below:

https://utwentebs.eu.qualtrics.com/jfe/form/SV_0jo0rWqeDevEfL8

Consent, Data Privacy, and Ethics Approval

Please remember that your participation is entirely voluntary; you have the freedom to withdraw from the study at any point, without the need for justification. Similarly, should you choose, you can request the deletion of your data at any time, also without justification. Rest assured, all personal data collected during this study will be securely stored on the University of Twente's servers, ensuring your privacy and data security. We anticipate no harm to participants from being involved in this study. This study has received approval from the BMS Ethics Committee, under approval number XXXX, on (put date here), ensuring adherence to ethical research standards, including the principles of the Declaration of Helsinki regarding research practices and the protection of participants' rights and well-being.

Contact details

If you have any questions, you can contact one of the following students who are involved in data collection or the supervisors. The contact details can be found below.

Students

Christin Thesing (c.thesing@student.utwente.nl)

Kevin Paluschek (k.paluschek@student.utwente.nl)

Supervisors

Dr. Jorge Piano Simoes (j.pianosimoes@utwente.nl)

Dr. Jannis Kraiss (j.t.kraiss@utwente.nl)

Thank you for participating in this study.

Your contribution to our bachelor theses is greatly appreciated.

Kind regards, on behalf of the whole study team!