

Thesis

*Guided mindfulness meditation as facilitated by the
Headspace smartphone application: potential
relationships with the mind of higher education students*

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Abstract

This study researched to what extent a smartphone application-based guided mindfulness meditation practice could be related to aspects of the mind of higher education students, such as metacognition, adaptive expertise, meditative experiences and reflection, personality and subjective well-being. Seven students at Utrecht University were recruited and assigned to either an experimental group, characterized by a three week intervention period with the Headspace app for guided mindfulness meditation, or to a control group with no intervention in this period. Both groups filled in online self-report questionnaires related to the aforementioned aspects of the mind as part of a pre- and post-test. The results showed no significant difference scores of the pre- and post-tests. However, correlation analysis revealed multiple significant positive and negative correlations between the research constructs. The exposure of these correlations could help to create a better insight into the way these specific aspects of the mind relate with each other within a larger network. The consequential more comprehensive understanding could potentially have positive implications for the scientific field of cognitive and neurobiological psychology, as well as in a therapeutic and educational context. With the current digital age, society's increasing demand for flexibility and intricate cognitive skills, and with higher education students being important future (leading) figures, further research within the combination of themes of the current study is encouraged.

Keywords

Mindfulness meditation, higher education, Headspace smartphone application, metacognition, subjective well-being, meditative experiences and reflection, adaptive expertise, personality

1. Introduction

1.1. Research direction

Mindfulness meditation originates in the Buddhist tradition and is increasingly explored in academic research for its potential beneficial effects on multiple aspects of the human mind, such as cognitive flexibility, experiencing flow, metacognition and subjective well-being, to name a few (Moore & Malinowski, 2009; Cash & Whittingham, 2010; Moore, 2013; Jankowski & Holas, 2014). The deepening of our understanding of the relational nature of these aspects could hypothetically have a positive effect on the well-being and educational learning experience of higher education students. This is the case, because today's societies are becoming increasingly reliant on complex cognitive abilities such as metacognitive skills, which involve the reflection on one's own cognitive experiences (Napora, 2011). The developing of these skills might prove to be essential (Napora, 2011). Mindfulness meditation has been characterized as an intentional and non-judgemental attentive focus on the present moment, including an open receptivity for experience, and is a practice with which these metacognitive skills could be developed (Greenberg, Reiner, & Meiran, 2012; Napora, 2011). Hence, it could be a new 'pedagogical tool' through which an enriched insight and contribution to the way students learn and adapt can be created (Napora, 2011). With higher education students playing important future (leader) roles in society, it is essential to equip them with a resilient cognitive foundation in order for them to cope well within this challenging environment and be potent actors for social change (Napora, 2011).

Due to the aforementioned potential relationships between mindfulness meditation and the mind and due to the significance of higher education students for society, a relevant research population was targeted and the current study was set up. This was done so by having the digital age in mind. With the current digital age, the use of self-help applications on the smartphone is popular and provides a low cost, time-efficient and flexible way of engagement (Howells, Ivtzan, & Eiroa-Orosa, 2016; Mani, Kavanagh, Hides, & Stoyanov, 2015; Wen, Sweeney, Welton, Trockel, & Katznelson, 2017; Economides, Martman, Bell, & Sanderson, 2018). Hence, using a smartphone application for mindfulness meditation might prove to be a useful and suiting intervention method and worthy for investigation.

1.1.1. Justification research approach

With mindfulness meditation being potentially related to many different aspects of the mind, the relevance of creating a synthetic conceptualization has been suggested for gaining a more comprehensive understanding of these relationships (Raffone & Srinivasan, 2017). This synthesis concerns a focus on multiple parts, while trying to contextualize and fuse them within a connected whole. Thus, valuing the details as well as the formation of a larger integrative framework. In this way, a better overview might be generated of the central components of the mind that are related to mindfulness meditation and how these relationships might intertwine (Grossenbacher & Quaglia, 2017). This could potentially increase the scientific awareness of relevant connections and solve the challenge of identifying which aspects of the mind are common to meditative practice or involve a meditative element (Grossenbacher & Quaglia, 2017). Also, in the context of for instance the therapeutic potential of meditation, the importance of an integrative approach has already been

stressed for combining multiple perspectives into a broader theoretical framework (Manuello, Vercelli, Nani, Costa, & Cauda, 2016). Such a broader and hence more inclusive theoretical framework may relate to the role meditation might play for higher education students in developing a more inclusive and critical viewpoint from which their own knowledge and mind is observed, as well as their relation to other people and society at large, through increased awareness of interconnectedness (Shapiro, Brown, & Astin, 2011). Also, there is a growing appreciation of 'whole person education' in higher education, which takes into account and integrates more aspects of the student (Shapiro et al., 2011).

Mindfulness has been regarded as being holistic in nature and thus an integrative research approach has been suggested to capture it as a whole, instead of merely looking at isolated fragments and missing the bigger picture (Gause & Coholic, 2010). Such a holistic nature comprises psychological, physical, social, spiritual and energetic aspects (Turner & Holroyd, 2016). As a recognition of this holistic nature of mindfulness and with the relevance of creating an integrative framework in mind, the choice was made to include a great diversity of constructs in the current research project. Research constructs such as 'The degree of mindfulness', 'Adaptive expertise', 'Mind-wandering and creative ideas', 'The presence of flow experiences', 'Reflecting on the self as creative', 'Reflecting on the self as a critical thinker', 'Openness to new and challenging ideas and experiences' and 'Personality' are related to the psychological aspect of mindfulness. The construct 'Flexible coping with stress' and the association between stress and physical health relates to the physical aspect of mindfulness. A construct such as 'Vitality and energy' is related to the energetic aspect. Furthermore, constructs such as 'Life satisfaction' and 'Quality of life' have been related with spirituality and social functioning, hence relate to the spiritual and social aspects of mindfulness (Tate & Forchheimer, 2002).

Integration has been noted as a method for blending different parts into a whole, which has been related with holism and synthesis (Repko & Szostak, 2017). So, by integrating the diversity of aspects of the mind and mindfulness into an integrative framework within the current research project, it was intended to on the one hand provide a thorough focus on the psychological aspect, but on the other hand also bring the bigger picture of the holistic nature of mindfulness into clearer perspective and situate the diversity of aspects within a connected whole. It was understood that this method could contribute to a more complete understanding of mindfulness and the mind. Hence, leading to a more insightful discussion of higher quality in this research project of how mindfulness meditation could be related to the mind of higher education students. For the current study this method specifically concerned a unifying process of different sets of correlations within a larger network, by using two integrative visual portrayals. These are shown as figure 7 in section 1.4. (introduction) and figure 15 in section 4.2. (discussion).

Furthermore, as a way to approach a more complete understanding of mindfulness and the mind, both quantitative and qualitative data were included in this study. It was understood that the phenomenological viewpoint of qualitative comments could situate the quantitative findings into a deeper analysis, by providing a more complete account of experience. Creating such a reconciliation of scientific and phenomenological descriptions has been considered to be relevant for developing an integrative framework (Grossenbacher & Quaglia, 2017). Thus, being in line with the integrative approach in this study. Also, in the case of a small sample size, qualitative remarks might provide valuable extra information about the relatively limited amount of quantitative data (in contrast to the situation in which only quantitative data would have been present). Hence, the inclusion of qualitative data was also considered to be a legitimate choice for contextualizing a possible limited degree of quantitative data into a potentially more meaningful interpretation.

1.1.2. Research question and structure of the introductory section

Having taken the aforementioned content into account, this study focused on the following central research question: to what extent could a smartphone application-based guided mindfulness meditation practice be related to aspects of the mind of higher education students concerning the degree of mindfulness, metacognition, adaptive expertise, personality, meditative experiences, and reflective facets on creativity, critical thinking, openness to new and challenging ideas and experiences, flexible coping with stress, and subjective well-being?

To put this research question into an academic context, mindfulness meditation will first be clarified. Subsequently in this introductory section, the various aforementioned aspects of the mind will be introduced and discussed in more detail and linked to the relevant academic context. Furthermore, the research design of the current study will be explained and the questionnaires used in this study will be justified. Also, hypotheses will be formulated and an integrative framework (figure 7) will be presented. Lastly, the implications and relevance of this study for the scientific field of cognitive and neurobiological psychology will be discussed, followed by the potential impact of new insights for the learning experience and well-being of students in higher education.

1.2. Relevant aspects of the mind

1.2.1. Mindfulness meditation, metacognition, mind-wandering and critical thinking

The meditative mindfulness practice is regarded as a process consisting of focused attention on the here and now and an open, non-judgemental and non-reactive stance towards current experiences (Moore & Malinowski, 2009; Noone, Bunting, & Hogan, 2016). This mindful process creates a meta-awareness of these experiences, in which experiences such as thoughts and emotions are simply regarded as mind occurrences, instead of as truthful representations of reality (Jankowski & Holas, 2014). This is also termed ‘metacognitive insight’ and has been suggested to be facilitated by mindfulness meditation (Jankowski & Holas, 2014). More awareness and a less judgemental view of the self and its experiences is created, which could also be described as a ‘decentering’ or ‘reperceiving’, signifying an alteration in perspective which might be beneficial for the practitioner (Hölzel et al., 2011).

The aforementioned ‘metacognitive insight’ is part of metacognition. Metacognition could be described as the knowledge about cognition and as the monitoring and evaluating of appearances in one’s mind, recognizing them as fleeting (Fox & Christoff, 2014; Grabova, Lau, & Willett, 2011). Metacognitive awareness is expressed in the experiencing of thoughts as mere mental activity, instead of as fully truthful reflections of the self and of reality (Teasdale, Moore, Hayhurst, Pope, & Williams, 2002). This indicates that thoughts are witnessed neutrally, instead of as being experienced as necessarily true and as good or bad. Thus, in contrast to a total personal identification with appearances in the mind, the appearances are experienced in a broader range of awareness from a more distant perspective (Teasdale et al., 2002).

Mind-wandering can on the other hand be regarded as often involving involuntary, aimless and unplanned thoughts and can also be described as ‘daydreaming’ (Fox & Christoff, 2014). Fox and Christoff (2014) have suggested that there could be a beneficial relationship between mind-wandering and metacognition. They claim that this potential relationship might be the case due to the role metacognitive awareness could play in expanding the range of receptivity for mind events, such as for previously suppressed and impulsive thoughts that may have otherwise not come into the field of awareness. In this way, if mindfulness meditation could increase the focal scope of attention and meta-

awareness, and hence the mind’s receptivity, the surfacing of new and creative realizations and insights could potentially be enhanced (Fox & Christoff, 2014). This might in turn be beneficial for a more flexible and adaptive reactivity with regards to emotions and behaviour (Fox & Christoff, 2014). Also, it might lead to a better understanding of the working mechanisms of the own cognition and an enhanced capacity for navigating the mind with respect to advantageous pursuits (Fox & Christoff, 2014).

More meta-awareness may also be connected to the ability for critical thinking in higher education (Noone et al., 2016). Critical thinking concerns the evaluative and analytical capacity with respect to reasoning and outcomes (Noone et al., 2016). Awareness of one’s own thinking and the evaluative metacognitive skill might be intricately linked to this critical way of thinking (Noone et al., 2016). See figure 1 for a visual overview of the relationships discussed in this section (1.2.1.).

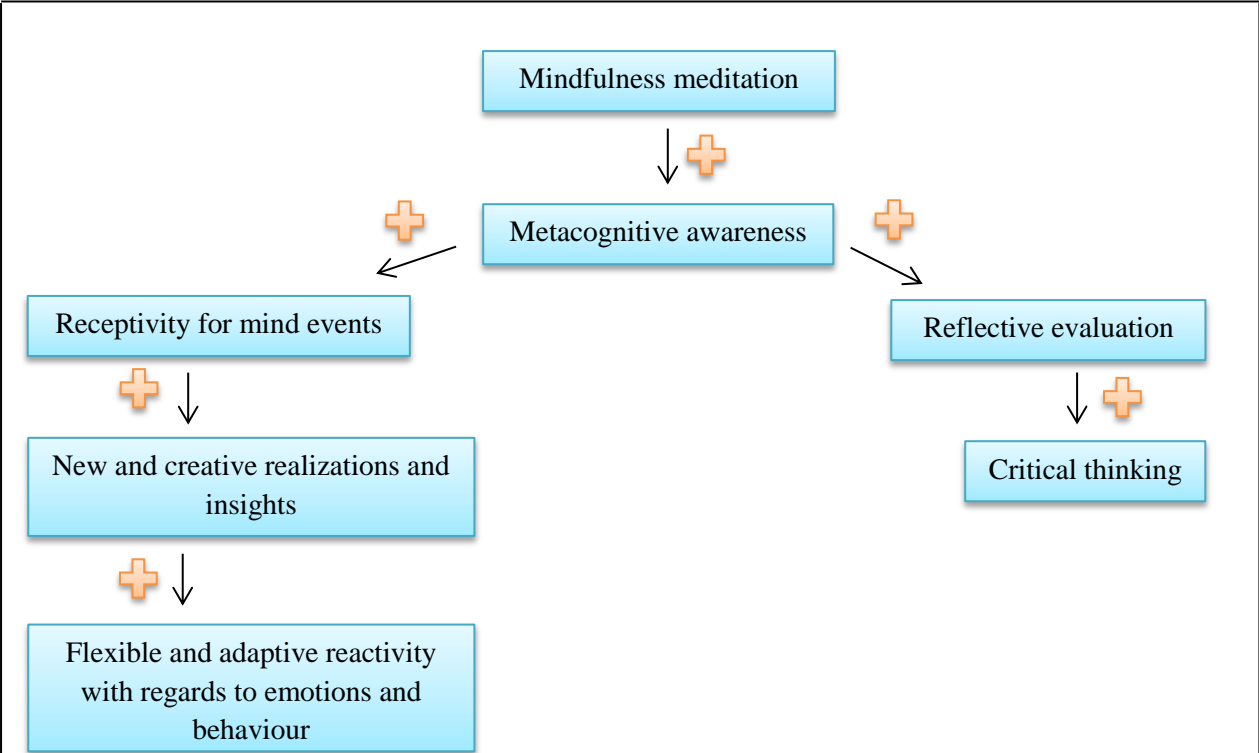


Figure 1. Relationships section 1.2.1. ‘Mindfulness meditation, metacognition, mind-wandering and critical thinking’. Note: an arrow represents a relationship. A positive relationship is indicated by a (+) sign.

1.2.2. Mindfulness, cognitive flexibility, flow and adaptive expertise

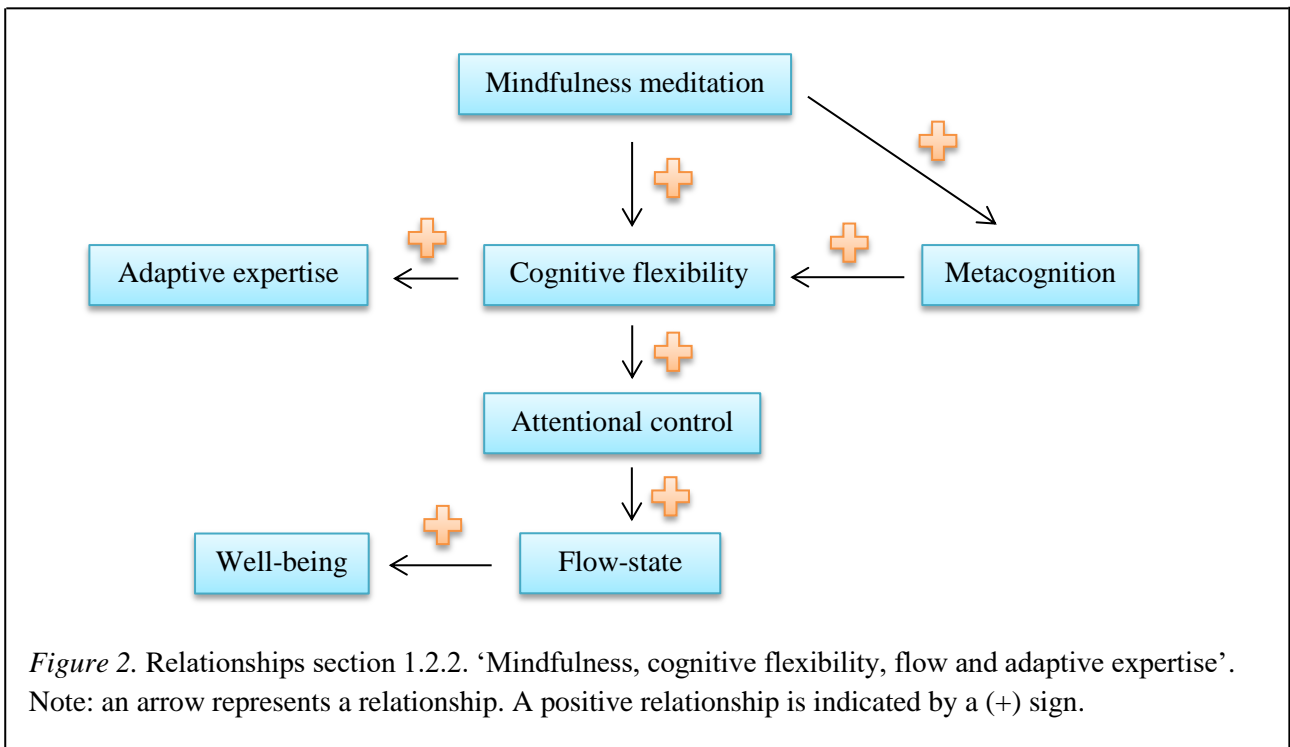
The expanded field of non-judgemental and open awareness through mindfulness meditation might lower the chance of getting caught in disrupting thought-loops, allowing for greater cognitive flexibility and adaptive dynamics (Fox & Christoff, 2014). Cognitive flexibility could be characterized as being able to adapt well to change in an efficient manner, being able to imagine a diversity of ideas, classifications, and multiple perspectives, and the absence of rigidity in cognition (Moore, 2013). Being cognitively flexible could play a valuable role in the self-regulation of attention, which is the

capacity for directing attention (Moore, 2013). Hence, events in experience can be subject to more attentional control.

An increase in attentional control might facilitate the flow-state, in which there is a strong continuous focus and a very high involvement in a specific task (Moore, 2013; Payne, Jackson, Noh, & Stine-Morrow, 2011). For sustaining an intense flow-state, cognitive resources involved in the regulation of attention are essential. Hence, the presence of more attentional control could make it cognitively easier to stay in the flow-state (Moore, 2013). A higher cognitive flexibility in directing one's attention could thus facilitate flow (Moore, 2013). Furthermore, it has been suggested that flow experiences can contribute to subjective well-being, partly due to the flow experience being intrinsically satisfying (Moore, 2013; Payne et al., 2011). Thus, mindfulness meditation and its potential for increasing cognitive flexibility, could in turn facilitate a better directing and sustaining of attention and hence might be beneficial for well-being (Chambers, Lo, & Allen, 2007; Moore, 2013). This could be so due to the mindful non-evaluative position towards thoughts, which might help in reducing the occurrences of certain cognitive defence mechanisms that have become part of the mental routine (Chambers et al., 2007). Hence, with less presence of these routine-based reactions, more mental space could be available for a greater scale of cognitive activities, which allows for more flexibility (Chambers et al., 2007). Also, the detached non-judgemental mindful stance might work as a catalyst for the creative flexibility in cognitive flexibility (Moore, 2013).

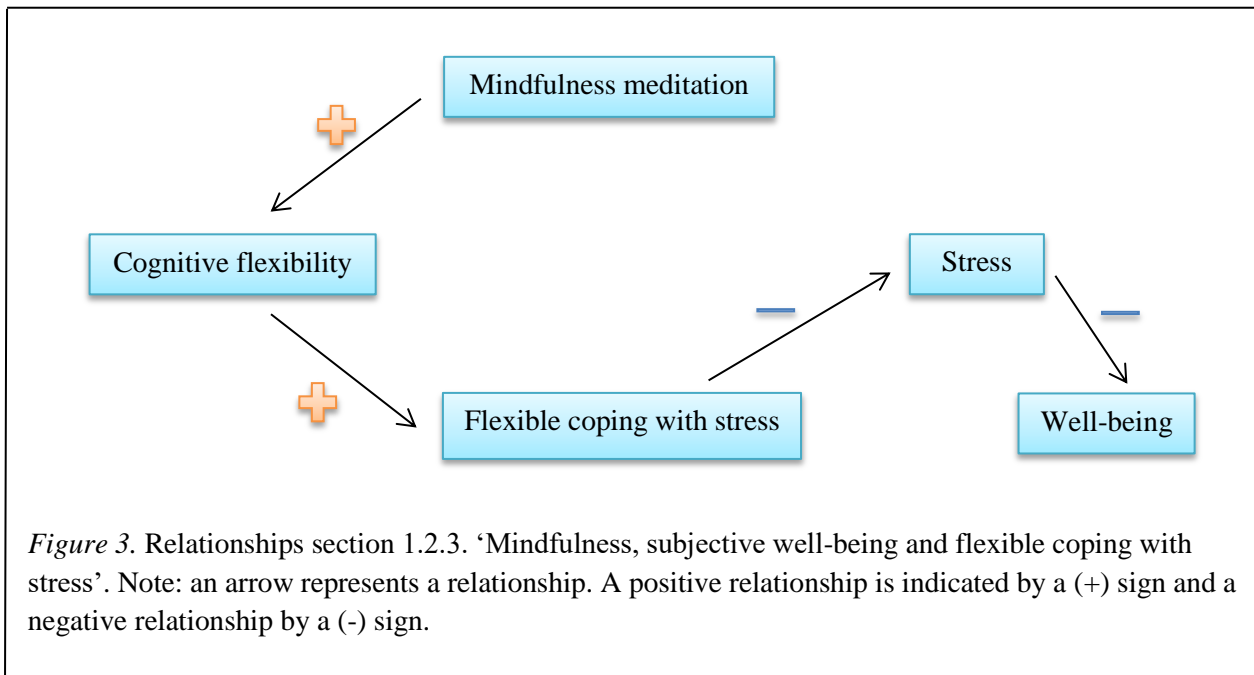
Being cognitively flexible is also an important component of adaptive expertise. According to Bohle Carbonell, Stalmeijer, Könings, Segers and Van Merriënboer (2014) adaptive expertise can be defined as the capacity for adjusting in a fast manner to changes. This ability is especially relevant in unfamiliar situations, in which the adaptive flexibility could potentially be more practical for a suitable response that is in line with the demands of the situation. This in contrast to a less flexible, more routine-based response. Adaptive expertise can furthermore be characterized by the following components: it includes all aspects of routine expertise, includes more emphasis on metacognition than routine expertise, and includes abilities related to innovation, change, approaching difficult tasks, being creative and eagerness to keep on learning (Bohle Carbonell et al., 2014). By potentially increasing the metacognitive ability through mindfulness meditation and hence cognitive flexibility, a beneficial contribution to the aforementioned aspects might be made. If so, I would hypothesize that it could be expressed in the following ways.

The ability to come up with a diverse multiplicity of ideas and perspectives has been described as an aspect of being cognitively flexible (Moore, 2013). I would hypothesize that this increased degree of ideas and perspectives might extend the variety of inspirational sources that can be used for the creative process. Furthermore, being creative is a component of adaptive expertise. Based on the aforementioned, I would hypothesize that a greater creativity relates to a higher inclination to use and reflect upon multiple perspectives and could create a higher potential to approach scientific issues in innovative and dynamic ways. Also, I would state that a higher metacognitive awareness of mind events through mindfulness meditation could relate to more insight and a better comprehension of the own mind. Furthermore, I would state that responses that are more flexible, adaptive and insightful, might contribute to more perseverance and a higher capability to deal with challenges, failures, complexities, and changes in knowledge. In other words, essential aspects of adaptive expertise. A greater flexibility might in turn be beneficial for mental balance and well-being (Moore & Malinowski, 2009). See figure 2 for a visual overview of the relationships discussed in this section (1.2.2.).



1.2.3. Mindfulness, subjective well-being and flexible coping with stress

Well-being could be described as the intensity of the subjective experience of feeling alive and vital, and psychological and physical factors play a significant role in this (Ryan & Frederick, 1997). Several of these factors concern for example stress, depression and anxiety (Ryan & Frederick, 1997). Stress has been associated with negative effects on well-being and could create vulnerability for psychological symptoms (Shapiro, Schwartz, & Bonner, 1998). Hence, I would argue that finding ways for coping effectively and flexibly with stress could be beneficial for well-being. Cash and Whittingham (2010) found that the mindfulness facets ‘nonjudging of experience’ and ‘acting with awareness’ were predictive for less depression, stress and anxiety in a study including 106 participants from meditation organizations and students following a bachelor’s degree in psychology. The ‘Five-Facet Mindfulness Questionnaire (FFMQ)’, the ‘Depression, Anxiety, Stress Scale’ and the ‘Personal Well-being Index’ were used as measures. Also, in a study including 135 university students in year one that filled in questionnaires, a significant relationship was revealed between high scores on the degree of being mindful and relatively lower scores on the ‘Perceived Stress Scale’ (Palmer & Rodger, 2009). The aforementioned studies point towards a potential relationship between mindfulness, stress and well-being. I would hypothesize this relationship as follows: an increase in the degree of mindfulness and accompanied cognitive flexibility could have a beneficial effect on the capacity for adaptive coping, such as with a stressful situation. Thus, stress could be more effectively dealt with. As aforementioned, there are negative associations between prolonged stress and well-being (Shapiro et al., 1998). Thus, a more effective mindful coping with stress could be beneficial for well-being. See figure 3 for a visual overview of the relationships discussed in this section (1.2.3.).



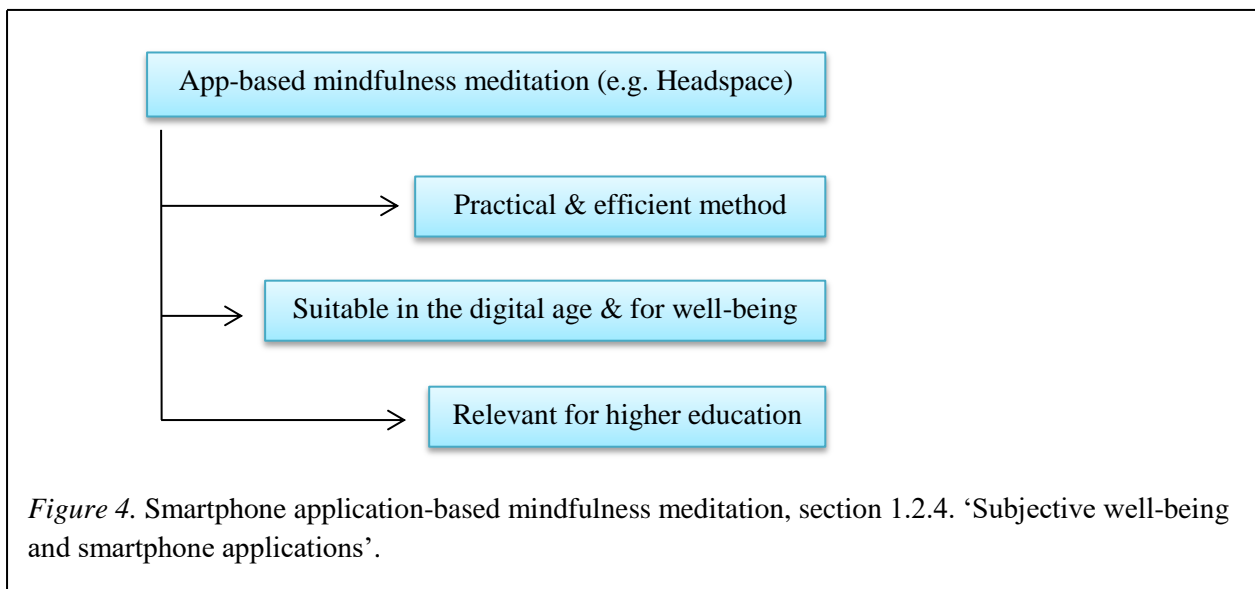
1.2.4. Subjective well-being and smartphone applications

The search for happiness and well-being are manifesting in many self-help smartphone applications nowadays (Howells et al., 2016). The usage of these applications as a medium for the promotion of health and personal development is growing in popularity, also due to the increased presence of smartphones in daily life (Mani et al., 2015). Using a digital medium could be regarded as a way in which people can be more continuously connected to practices concerning health and personal development. This is the case due to instant digital access, in comparison with non-digital forms, such as meeting a health counsellor in-person only at certain intervals. Also, the digital method is generally cheaper, less time-consuming than non-digital practices and contributes to flexibility and mobility (Wen et al., 2017; Economides et al., 2018). A mobile application grants instant access to an intimate service and can be opened at any location. Using mobile applications for well-being is growing in popularity, however solid conclusions about the efficacy remain few in number (Bostock, Crosswell, Prather, & Steptoe, 2018). For instance, three research projects found that mindfulness training as provided by an app created similar benefits on measures such as subjective well-being and depressive symptoms in adolescents in comparison to more standard, non-digital approaches (Bostock et al., 2018). Also, apps for well-being have shown to be potentially beneficial for initiating changes in behaviour, as concluded by a review of 24 research projects directed on these changes in behaviour through the use of health apps (Lee & Jung, 2018). Other studies support the view that smartphone application-based mindfulness interventions could have a positive effect on well-being, the degree of mindfulness and quality of life (Economides et al., 2018).

As a specific example, the study by Howells et al. (2016) included a randomized controlled experimental group of happiness-seeking participants that were part of a guided mindfulness intervention on the smartphone for 10 days and a control intervention group. The mean age of the 121 participants in this study was 40.7 years and 6.6% of the group were students. It is not specifically stated what type of education the students followed, however it is stated that 78.4% and 70.1% of the total group of participants in the experimental group and the control group respectively were associated with a university degree. The study presented itself as directed at increasing well-being and

used a mindfulness program on the smartphone as a potential means for this. The Headspace app for guided mindfulness meditation was used in the experimental setting, whereby the participants followed 10 sessions of each 10 minutes over the course of 10 days. For the control setting, participants had to keep track of a list of activities they engaged in exactly a week before. This also had to be done for 10 minutes each day during 10 days and was intended as a neutral activity. The conclusion of this study was that the use of the Headspace app was significantly beneficial for well-being, as seen in an increase in positive affect and a decrease in depressive symptoms. Since these positive effects were already present after a short period of 10 days, I would argue that the use of guided mindfulness meditation as facilitated by a digital medium might turn out to be a very practical, efficient and relevant beneficial contribution for well-being. However, the degree of studies that suggest potential positive effects is still small and hence don't provide a stable base of evidence yet. Thus, initiating further research in the field of digitally provided mindfulness training could deepen our understanding of the potentially beneficial role it could play for well-being.

There are multiple known health apps available that are related to mindfulness meditation, of which the 'Headspace: Meditation & Sleep' app, as used in the previously mentioned studies of Bostock et al. (2018) and Howells et al. (2016), is the mindfulness app that is ranked number one based on the 'Mobile Application Rating System' (Economides et al., 2018). Specifically, the Headspace app was created to let people "experience the benefits of meditation anytime, anywhere" (Headspace Inc., 2019). The app offers a free Basics course consisting of 10 meditation sessions, in which the choice can be made for a session to be either 3, 5 or 10 minutes in duration. These free sessions are intended to introduce people to "the essentials of meditation and mindfulness" (Headspace Inc., 2019). Even though research on mindfulness meditation as guided by the Headspace app has already been performed, as aforementioned, it is still quite in its infancy and further research could potentially contribute to a more solid scientific basis for the (in)effectiveness of such an app for multiple aspects of the mind of higher education students. Currently, mindfulness meditation is still for a large portion an in-person type of intervention (Howells et al., 2016). By researching an alternative means of providing mindfulness meditation, such as digitally via an app, comparisons can be made between the methods. The results of this might support the digital method over the in-person method in today's society, or the other way around. This gap in knowledge is worthy of investigating, due to the potential positive implications more insight could have for higher education students, as will be discussed later in more detail. Higher education is specifically targeted for this study, due to the increasing complexity of societal processes and the increasing demand for flexibility and strong cognitive skills in the globalized and information-centred world economy these days (Napora, 2011). Higher education students will be involved in important future (leader) roles in this environment, hence it is relevant and urgent to increase the understanding of methods with which the cognition of higher education students can be strengthened, in order to prepare them for adapting well within this environment. See figure 4 for a visual overview of the themes discussed in this section (1.2.4.).



1.2.5. Personality, academic success, mindfulness and student’s well-being

Researching the potential relationships between the use of such a health app, its effectiveness and a participant’s personality traits could be relevant as well, since certain personality traits correlate with mindfulness (De Vibe et al., 2015). Personality could be defined as the generally consistent behavioural habits of a person (Glassman & Hadad, 2013). Personality traits are certain aspects of personality, such as extroversion and openness, which also makes the distinguishing between the personalities of different people possible (Glassman & Hadad, 2013). There is supporting evidence that personality traits are influential in motivation and academic success, as well as for student’s well-being (Komarraju, Karau, & Schmeck, 2009; Saklofske, Austin, Mastoras, Beaton, & Osborne, 2012). For example, the study of Komarraju et al. (2009) investigated the correlations between the Big Five personality traits (extroversion, openness, conscientiousness, agreeableness and neuroticism) and the motivation and success of academic students. The study included 308 undergraduate college students, who filled in the ‘Academic Motivations Scale (AMS)’, the ‘Five Factor Inventory (NEO-FFI)’ concerning personality, and reported their GPA. Specifically, the AMS measured the intrinsic and extrinsic motives for engagement with university, and it measured amotivation (Komarraju et al., 2009). The results showed that the trait of conscientiousness and the trait of openness had a beneficial effect on motivation and academic success (Komarraju et al., 2009). Conscientiousness is characterized by being structured and hardworking and the trait of openness is characterized by the drive for exploring new possibilities (Komarraju et al., 2009).

Also, Saklofske et al. (2012) found that academic failure and stress are related to low levels of conscientiousness and adaptive ability. This study included 238 bachelor students (mean age of 20.03 years; standard deviation of 4.69 years) who completed a survey with regards to emotional intelligence, personality, coping with stress, perceived stress, positive and negative affect and life satisfaction. The presence of the relationships between personality traits, adaptive ability, stress, and academic success are relevant with regards to the academic learning experience, academic performance and student’s well-being. For example, with a better understanding of the relationship between the personality trait conscientiousness and academic motivation, the educational learning setting could be adjusted in accordance with this understanding to create a setting in which the learning process is positively affected (Komarraju et al., 2009). Also, this deeper understanding could expose potentially vulnerable students, due to the recognition of the relationships between these

personality traits and vulnerability for stress and academic failure (Saklofske et al., 2012). When these relationships are recognized, suitable interventions could be applied in order to help those students.

A potential appropriate intervention in this case could be mindfulness meditation. In the study of Hurk et al. (2011) questionnaires concerning personality and mindfulness were completed by mindfulness meditation practitioners and non-meditators as controls. Mindfulness meditation was for instance found to have a beneficial relationship with the personality trait of openness. This could link to the findings of Komarraju et al. (2009) with regards to openness having a positive relationship with motivation and academic success. This relationship between the exercising of mindfulness meditation and personality traits has not been thoroughly researched yet, indicating a gap of knowledge (Hurk et al., 2011). Thus, exploring this relationship is in itself innovative and can contribute to more insight. An increased understanding in the correlations between mindfulness and certain personality traits might contribute to a more efficient potential application of mindfulness meditation in educational settings. This could be the case due to the easier recognition of vulnerable students based on an assessment of personality traits and the specific targeting of them for a mindfulness intervention. In relation to the current study, vulnerable students could follow a guided mindfulness meditation intervention as provided by the Headspace app. See figure 5 for a visual overview of the relationships discussed in this section (1.2.5.).

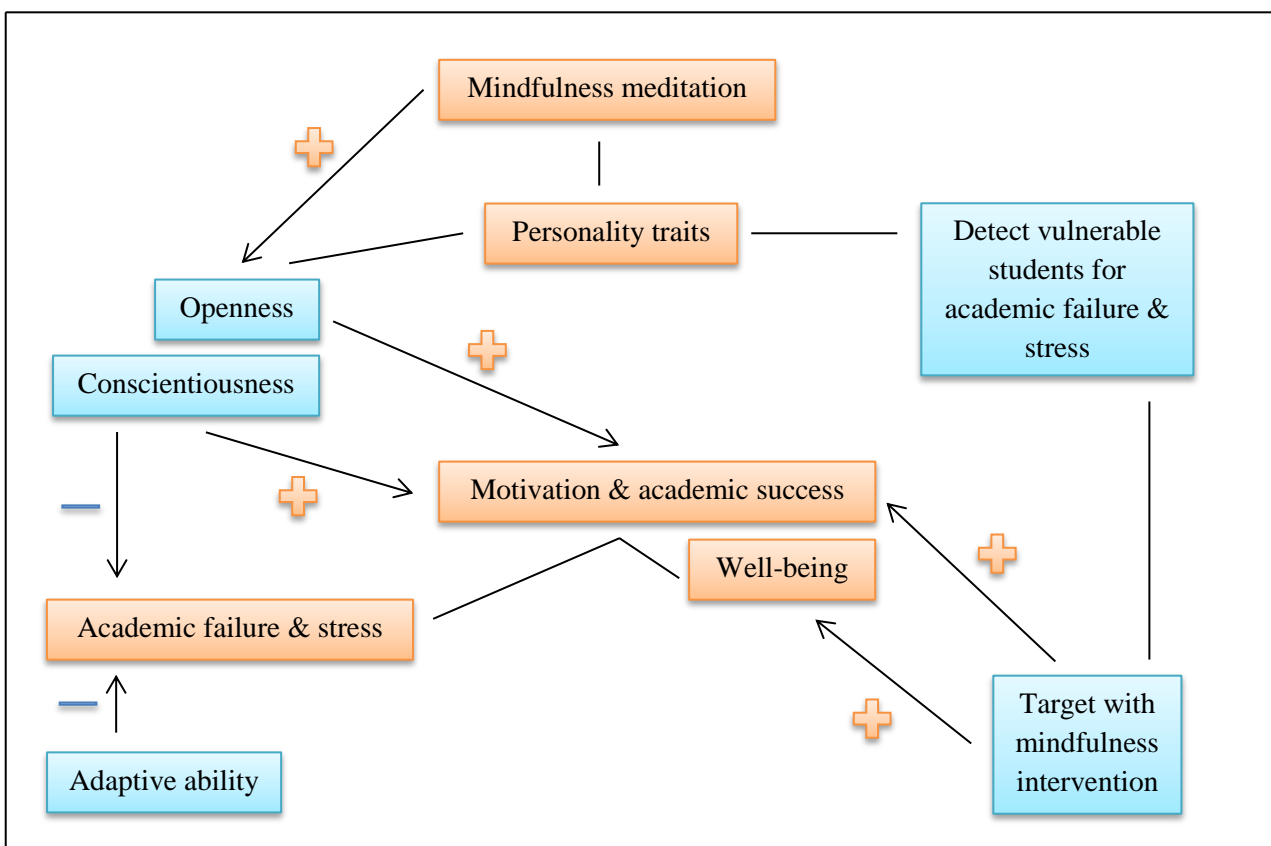


Figure 5. Relationships section 1.2.5. ‘Personality, academic success, mindfulness and student’s well-being’. Note: an arrow represents a relationship. A positive relationship is indicated by a (+) sign and a negative relationship by a (-) sign. A straight line represents shared components. An orange box concerns a construct or a main component and a blue box concerns a connecting factor.

1.3. Research design and justification questionnaires

1.3.1. Research design

In more detail, the current study investigated the potential relationship of following guided mindfulness meditation, as facilitated by the Headspace app, for three weeks with multiple aspects of the mind of higher education students. For the participants in the experimental group, the meditation practice with the Headspace app for three consecutive weeks was an intervention. In contrast, the participants in the control group did not take part in an intervention. An experimental set-up was chosen for its powerful design and ability to expose potential correlations. The selection of students for either the experimental or control group was based on a self-created questionnaire, which enabled the creation of a brief profile of the student at the start of the research project. These questions concerned for instance age, type of university degree, and familiarity with mindfulness meditation. The knowledge of these different aspects was considered to be relevant for several reasons. For example, could prior knowledge of mindfulness meditation and having (frequent) meditative experiences before participating in the research project be related to the effectiveness of the mindfulness meditation intervention? Due to for instance the proposed beneficial relationship between metacognition and mind-wandering and creativity by Fox and Christoff (2014), it can be hypothesized that more meditative experience, such as in mindfulness meditation - and hence likely higher metacognitive abilities - will potentially influence the relative impact on the results of different participants in this research project (Jankowski & Holas, 2014). These potential relations were considered to be important to include in the investigation, since they could provide a deeper insight and discussion of the subject matters.

Both groups of students completed questionnaires with regards to the degree of mindfulness, adaptive expertise, meditative experiences and reflection, and personality. No research results were found in the literature that indicate that a mindfulness meditation intervention of three weeks can create significant changes in personality traits. It seems that only a longer practice of meditation can lead to more integration of mindfulness in daily life, which can affect personality traits such as openness and conscientiousness (Hanley, 2016). Hence, due to the length of the intervention in this research project the choice was made for only measuring personality once, before the period of three weeks.

In order to frame the potential variety of constructs in the research population to a smaller degree, it was chosen to only recruit Dutch students of Utrecht University. Thus, this selection excluded English students and students of other universities. Furthermore, both Bachelor and Master students were recruited for several reasons (with an inviting flyer, spread physically and digitally). Firstly, to include more diversity in the research population and hence create a broader potential for analysis. Secondly, to extend the range of applicants. And thirdly, to see if the mindfulness meditation intervention and its potential effects differ between Bachelor and Master students as a consequence of constructs such as age and experience. This could be useful to know, in order to see if a short mindfulness meditation practice might be more effective at certain stages of education. In turn, this might contribute to a better implementation of the practice to suit the needs of students at specific intervals. See figure 6 for a visual overview of the research design.

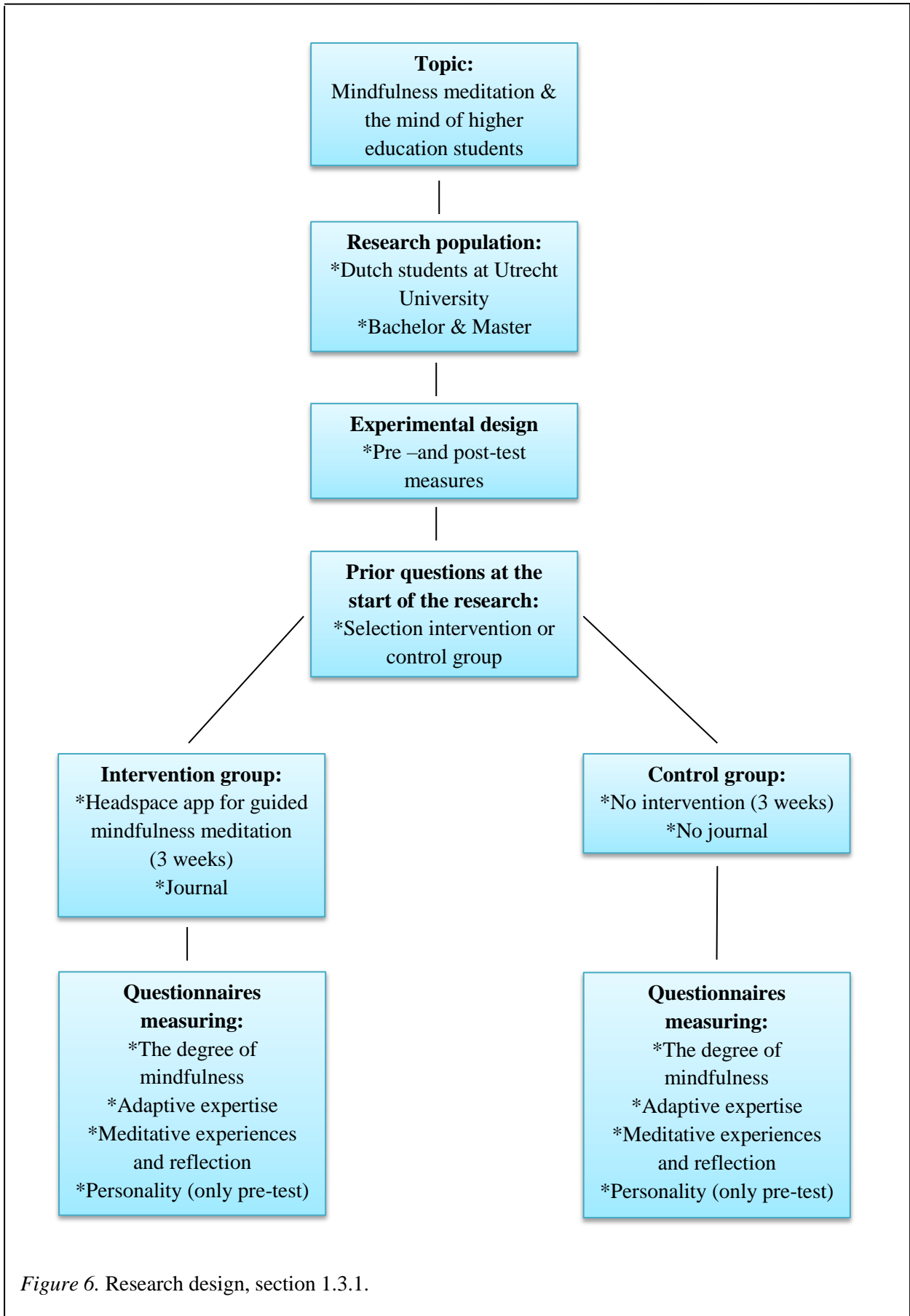


Figure 6. Research design, section 1.3.1.

1.3.2. Justification of the questionnaires that were used in the current study

(1) Five Facet Mindfulness Questionnaire (FFMQ)

Mindfulness meditation training has been associated with higher scores on mindfulness after training (Zeidan, Johnson, Diamond, David, & Goolkasian, 2010). In order to know how exactly potential beneficial effects of a mindfulness meditation intervention are created, it is important to measure the difference between the values of the same factors before and after the intervention according to Baer (2011). An increase in the degree of mindfulness is assumed to relate to being more mindful throughout the day in relation to experiences (Baer, 2011). However, in order to scientifically test this, it is important to include a measure on the degree of mindfulness before and after the intervention. This could provide an answer to the question whether the effects of mindfulness meditation are really due to a higher resultant degree of mindfulness itself, or actually due to any other (general) factors related to a mindfulness intervention (Baer, 2011). It is important to get more clarification on this matter, because it will contribute to our understanding of how exactly mindfulness meditation creates its effects. Thus, including a mindfulness questionnaire in the current research project was considered a legitimate and relevant choice.

There is a multiplicity of questionnaires available for measuring mindfulness, such as the 'Freiburg Mindfulness Inventory', the 'Cognitive and Affective Mindfulness Scale – Revised', the 'Southampton Mindfulness Questionnaire', the 'Kentucky Inventory of Mindfulness Skills', and the 'Mindful Attention Awareness Scale' (Baer, 2011). While all of these questionnaires were considered to be potential options for the current research project, it was chosen to include the 'Five Facet Mindfulness Questionnaire (FFMQ)' instead. This was done so, because this questionnaire is a synthesis of the previously mentioned questionnaires and contained a large extent of 39 items that were empirically and statistically concluded to be psychometrically most robust (Baer, 2011). Also, the FFMQ is one of the most researched mindfulness questionnaires and shows a good construct validity (De Bruin, Topper, Muskens, Bögels, & Kamphuis, 2012). Thus, the FFMQ was considered to be the most reliable and valid measure to include in the current study.

Furthermore, a Dutch version of the FFMQ was available. With the Dutch student population of the current study in mind, it was considered to include this version. The Dutch FFMQ has shown sufficient internal consistency and psychometric features and confirmed the quality of the English version of the FFMQ (De Bruin et al., 2012). Thus, including the Dutch FFMQ was judged to be valid.

(2) The Adaptive Expertise (AE) Questionnaire

Adaptive expertise as a construct was regarded to be a valuable addition to the current research project, due to several potentially relevant relationships of it with mindfulness meditation. Both adaptive expertise and mindfulness meditation are related to metacognition and cognitive flexibility. For instance, adaptive expertise is characterized by a more skilful metacognitive evaluation in comparison to routine expertise and mindfulness meditation is suggested to create more metacognitive insight (Bohle Carbonell et al., 2014; Jankowski & Holas, 2014). Also, mindfulness meditation has been associated with a higher cognitive flexibility and cognitive flexibility relates to aspects of adaptive expertise, such as the perceiving of multiple perspectives, adaptive ability and the willingness for flexibility, and the enabling of creative responses to challenges (Moore, 2013; Janssens, Oberman, & Van Goch, n.d.). Thus, if mindfulness meditation practice is able to increase cognitive flexibility, it could have relevant implications for the adaptive expertise of an individual. This could in turn be relevant specifically for higher education students, for whom the development of more adaptive

expertise could be beneficial to better meet the need for flexibility in their career (Janssens et al., n.d.).

Furthermore, including adaptive expertise as a construct was also considered to be innovative for the following reason. According to Bohle Carbonell, Könings, Segers and Van Merriënboer (2016) there have been no instruments so far that measure adaptive expertise, because the present instruments do not appropriately operationalize the total concept of what adaptive expertise entails. For instance, an instrument by Pulakos et al. (2000) measures adaptive performance, however does not meet all criteria of adaptive expertise (Bohle Carbonell et al., 2016). The instrument by Charbonier-Voirin and Roussel (2012) also measures adaptive performance, however also does not include all criteria for adaptive expertise, such as metacognitive skills (Bohle Carbonell et al., 2016). Thirdly, Fisher and Peterson (2001) made a measure for adaptive expertise, however it lacks the inclusion of domain-specific skills (Bohle Carbonell et al., 2016). Lastly, there is a measure on professional flexibility by Van der Heijden (2000), however it does not realize the ‘epistemological perspective’ component (Bohle Carbonell et al., 2016).

Thus, based on these instruments it can be concluded that research on adaptive expertise has fallen short so far, because the instruments do not meet all the necessary criteria needed to encompass what adaptive expertise is according to Bohle Carbonell et al. (2016). So, Bohle Carbonell et al. (2016) created the ‘Adaptive Expertise Inventory’ as a response to this, which has turned out to be a valid measure for adaptive expertise. Also, Janssens et al. (n.d.) created a questionnaire for measuring adaptive expertise in higher education students, based on the work of Fisher and Peterson (2001) and with reference to Bohle Carbonell et al. (2016). Due to the fact that the questionnaire by Janssens et al. (n.d.) took into account the aforementioned and was specifically targeted at higher education students, it was considered to be a suitable and relevant addition to the current research project with higher education students.

(3) Meditative Experiences and Reflection Questionnaire (MERQ)

In accordance with an integrative approach to mindfulness and the mind, the holistic nature of mindfulness and the relevance of creating an integrative framework, multiple questionnaires were used to cover a wide range of aspects. Specifically the ‘Meditative Experiences and Reflection Questionnaire (MERQ)’ was created by myself in order to create one comprehensive questionnaire in which a variety of self-chosen constructs could be included. The ambition to do so was sparked due to an unsatisfactory review of the standardized questionnaires found in the current literature in relation to the themes of flow experiences and mind-wandering. Due to my interest in meditative experiences in general, firstly mindfulness meditation appeared to be a relevant theme. Later on, after the early stage of literature search, flow experiences and mind-wandering came into view as potentially related to meditative experiences and the search for questionnaires was initiated.

For instance, the literature provided the ‘Flow State Scale (FSS)’ that could be used for measuring multiple dimensions of flow (Jackson & Marsh, 1996). However, it was related to flow specifically in the context of sports, hence would be limiting for the potential context of flow beyond sports within the current research project. Also, the ‘Flow State Questionnaire’ was found (Magyaródi, Nagy, Soltész, Mózes, & Oláh, 2013). However, it included seven dimensions for measuring flow and hence seemed to be too elaborate for the degree to which flow was considered to be a part of the research project. In the stage of designing the current research project, some literature had been found on the potential connection between flow and mindfulness, however this amount of literature was not so substantial. Thus, including an elaborate questionnaire just on flow seemed to be not proportionate to its potential involvement in this research. This was also the case for the construct of mind-wandering. For instance, the ‘Mind Wandering Spontaneous’ questionnaire and the ‘Mind Wandering

Deliberate' questionnaire had been found as measures for mind-wandering (Seli, Carriere, & Smilek, 2015). However, with both of these questionnaires specifically being used together in the study by Seli et al. (2015) and with the distinction in the type of mind-wandering, it did not seem to be the right choice to include them in the current study. A general and less elaborate approach to mind-wandering seemed to be more suitable, especially in relation to the small degree of literature that I found on the link between mindfulness and mind-wandering. Thus, it was concluded that the questionnaires on mind-wandering were not in line with its expected relevance in this study.

After arriving at the conclusion that for both flow and mind-wandering no satisfactory questionnaires were found, the idea was generated to create my own questionnaire (MERQ). It would allow me to formulate questions, based on the scientific literature in terms of content and relevance, that did cover themes such as flow and mind-wandering, however to a less elaborate extent. Also, by doing so, this research project could touch upon a greater diversity of fascinating topics, while logistically being efficient due to the inclusion of many constructs into one questionnaire. Thus, providing a substantial thematic basis for the creation of an integrative framework of mindfulness and the mind, in line with the holistic nature of mindfulness.

Furthermore, the MERQ allowed for a qualitative component to be added to the research study, namely through the addition of qualitative remarks that had to be filled in by the participants for each research construct. In this way a phenomenological perspective was added to each quantitative result. This addition was perceived to be able to contextualize the scores within a more complete interpretation of experience, thus contributing to a more integrative understanding of mindfulness and the mind. The relevance of such a combination of scientific descriptions with phenomenological accounts for an integrative approach has also been stressed (Grossenbacher & Quaglia, 2017). Questions in the MERQ included a self-reflective essence in line with the subjective nature of self-report and due to the potential relationship of metacognitive awareness in mindfulness meditation with reflective evaluation.

The inclusion of the MERQ in the current study might stimulate new and innovative scientific engagement with regards to the learning abilities and well-being of students. For instance, discovering potential significant correlations between the construct 'Openness to new and challenging ideas and experiences' and the construct 'The presence of flow experiences' with multiple components of subjective well-being, could lead to further investigation into what contexts and actions could enhance flow experiences to occur. In turn, this might hypothetically lead to a difference in life satisfaction and openness in engaging with the world that could be beneficial for the student. The MERQ was also created in line with a growing interest in the relationships between the covered components. For instance, according to Noone et al. (2016) the ability for critical thinking is connected to metacognitive regulation, which may be affected by mindfulness meditation. Cash and Whittingham (2010) furthermore studied the potential relationship between different mindfulness facets and psychological symptoms and well-being. They suggest that for example the mindfulness facet 'act-aware', which characterizes the capacity for being aware of everyday actions, could have a clinical use for depressive symptoms. Also, they suggest that the mindfulness facet 'nonjudge', which indicates that you're able to observe experiences of yourself such as thoughts without judgement, predicts less depressive, anxiety-related and stress-related symptoms (Cash & Whittingham, 2010).

Research constructs included in the MERO

The presence of flow experiences

Concerning ‘The presence of flow experiences’, the following question was formulated: do you regularly have experiences in which you’re totally and optimally involved in a certain task, also formulated as: experiences in which there is the presence of a high degree of concentration and the feeling that you’re in the flow of the moment? This question was based upon the characterization of the flow-state as a state including a high and stable focus and immersive engagement with a task (Moore, 2013; Payne et al., 2011). The latter part of the question was intended as a clarification for the reader and as a way to approach the subjective feeling of being in the zone, which is a reference for the flow-state and being in the moment (Payne et al., 2011).

Mind-wandering and creative ideas

For ‘Mind-wandering and creative ideas’ the next question was created: do undirected, spontaneous emerging thoughts frequently form the initiation of creative ideas you have? The inspiration for this question came from the description of Fox and Christoff (2014), who articulated mind-wandering as thoughts that are not voluntary, not planned and without a specific direction. Furthermore, Fox and Christoff (2014) potentially linked mind-wandering to mindfulness meditation, metacognition and creative ideas. Also, mind-wandering has been related to creative activities and overall creativity by Zedelius and Schooler (2015). Hence, as a way to express these suggested relationships, it was chosen to include ‘creative ideas’ in the question in the MERO.

Reflecting on the self

Mindfulness meditation has been related with more awareness of the self and its experiences, in which a metacognitive monitoring is the case (Hölzel et al., 2011; Vacca & Hoadley, 2016). Self-reflection has been considered to be a component of this self-monitoring, being conceptual in nature and specifically related to the awareness of mental activities (Vacca & Hoadley, 2016). Furthermore, the curious and open nature of self-reflection has been positively related with creativity (Shrimpton, McGann, & Riby, 2017). Also, an increase in meta-awareness of thoughts due to mindfulness meditation could be positively related to the reflective and evaluative nature of critical thinking (Noone et al., 2016). Thus, due to the relevant self-reflective aspect of mindfulness meditation and its relation to creativity, the following question on creativity was added: do you reflect upon yourself as a creative person? Also, the following question on critical thinking was included: do you reflect upon yourself as a critical thinker?

Openness to new and challenging ideas and experiences

Due to the open and accepting nature of mindfulness and it being a dynamic cognitive style, it could be the case that this allows for a better coping of the individual with events (Hinterman, Burns, Hopwood, & Rogers, 2012). Also, openness to new experiences has been related to better cognitive restructuring in the face of challenges and stress and has also been positively related to positive coping styles (Xu et al., 2017). Thus, it was hypothesized that the connection between cognitive coping and the openness to new and challenging ideas and experiences could be related to more flexibility and a less rigid engagement with life events. So, the choice was made to add the following question: are you frequently open to new and challenging ideas and experiences?

Subjective well-being

For the inclusion of subjective well-being as a construct in this research project, the consideration was made to include a questionnaire on subjective well-being. There is a general agreement that questions about how satisfied you feel with regards to aspects of yourself, are a good measure of subjective well-being (International Wellbeing Group, 2013). Two potential questionnaires were found, of which the first one was the 'Personal Wellbeing Index' and the second one the 'Subjective vitality' measure (International Wellbeing Group, 2013; Ryan & Frederick, 1997). Firstly, the 'Personal Wellbeing Index' consists of seven questions related to satisfaction, with every question relating to a different dimension of the quality of life (International Wellbeing Group, 2013). These dimensions included: life standard, life achievements, feeling safe, connection with the community, security in the future, health, and relationships (International Wellbeing Group, 2013). Secondly, research by Ryan and Frederick (1997) revealed the relevance of subjective vitality for physical and psychological well-being. In their 'Subjective vitality' measure, there were seven questions that related to feelings of aliveness, vitality, energy and alertness (Ryan & Frederick, 1997).

After a review of these questionnaires it was decided to not include any of them. Instead, I used my inspiration gained from the review to add certain elements to the MERQ. This was done so for the following reasons. Firstly, the 'Personal Wellbeing Index' was regarded to include too many different facets of quality of life. This made it quite specific, while the construct of subjective well-being in the current project was more related to the general self-reflective attitude towards quality of life. Secondly, the 'Subjective vitality' measure was regarded to miss certain important aspects of subjective well-being, such as life satisfaction and quality of life. It therefore seemed a legitimate action and an efficient way to integrate a combination of certain main components of these questionnaires in the MERQ. Thus, the following three important components were used: vitality and energy, life satisfaction, and quality of life. With regards to vitality and energy, this resulted in the following question: do you generally feel vital and energetic? With regards to life satisfaction, the following question was formulated: do you get enough satisfaction from life? Lastly, for quality of life the following question was stated: are you content with your overall quality of life? These questions were not cited, but self-formulated.

The importance of subjective vitality and quality of life for well-being have already been stressed by Ryan and Frederick (1997) and the 'International Wellbeing Group' (2013) respectively (see the first paragraph of this section on well-being). Life satisfaction was specifically included as a construct due to it being regarded as a cognitive evaluation of subjective well-being and hence a dimension of well-being (Christopher & Gilbert, 2009; Pavot & Diener, 2008; Cikrikci & Odaci, 2016). So, the inclusion of the construct life satisfaction in this research project was considered to be a useful addition for measuring subjective well-being. Furthermore, life satisfaction has been considered to be related to metacognitive abilities, in which metacognitive abilities might be involved in the degree of cognitive achievement, such as in problem solving, which in turn might influence satisfaction in life (Cikrikci & Odaci, 2016). Also, metacognitive abilities have been related with mindfulness meditation and a higher degree of mindfulness has been positively related with life satisfaction (Fox & Christoff, 2014; HINTERMAN et al., 2012). Thus, due to this potential link of life satisfaction with metacognition and the relationship between metacognition and mindfulness meditation, an association between life satisfaction and mindfulness was hypothesized. For instance, the 'Mindful Attention Awareness Scale' has been positively correlated with life satisfaction (Christopher & Gilbert, 2009). Also, the mindfulness facets 'Describe' and 'Act with Awareness' in the 'Kentucky Inventory of Mindfulness Skills' have been positively related with life satisfaction (Christopher & Gilbert, 2009).

Furthermore, it was found that stress had been negatively related with well-being (Shapiro et al., 1998). Coping in a more flexible manner with stress might thus be positive for well-being.

Mindfulness meditation has furthermore been associated with more cognitive flexibility (Fox & Christoff, 2014). Thus, it was considered to be relevant to create a question in the MERQ based upon the reflection of the participant on their flexibility in coping with stress. This was done so in line with the hypothesis that the practice of mindfulness meditation could be associated with cognitive flexibility, as aforementioned, and hence with the cognitive coping of the participant with stress. The following question was formulated: do you mostly deal with stress in a flexible manner?

(4) ‘The Big Five Personality Test (IPIP-50)’

The ‘Big Five’ personality structure of the domains ‘extraversion’, ‘agreeableness’, ‘conscientiousness’, ‘neuroticism’ and ‘openness’ have constantly recurred in many empirical studies as descriptions for personality traits (Goldberg, 1992). Many years of scientific research are leading to an agreement of these five personality traits as the basic classification of personality (Constantinescu & Constantinescu, 2016). Hence, these five personality factors have been considered to potentially constitute a unified theoretical framework for personality (Digman, 1990; Constantinescu & Constantinescu, 2016). This ‘Big Five’ personality structure is thoroughly researched, scientifically validated and has been proven useful across different cultures and different psychological fields (Hanley, 2016; Constantinescu & Constantinescu, 2016). Due to the aforementioned findings in my review of the literature and the strong scientific conviction of the importance of these five aspects of personality, using the ‘Big Five’ personality structure as the basis for choosing a personality questionnaire was considered to be justified. During my literature search, I came across two dominantly present options for a questionnaire. The first option was the ‘NEO Five Factor Inventory-Revised (NEO-FFI-R)’, which includes 60 items on the ‘Big Five’ personality traits and is a shorter edition conducted from the ‘NEO Personality Inventory Revised (NEO-PI-R)’ containing 240 items (Inchausti, Mole, Fonseca-Pedrero, & Ortuño-Sierra, 2015). Values of the scales of ‘NEO-FFI-R’ for internal reliability coefficients are 0.75-0.82 and alpha reliabilities of 0.71-0.82 have been found in Spanish populations (Aluja, García, Cuevas, & García, 2007).

The second option was ‘The Big Five Personality Test (IPIP-50)’, which uses the ‘IPIP Big-Five factor markers’ from the ‘International Personality Item Pool (IPIP)’. The IPIP is an international online network base for personality items initiated by Goldberg (1992). It is accessible for free and its creation was intended to increase the quality of ‘Big Five’ questionnaires due to easy cooperation between researchers and hence better revision (Constantinescu & Constantinescu, 2016). ‘The Big Five Personality Test (IPIP-50)’ includes 50 items on the ‘Big Five’ personality traits and has been shown to have good psychometric features, also across different cultures (Constantinescu & Constantinescu, 2016). The scales of the ‘IPIP-50’ have good internal consistency and strong correlations to other popular questionnaires for personality, such as the ‘NEO Five Factor Inventory’ and the ‘Eysenck Personality Questionnaire-Revised Short Form’ (Gow, Whiteman, Pattie, & Deary, 2005). Cronbach’s alpha values for ‘IPIP-50’ are 0.82-0.97 (Constantinescu & Constantinescu, 2016).

Based on an evaluation of these findings and the qualities of the ‘NEO-FFI-R’ and the ‘IPIP-50’, the ‘IPIP-50’ was regarded to be the most suitable choice for the current research project. This was the case, due to the following reasons. Firstly, the ‘IPIP-50’ showed a higher range of alpha values and hence was considered to be a more reliable questionnaire, even though the ‘NEO-FFI-R’ also displayed good alpha values. Secondly, due to the potential higher quality of a ‘Big Five’ questionnaire through the ‘IPIP’, as suggested by Goldberg (1992), using the ‘IPIP-50’ was expected to be a stronger measure. Thirdly, the fact that the ‘IPIP-50’ included 50 items in comparison to 60 items included in the ‘NEO-FFI-R’, while measuring the same personality traits, was interpreted as a sign that the ‘IPIP-50’ might be a more thorough and efficient measure.

1.4. Hypotheses and relevance

1.4.1. Hypotheses

Based on the relationships that have been covered in the introductory section of this thesis, the following hypotheses are formulated. Generally, it is to be expected that a guided mindfulness meditation training for a duration of three weeks (experimental group), as facilitated by the Headspace app, can be beneficial as an assistance and as a catalyst for the development and functioning of multiple aspects of the mind of higher education students and the reflection upon these aspects. It is assumed that the difference scores of the pre- and post-test measures for the research constructs could turn out to be significantly positively higher in the experimental group compared to the control group. Concerning the time period of the intervention: there is limited evidence available on the time period needed for the initiation of effects of smartphone application-based mindfulness training, however it has been suggested that a period of three days to four weeks could potentially be beneficial for aspects such as negative mood, attention, the degree of mindfulness and the perception of stress (Walsh, Saab, & Farb, 2019). Thus, having taken this period into account, it was hypothesized that an intervention of three weeks in the current study was an adequate length of time.

With regards to the research constructs, firstly the relationship between the degree of mindfulness, metacognition and mind-wandering will be considered. It is hypothesized that an increase in the degree of mindfulness can create a higher awareness, a broader receptivity of the mind, and more attentive abilities of the mind, which might make a greater diversity of thoughts arise that in turn could increase the chance for new and creative realizations and insights to appear in awareness (Fox & Christoff, 2014). This higher degree of mindfulness might be created by the practice of mindfulness meditation, hence for the current study it is hypothesized that the experimental group might show a significant difference score between the pre- and post-test measure in the degree of mindfulness, relatively to the control group showing no significant difference score.

Regarding the reflection on the self as a critical thinker, I suggest that the development of metacognitive skills through mindfulness meditation might be related to the perception of the self as a critical thinker, due to either a difference in degree of critical thinking or more awareness of it. More meta-awareness has already been linked with critical thinking (Noone et al., 2016). It could be so that more awareness is associated to greater reflective and evaluative capacities, due to a more flexible state of mind. I would hypothesize that this could relate to more critical evaluative thinking. With regards to a reflection on the self as creative, I would hypothesize that mindfulness meditation increases self-reflective curiosity and openness towards experiences, which has been associated to be beneficial for creativity (Shrimpton et al., 2017).

In the context of cognitive flexibility, I would argue that being cognitively flexible could be an integral aspect of a person's ability to attend and adapt creatively to whatever presents itself in experience. Being able to adapt more creatively and having a higher reflective awareness, might contribute to reflecting on the self as creative. Also, the presence of more attentional control could make it cognitively easier to stay in the flow-state (Moore, 2013). A higher cognitive flexibility in directing one's attention could thus facilitate flow (Moore, 2013). Mindfulness meditation and its potential for increasing cognitive flexibility, could in turn facilitate this better directing and sustaining of attention (Chambers et al., 2007). Also, this cognitive flexibility might allow for more flexible coping with stress, which could be beneficial for well-being. Furthermore, I would hypothesize that the openness to new and challenging ideas and experiences could work as a facilitator for the development of the cognitive aspects covered in this study, as well as that it might be positively affected by mindfulness meditation.

Also, I hypothesize that an enhancement of metacognitive ability, which is the ability to experience mental appearances not as fully personal but in a more expanded non-judgemental awareness, due to mindfulness meditation, might connect well with adaptive expertise. Furthermore, an increased understanding in the correlations between mindfulness and certain personality traits could potentially contribute to a more efficient application of mindfulness meditation in educational settings. This could be the case due to the easier recognition of vulnerable students based on an assessment of personality traits and the specific targeting of them for a mindfulness intervention. This might be beneficial for the student's well-being, with regards to coping with stress, vitality and energy, life satisfaction and quality of life. See figure 7 for the integrative framework of the introductory section of this thesis.

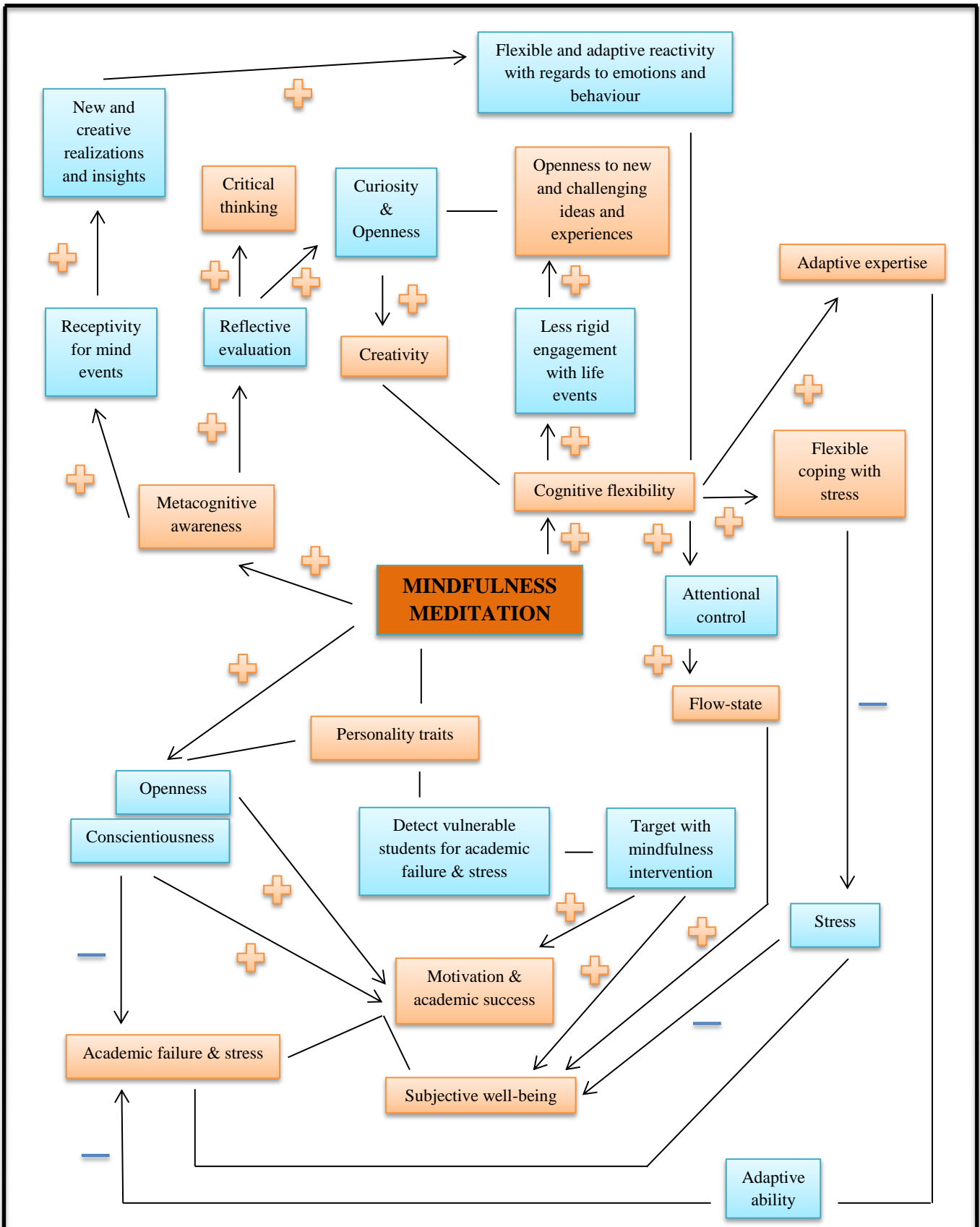


Figure 7. Integrative framework (introduction). Note: an arrow represents a relationship. A positive relationship is indicated by a (+) sign and a negative relationship by a (-) sign. A straight line represents shared components. An orange box concerns a construct or a main component and a blue box concerns a connecting factor.

1.4.2. Relevance

To conclude, the combination of the topics in this research project is innovative. This is the case, because there's still a lot of progress to be made in the academic investigation of the links between mindfulness meditation and the human mind within the field of cognitive and neurobiological psychology (Moore & Malinowski, 2009; Cash & Whittingham, 2010; Moore, 2013; Jankowski & Holas, 2014; Napora, 2011). Examples of directions for innovative investigation are: providing more empirical evidence about the specific processes involved in mindfulness practice, gaining more knowledge about the potential clinical uses of mindfulness meditation for psychiatric illnesses, stress and behavioural treatments, the relationship with neuroplasticity, the relationship between mindfulness, flow and productivity, and more empirical investigation into meditation as a potential beneficial instrument for studying (Moore & Malinowski, 2009; Cash & Whittingham, 2010; Moore, 2013; Jankowski & Holas, 2014; Napora, 2011). The student research population and digitally guided mindfulness meditation adds to the innovative character of this study (Howells et al., 2014; Lee & Jung, 2018).

This innovative character could lead to new insights and knowledge, which could add an inspiring spark to the evolutionary process of these research topics in the scientific field of cognitive and neurobiological psychology, in which the cognitive and neurobiological workings of the human mind are studied. New insights and knowledge in these topics could in turn contribute to a deeper understanding of the mind and an enhanced understanding of our human nature. This could be relevant for the therapeutic and educational field, since interventions might, as a consequence, utilize a greater effectiveness due to the increased insight into the interplay between these different aspects of the mind. More insight into the web of these relationships could thus potentially contribute to the construction of interventions of higher quality and potency. This reveals the potential practical relevance of the current study within the field of cognitive and neurobiological psychology.

Also, the exposure of these relationships and potential positive implications for aspects such as stress management, cognitive flexibility and focus, might improve the learning experience and general well-being of students throughout their education. Being healthier, more grounded and cognitively stronger as a potential result of regular meditation practice might positively facilitate this learning experience and general well-being. With more students having a better learning experience and a higher well-being, an accumulative positive effect could hypothetically be created on a larger level. This larger level includes the interactions of the students with each other and with the learning methods. If there are more dynamic and flexible interactions present, there might hypothetically be more space for creative development. I would hypothesize that this could be the case, because these interactions might lead to better communication and discussions and a higher quality of collective problem-solving. This might in turn lead to universities being more 'creativity-fostering places' (Plucker, Beghetto, & Dow, 2004).

The current digital age also makes great demands of our cognitive capacities, hence creating a stronger cognitive potential through meditative practices might hypothetically contribute to better adaptability and skilfulness in this demanding environment. Thus, gaining more insight into the potential relationships between mindfulness meditation and the mind of higher education students, could for instance lead to evidence in favour of the implementation of mindfulness training programs in educational systems, or in contrary a lack of evidence for the need for implementation. For a better understanding of this matter, the exposure of potential significant relationships between mindfulness and the mind of higher education students is crucial. This is where the current research project, together with previous research and other future research projects within the field of cognitive and neurobiological psychology, can play a vital role.

2. Method

2.1. Participants

In this research project two different groups were present, both including higher education students of Utrecht University. There was an experimental group on the one hand and a control group on the other hand. Higher education students in the experimental group were to use the Headspace smartphone application for guided mindfulness meditation for a period of three weeks as an intervention ($N = 4$). Higher education students in the control group were not subject to an intervention in the same period of three weeks ($N = 3$). A pre-test measure before this period of three weeks and a post-test measure after this period collected quantitative as well as qualitative data. Both bachelor ($N = 5$) and master ($N = 2$) students were present in this study, including mostly females ($N = 6$). The age ranged between 19-25 years, with a mean age of 22.29 years and a standard deviation of 2.289 years. Based on the responses of the participants to a questionnaire at the start of the research, a selection was created for placement in either the experimental or the control group. This questionnaire contained personal questions regarding the frequency and type of meditative experiences, familiarity with mindfulness meditation, age, and type of university degree.

Due to there being two master students, one was included in the experimental group and one in the control group. Concerning the frequency of meditative experiences, a distribution was made wherein the frequency value of ‘very sporadically’ was one ($N = 1$) for the experimental group and two ($N = 2$) for the control group. This distribution was based on the expectation that students who have a higher frequency of meditative experiences might be prone for greater effectivity of a short mindfulness training. Furthermore, the experimental group contained four students ($N = 4$) relative to three students ($N = 3$) in the control group. This distribution was based on the preference for including one more participant that would be subject to the intervention. Hence, if there would be attrition, which I presumed would be more likely for an active intervention for a period of three weeks, then the chance of maintaining relatively equal group sizes would be higher.

Familiarity with mindfulness meditation was also equally distributed, with relatively well-known familiarity in the experimental group ($N = 2$) and in the control group ($N = 2$), and with lesser familiarity in the experimental group ($N = 2$) and in the control group ($N = 1$). In the experimental group, all three types of meditative experiences were present: the presence of flow experiences ($N = 3$), mind-wandering and creative ideas ($N = 3$) and mindfulness meditation ($N = 2$). In the control group, also all three types of meditative experiences were present: the presence of flow experiences ($N = 2$), mind-wandering and creative ideas ($N = 3$) and mindfulness meditation ($N = 1$). The experimental group included students with the following degree: master ‘Climate Physics’ 2nd year, bachelor ‘Liberal Arts and Sciences’ 1st year, bachelor ‘Liberal Arts and Sciences’ 4th year, and bachelor ‘Artificial Intelligence’ (no year mentioned). The control group included students with the following degree: bachelor ‘Liberal Arts and Sciences’ 1st year, bachelor ‘Liberal Arts and Sciences’ 2nd year, and master ‘Waterscience and Management’ 2nd year.

Of the four respondents ($N = 4$) in the experimental group, only two ($N = 2$) finished the questionnaires at both the pre- and post-test measures. Of these two, one ($N = 1$) was actively engaged in the intervention of using the Headspace app for guided mindfulness meditation and kept track of fifteen journal entries, one for each meditation session. The other respondent started off with a single use of the Headspace app and a single journal entry, but did not continue due to a busy schedule for her master thesis. She did however complete the questionnaires of the post-test measure. Even though no potential effect of meditation can be measured, the completion of the pre- and post-test measures could still prove useful for the analysis of the correlations between the different variables.

The two respondents ($N = 2$) that did not start with the intervention were approached in order to motivate continued participation in the research project and to discover their reason for not starting with the intervention. However, no response was received from both. It can be hypothesized that an intervention of three weeks, including the maintenance of a journal, proved to be too much of a commitment for them. On the one hand, this might be a weak point of the research design, with the weak point being the length of time. A shorter intervention period might have lowered the threshold for them to participate. However, a period of three weeks was specifically chosen due it being deemed the appropriate length of training needed for initiating potential effects of the intervention. A period of one or two weeks seemed too short and a less safe length of time for proper research. In the control group one respondent ($N = 1$) only completed the pre-test questionnaires a few days before the actual post-test measure was supposed to take place, hence could not be included in a pre- and post-test analysis.

2.2. Measures

Pre-test and post-test measures

Participants in both the experimental group and the control group filled in the following self-report questionnaires: ‘Five Facet Mindfulness Questionnaire (FFMQ)’, ‘Adaptive Expertise (AE) Questionnaire’, ‘Meditative Experiences and Reflection Questionnaire (MERQ)’ and ‘The Big Five Personality Test (IPIP-50)’. These questionnaires will be discussed in more detail in the sections below. Every questionnaire was filled in once as a pre-test measure and once again as a post-test measure, except for ‘The Big Five Personality Test (IPIP-50)’, which was only used as part of the pre-test measure.

Five Facet Mindfulness Questionnaire (FFMQ)

The ‘Five Facet Mindfulness Questionnaire (FFMQ)’ is a validated mindfulness questionnaire (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Baer et al., 2008). Mindfulness can be described as a non-judgemental, open and accepting way of being in relation to what happens in the here and now (Christopher, Neuser, Michael, & Baitmangalkar, 2012). The ‘FFMQ’ is widely used for measuring a total score of mindfulness and scores for different facets of mindfulness for a person. In the current study, only the total score of mindfulness was used as indicated by the variable ‘The degree of mindfulness’. The ‘FFMQ’ includes 39 questions requiring self-report on a scale from 1 (never or almost never true) to 5 (very often or always true). An example of a question is: when I’m walking, I consciously notice how the movement of my body feels (Bohlmeijer, Ten Klooster, Fledderus, Veehof, & Baer, 2011; Veehof, Ten Klooster, Taal, Westerhof, & Bohlmeijer, 2011). Another example is: I am easily distracted (Bohlmeijer et al., 2011; Veehof et al., 2011). The different facets of mindfulness include the following: observing (8 questions), describing (8 questions), acting with awareness (8 questions), non-judging of inner experience (8 questions), and non-reactivity to inner experience (7 questions). ‘Observing’ refers to the perception of internal and external stimuli. ‘Describing’ refers to the description of internal and external experiences. ‘Acting with awareness’ refers to being fully present in the here and now whilst acting. ‘Non-judging of inner experience’ refers to fully accepting experiences without labelling or resisting them. ‘Non-reactivity to inner experience’ refers to not anticipating any internal experience, but just letting it pass (Bohlmeijer et al., 2011; Veehof et al., 2011).

Baer et al. (2008) found that there was an adequate to good internal consistency (0.72-0.92) of

these five domains with different samples, including people with meditation experience, people without meditation experience (community sample), and highly educated people without meditation experience (Cash & Whittingham, 2010). Bohlmeijer et al. (2011) assessed the reliability of the mindfulness domains in the Dutch 'FFMQ' and found all Cronbach's alpha values to be higher than 0.70, which was considered to be the allowing threshold value for research. Specifically, the alpha values ranged between 0.73 and 0.91, hence 'FFMQ' reliability was the case. Other research supports the reliability and validity of the 'FFMQ' (Christopher et al., 2012; De Vibe et al., 2015). In the current research project a Dutch version of the 'FFMQ' was used. This Dutch version is a translation by Muskens and Kamphuis and has been validated in studies concerning people with symptoms related to mood and/or anxiety and fibromyalgia (Bohlmeijer et al., 2011; Veehof et al., 2011).

The Adaptive Expertise (AE) Questionnaire

The 'Adaptive Expertise (AE) Questionnaire' is a questionnaire based on work by Fisher and Peterson (2001) and developed by Janssens et al. (n.d.) to assess adaptive expertise in higher education students. It consists of 40 questions in Dutch, requiring self-report on the four themes of 'epistemology', 'goals and beliefs', 'metacognitive self-assessment, and 'multiple perspectives', with 10 questions on each theme (Janssens et al., n.d.). Hereby, 'epistemology' concerns the perspective on the essence of what knowledge is, for instance as dynamic or static. 'Goals and beliefs' refers to the perspective of students on learning aims and the essence of skilfulness. 'Metacognitive self-assessment' is about the student's usage of reflective methods upon one's own comprehension and performance. Lastly, 'multiple perspectives' concerns the student's readiness for adopting several different stances while engaged in work (Fisher & Peterson, 2001). An example of a question is: usually there is only one particular way to approach a problem (Janssens et al., n.d.). Another example is: when I make a mistake, I view it as a learning experience (Janssens et al., n.d.). With Cronbach's alpha being 0.767, the questionnaire was reliable and appropriate for usage.

Meditative Experiences and Reflection Questionnaire (MERQ)

The 'Meditative Experiences and Reflection Questionnaire (MERQ)' was developed specifically by myself for this research project (see section 1.3.2. of this thesis for the justification and all formulated questions). It includes the following variables: 'The presence of flow experiences', 'Mind-wandering and creative ideas', 'Reflecting on the self as creative', 'Reflecting on the self as a critical thinker', 'Openness to new and challenging ideas and experiences', 'Flexible coping with stress' and subjective well-being including the variables 'Vitality and energy', 'Life satisfaction' and 'Quality of life'. The questionnaire consists of 9 questions in Dutch, of which every question concerns one of the aforementioned variables each. Quantitative answers could be given on a scale from 1 (not applicable) to 10 (very applicable) for each question. Also, a qualitative explanatory remark for each component was to be given, which was intended to situate the quantitative answers into a more in-depth reflective and personal context. This could make a positive contribution to the interpretation of the results by providing potential (non)supportive statements for certain quantitative relationships.

With regards to the questions in the MERQ, it was specifically chosen to include a frequency in most formulations. For instance: do you mostly cope in a flexible manner with stress? In contrast to: do you cope in a flexible manner with stress? Hence, a greater degree of subtlety in the answers on a scale from 1 to 10 could be given, instead of clear-cut answers (yes or no). This could contribute to the specificity of the study. A second example of a question is: do you regard yourself as being creative? Another example of a question is: do you generally feel vital and energetic? The inspiration for these questions came from the scientific literature that was used in the current study (see section 1.3.2.).

The Big Five Personality Test (IPIP-50)

‘The Big Five Personality Test (IPIP-50)’ is a test including questions concerning five personality traits that are associated with psychological and physical health (Latzman & Masuda, 2013). It is a psychometrically strong measure and is also researched very elaborately (Latzman & Masuda, 2013; Hanley, 2016). ‘The Big Five Personality Test (IPIP-50)’ consists of 50 questions requiring self-report on a scale from 1 (disagree) to 5 (agree), involving the following personality traits: extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. This ‘Big Five model’ is a well-supported and intensively studied construct of personality in the research field (Hanley, 2016). Examples of questions in the test are: “I sympathize with other’s feelings”, “I get chores done right away” and “I get irritated easily” (Goldberg, 1992).

The trait ‘extraversion’ describes the tendency for gaining fulfilment in external sources. ‘Agreeableness’ describes the tendency in which an individual adapts their behaviour to other people. ‘Conscientiousness’ describes the tendency to work hard and to be honest. ‘Neuroticism’ reflects the degree of emotionality. ‘Openness to experience’ describes the tendency to explore unfamiliar experiences and the intellect (Goldberg, 1992). For this test Cronbach’s alpha values were found ranging from 0.82 to 0.97 (Constantinescu & Constantinescu, 2016). Thus, they were acceptable. Also, several potential difficult English words in the questionnaire for Dutch students were translated for clarification, using the Van Dale online dictionary (2019).¹

Intervention

In the experimental group the ‘Headspace: Meditation and Sleep’ smartphone application was used as an intervention, which could be downloaded for free in the Apple App Store and Google Play. The Headspace app had to be used for three consecutive weeks (from 07-05-2019 until 28-05-2019), at least 5 days a week, a minimum of 1 session on each of those days and a self-chosen duration of 3, 5 or 10 minutes. A journal, created by myself, was to be filled in after each meditation session to reflect on the session. Questions in the journal were related to the following aspects: the session number, duration of the session, date, location, time of day, urge to meditate, general feeling before, during and after the meditation, and other remarks. This reflection might on the one hand benefit the metacognitive skills of the participant, while on the other hand provide valuable information for the research project such as: how is meditating experienced, are certain places and moments more attractive for meditating, and do different durations of the sessions influence the potential effects of a meditative practice?

For instance, it can be valuable to know how the meditation session is experienced, in order to see the potential effect of meditation from a phenomenological perspective. This could provide information on whether a single session can for example already have a calming effect on the mind and whether the potential effectiveness of mindfulness is more substantially noticed after being more acquainted with the practice (e.g. after two weeks of practice). These could be relevant qualitative connections with potential quantitative changes in the degree of mindfulness. Also, knowing the qualitative remarks on meditation sessions of different durations could provide valuable information on whether a minimum amount of time is necessary for an effect or whether just taking a moment of mindfulness (irrespective of the time duration) is already sufficient for a phenomenological change. This might be relevant for the practical application of mindfulness training, in terms of time

¹ Translations from ‘The Big Five Personality Test (IPIP-50)’: question 2, concern (betrokkenheid, bezorgdheid); q.12, insult (beledigen); q.15, vivid (levendig, krachtig); q.19, seldom (zelden, haast nooit); q.23, chores (karwei); q.28, proper (juist, passend); q.29, upset (overstuur); q.38, shirk (zich onttrekken aan); q.48, exacting (veeleisend); q.49, blue (gedeprimeerd, somber).

investment. Lastly, knowing if certain places and moments during the day are more attractive for meditating could be practically relevant. This relevance applies to the potential implementation of mindfulness training at certain specific intervals and type of settings during the day in for instance educational systems (in order to be most suitable and effective).

Control group

With regards to the control group, no guided mindfulness meditation intervention was followed and no journal had to be filled in. These actions were specifically related to the meditation practice in the experimental group. The choice was made for not including any active alternative task for the control group, in order to frame the potential effects of meditation as much as possible. For instance, if a control task was included that was related to a brain training (e.g. a smartphone application directed at cognitive games for focus and problem-solving skills) and/or the filling in of a journal unrelated to meditation, it might have been more difficult to expose the effects from meditation specifically. This could be the case due to the potentially shared cognitive aspects between meditation and brain training games, such as problem-solving skills and attention. Also, the reflective nature of a journal is characterized by the reflection on the cognitive activities of the self (metacognition), irrespective of the reflective focus on meditation or not. Thus, due to the overlap of the aforementioned relationships, it was deemed a better choice to exclude any task related to cognition for the control group, so that the chance of detecting a true potential effect of meditation would be higher.

2.3. Procedure

Participants were recruited in two ways. An inviting flyer was created in which a brief description was given of the central components of this research project, the requirement of the type of student for the project and a specification of the deadline and email address for application. Also, the flexibility and easily accessible method of participation in this project was emphasized. A shared email address (tomorrowproblemsolvers@uu.nl) was used for the applications, partly due to its more official appeal to potential respondents. Also, it was clearly stated that the data of the participants would be processed anonymously, in order to perhaps lower the threshold for participating and to allow for freer responses. Firstly, this flyer was shared multiple times in the digital space: Facebook, Whatsapp, and the LAS Community section of the digital Blackboard environment of Utrecht University. Secondly, 48 physical copies of this flyer were spread on notice boards in multiple buildings of Utrecht University. This sharing procedure was done twice: once when the deadline for application was set on the 19th of April and once again when the deadline was shifted to the 30th of April in order to potentially recruit more participants.

Questionnaires were shared with the respondents by using GoogleForms, an online method in which free online questionnaires can be created for personal use. This method facilitated easy access and a fast data processing speed, since the answers of the respondents could instantly be reviewed and downloaded after submission. These digitally provided questionnaires were filled in by the respondents as a pre-test and as a post-test, except for 'The Big Five Personality Test (IPIP-50)' (only as a pre-test). After obtaining all data of the pre- and post-test measures the respondent numbers were randomized, in order to lower potential interpretation bias.

For the data analysis spreadsheets in Microsoft Excel were created via GoogleForms and subsequently organized. The data that was analysed concerned the total score of the 'FFMQ', the total score of the 'AE questionnaire', the separate scores of the different variables of the 'MERQ', and the

different personality traits of 'The Big Five Personality Test (IPIP-50)'. With only one participant actively completing the mindfulness meditation intervention and a high attrition rate, a specific comparison between the data of the experimental group on the one hand and the control group on the other hand was not deemed to be appropriate. This specific comparison was intended while designing this research study, however would have been more suitable with a larger sample size and a higher degree of completed interventions.

The program IBM SPSS Statistics 25 was used for the statistical analysis of the data, including descriptive statistics, 'paired sample t-test' analysis, the 'Wilcoxon signed-ranks test' and correlation analysis between variables. These statistical analyses were performed for the following reasons. The descriptive statistics created a general overview of all variables in the current study, in order to compare different general statistical measures for the participants. Due to the pre-post design of the current study and hence coupled measures for the same participant, the 'paired sample t-test' allowed for a statistical interpretation of the correlations of the pre-test results with the post-test results and could show whether the mean difference scores were significant. With the necessary assumption of normality for the 'paired sample t-test' being violated for multiple variables, the nonparametric 'Wilcoxon signed-ranks test' was used as an advised alternative test for these specific variables. Lastly, a bivariate correlation analysis was a suitable method for statistically testing whether certain variables in this study were significantly associated with each other. By using this method, significant relationships and their direction and strength could be revealed, which could aid the process of creating a potential integrative framework of relationships concerning mindfulness and aspects of the mind.

3. Results

3.1. Quantitative data

3.1.1. Descriptive statistics

Table 1 shows the descriptive statistics of all variables included in the current study, in order to create a general overview. The pre-test measures were completed by all seven participants ($N = 7$) and the post-test measures were completed by four participants ($N = 4$).

Table 1

Descriptive Statistics including All Variables of the FFMQ, Adaptive Expertise Questionnaire, MERQ and The Big Five Personality Test (IPIP-50)

Variables	N	Minimum	Maximum	Mean	Std. Deviation
The degree of mindfulness (pre-test)	7	98	133	112.29	12.230
The degree of mindfulness (post-test)	4	112	129	120.25	7.676
Adaptive expertise (pre-test)	7	109	184	163.71	26.525
Adaptive expertise (post-test)	4	112	212	175.25	43.752
The presence of flow experiences (pre-test)	7	4	8	6.43	1.512
The presence of flow experiences (post-test)	4	4	7	6.00	1.414
Mind-wandering and creative ideas (pre-test)	7	2	10	6.29	3.039
Mind-wandering and creative ideas (post-test)	4	2	10	6.25	3.304
Reflecting on the self as creative (pre-test)	7	6	8	7.00	1.000
Reflecting on the self as creative (post-test)	4	3	9	6.50	2.646
Reflecting on the self as a critical thinker (pre-test)	7	3	10	7.57	2.299

Table 1 (continued)

Descriptive Statistics including All Variables of the FFMQ, Adaptive Expertise Questionnaire, MERQ and The Big Five Personality Test (IPIP-50)

Variables	<i>N</i>	Minimum	Maximum	Mean	Std. Deviation
Reflecting on the self as a critical thinker (post-test)	4	4	10	7.50	2.517
Openness to new and challenging ideas and experiences (pre-test)	7	4	9	8.00	1.915
Openness to new and challenging ideas and experiences (post-test)	4	8	10	8.50	1.000
Flexible coping with stress (pre-test)	7	2	9	6.14	2.854
Flexible coping with stress (post-test)	4	6	9	7.50	1.291
Vitality and energy (pre-test)	7	5	9	6.86	1.345
Vitality and energy (post-test)	4	5	8	7.00	1.414
Life satisfaction (pre-test)	7	6	10	7.43	1.618
Life satisfaction (post-test)	4	5	9	7.00	1.826
Quality of life (pre-test)	7	6	10	8.14	1.345
Quality of life (post-test)	4	6	9	8.00	1.414
Extroversion	7	4	39	20.71	12.459
Agreeableness	7	18	39	29.57	7.115
Conscientiousness	7	15	30	21.86	5.047
Neuroticism	7	4	33	20.71	11.856
Openness to experience	7	13	38	26.71	9.160

Note. Maximum scores for each questionnaire are as follows: FFMQ (195), Adaptive Expertise Questionnaire (280), MERQ (scale 1-10, from 'not applicable' to 'very applicable' respectively), and 'The Big Five Personality Test (IPIP-50)' (scale 1-5, from 'disagree' to 'agree' respectively; scores of each category are between 0-40); *N* = number of participants.

With regards to a possible maximum score of 195 on 'The degree of mindfulness', the mean value of 112.29 on the pre-test and the mean value of 120.25 on the post-test could be considered to be small to medium scores. However, in the pre-test value three respondents ($N = 3$) are included that are not included in the post-test value, since they did not complete the post-test measures. In relation to a possible maximum score of 280 on 'Adaptive expertise', the mean score of 163.71 on the pre-test and the mean score of 175.25 on the post-test could be regarded as medium scores. The greatest value was 212 on the post-test. This is a high score, especially when compared to a maximum score of 184 on the pre-test. In the post-test there's a large standard deviation of 43.752, showing great differences between the responses. This could be explained by the small sample size. In comparison with a maximum score of 10 on 'The presence of flow experiences', the mean scores of the pre- and post-test measures of 6.43 and 6.00 respectively are considered to be small in size, with the value of the post-test being lower. For 'Mind-wandering and creative ideas' it is remarkable that there's a large difference between the minimum score of 2 and the maximum score of 10 in both the pre- and post-test measures. This indicates a great diversity among the participants with respect to this variable, hence the large standard deviations of 3.039 (pre-test) and 3.304 (post-test). The mean values of 6.29 (pre-test) and 6.25 (post-test) show a moderate score.

For 'Reflecting on the self as creative' there are moderate mean scores of 7.00 on the pre-test and 6.50 on the post-test, with the presence of a high maximum score of 9 and a low minimum score of 3 on the post-test. For 'Reflecting on the self as a critical thinker' there are mean scores of 7.57 on the pre-test and 7.50 on the post-test and maximum scores of 10. These scores are relatively high in comparison with the other variables. For 'Openness to new and challenging ideas and experiences' the mean scores of 8.00 on the pre-test and 8.50 on the post-test are the highest mean scores of all variables, including a maximum score of 10. Especially on the post-test, the scores are within a small range between 8 and 10, hence a small standard deviation of 1.000. For 'Flexible coping with stress' there's a minimum score of 2 on the pre-test, hence together with the variable 'Mind-wandering and creative ideas' this variable includes the lowest score of all variables.

For 'Vitality and energy' there are moderate mean scores of 6.86 (pre-test) and 7.00 (post-test) and small standard deviations. For 'Life satisfaction' there are moderate to high mean scores (7.43 on the pre-test, 7.00 on the post-test) and high maximum scores. For 'Quality of life' there are high mean scores of 8.14 on the pre-test and 8.00 on the post-test, with small standard deviations.

For 'Extroversion' there's a large degree of variation among the participants, with the standard deviation being 12.459 and a minimum score of 4 and a maximum score of 39 (with the maximum possible score being 40). There's a moderate mean score of 20.71. For 'Agreeableness' there's a mean value of 29.57, hence this personality trait is scored highest on of all personality traits. This indicates that the students involved in this project are generally polite and conform well with others. For 'Conscientiousness' the mean score of 21.86 could be considered as a moderate score with regards to the scale of 0-40. The personality trait 'Neuroticism' includes the lowest minimum score of 4 of all personality traits, but also includes a high score of 33. The standard deviation of 11.856 indicates great variety among the participants. For 'Openness to experience' a moderate mean score of 26.71 was shown, which connects well with the relatively high scores on the variable 'Openness to new and challenging ideas and experiences'.

3.1.2. Paired sample t-test and the Wilcoxon signed-ranks test

For statistically comparing the means of the pre- and post-test scores for each variable, a paired sample t-test analysis was considered to be a suitable method. Specifically, this test measures if there is a statistically significant mean difference between coupled measures, which in this case are the pre- and post-test for the same participant. Thus, the null hypothesis is as follows: there is no mean difference between the pre- and post-test. The alternative hypothesis states that there is a mean difference between the pre- and post-test. Before starting the analysis, several assumptions for the paired sample t-test were tested. The dependent variables are numeric and continuous, hence the assumption for the level of measurement was met. Furthermore, there was a randomized selection of participants, hence the assumption of independence of observations was met. Also, no outliers were found in boxplots. For testing the assumption of normality, several factors were taken into account. The central limit theorem states that a sample is normally distributed with a minimal sample size of thirty (Universiteit Utrecht, 2017). In the current study however, the sample size of participants completing both the pre- and post-test measures was four. Thus, a test for normality was required. Due to the sample size being lower than fifty, the ‘Shapiro-Wilk test’ was chosen, instead of the ‘Kolmogorow-Smirnov test’ (Universiteit Utrecht, 2017). The ‘Shapiro-Wilk test’ for normality applies to the way the difference in value is spread between the two measures that are compared. In this study, this concerned the difference between the pre-test and the post-test. Thus, new variables were created of the difference scores (e.g. The degree of mindfulness (DS = Difference Score) = The degree of mindfulness (post-test) – The degree of mindfulness (pre-test)). These new variables were then tested on normality. Table 2 shows the results.

Table 2

Test of Normality for the Difference Scores of the Pre- and Post-test Scores of Each Variable

Difference scores	Shapiro-Wilk		
	Statistic	<i>df</i>	<i>p</i>
The degree of mindfulness (DS)	.857	4	.250
Adaptive expertise (DS)	.898	4	.420
The presence of flow experiences (DS)	.729	4	.024
Mind-wandering and creative ideas (DS)	.945	4	.683
Reflecting on the self as creative (DS)	.791	4	.086
Reflecting on the self as a critical thinker (DS)	.729	4	.024
Openness to new and challenging ideas and experiences (DS)	.729	4	.024

Table 2 (continued)

Test of Normality for the Difference Scores of the Pre- and Post-test Scores of Each Variable

Difference scores	Shapiro-Wilk		
	Statistic	<i>df</i>	<i>p</i>
Flexible coping with stress (DS)	.630	4	.001
Vitality and energy (DS)	.993	4	.972
Life satisfaction (DS)	.729	4	.024
Quality of life (DS)	.729	4	.024

A significance value higher than 0.05 indicates normality. Table 2 shows that this was the case for the variables ‘The degree of mindfulness (DS)’ ($p = .250$), ‘Adaptive expertise (DS)’ ($p = .420$), ‘Mind-wandering and creative ideas (DS)’ ($p = .683$), ‘Reflecting on the self as creative (DS)’ ($p = .086$) and ‘Vitality and energy (DS)’ ($p = .972$), so they meet the assumption of normality. This assumption is, among other aforementioned assumptions, required in order to perform the paired sample t-test. Thus, for these variables this test could be performed. Results of the paired sample t-test are shown in Table 4, Table 5 and Table 6.

On the other hand, Table 2 shows that the variables ‘The presence of flow experiences (DS)’ ($p = .024$), ‘Reflecting on the self as a critical thinker (DS)’ ($p = .024$), ‘Openness to new and challenging ideas and experiences (DS)’ ($p = .024$), ‘Flexible coping with stress (DS)’ ($p = .001$), ‘Life satisfaction (DS)’ ($p = .024$), and ‘Quality of life (DS)’ ($p = .024$) have a significance value lower than 0.05, thus do not meet the assumption of normality. Hence, for these variables the paired sample t-test could not be used. The nonparametric ‘Wilcoxon signed-ranks test’ provides an alternative for the paired sample t-test on testing these variables on the null hypothesis (there is no mean difference between the pre- and post-test) for when the assumption of normality is not met (De Vocht, 2016). Table 3 shows the results of the ‘Wilcoxon signed-ranks test’.

Table 3*Wilcoxon Signed-Ranks Test*

Paired difference	Ranks	<i>N</i>	Mean Rank	Sum of Ranks	<i>z</i>	Asymp. Sig. (2-tailed)
Flow (post – pre)	Negative	2	1.50	3	-1.414	.157
	Positive	0	0	0		
	Ties	2				
	Total	4				
RsCT (post – pre)	Negative	0	0	0	-1.414	.157
	Positive	2	1.50	3		
	Ties	2				
	Total	4				
OncIE (post – pre)	Negative	2	2.50	5	0	1
	Positive	2	2.50	5		
	Ties	0				
	Total	4				
FcS (post – pre)	Negative	0	0	0	-1	.317
	Positive	1	1	1		
	Ties	3				
	Total	4				
LS (post – pre)	Negative	2	1.50	3	-1.414	.157
	Positive	0	0	0		
	Ties	2				
	Total	4				
QoL (post – pre)	Negative	0	0	0	-1.414	.157
	Positive	2	1.50	3		
	Ties	2				
	Total	4				

Note. Flow = The presence of flow experiences; RsCT = Reflecting on the self as a critical thinker; OncIE = Openness to new and challenging ideas and experiences; FcS = Flexible coping with stress; LS = Life satisfaction; QoL = Quality of life; *N* = number of participants; *z* = *z*-value; Asymp. Sig. (2-tailed) = asymptotic two-tailed p-value; pre = pre-test; post = post-test.

Table 3 shows that the ‘asymptotic two-tailed p-value’ for all variables is larger than 0.05, so the null hypothesis is not rejected. There is no mean difference between the pre- and post-test of each variable. For displaying the practical relevance of the results, effect sizes of the ‘Wilcoxon Signed-Ranks Test’ were calculated with the following formula: $r = z/\sqrt{N}$. In this formula ‘*r*’ indicates the effect size, ‘*z*’ indicates the *z*-value, ‘sqrt’ indicates the square root and ‘*N*’ indicates the total size of both groups (Universiteit Utrecht, 2017). Values of the effect size ‘*r*’ that are below 0.3 are considered to be small in effect, values between 0.3-0.5 are considered to be medium in effect and values equal to or larger than 0.5 are considered to be large in effect (Universiteit Utrecht, 2017).

Firstly, the ‘Wilcoxon Signed-Ranks Test’ showed that for the variable ‘The presence of flow experiences’ the pre-test (*Mean Rank* = 1.50) and the post-test (*Mean Rank* = 0) do not differ

significantly. There is a large effect, $z = -1.414$, $p = 0.157$, $r = 0.707$. Secondly, the 'Wilcoxon Signed-Ranks Test' showed that for the variable 'Reflecting on the self as a critical thinker' the pre-test ($Mean Rank = 0$) and the post-test ($Mean Rank = 1.50$) do not differ significantly. There is a large effect, $z = -1.414$, $p = 0.157$, $r = 0.707$. Thirdly, the 'Wilcoxon Signed-Ranks Test' showed that for the variable 'Openness to new and challenging ideas and experiences' the pre-test ($Mean Rank = 2.50$) and the post-test ($Mean Rank = 2.50$) do not differ significantly. There is no effect, $z = 0$, $p = 1$, $r = 0$. Fourthly, the 'Wilcoxon Signed-Ranks Test' showed that for the variable 'Flexible coping with stress' the pre-test ($Mean Rank = 0$) and the post-test ($Mean Rank = 1$) do not differ significantly. There is a large effect, $z = -1$, $p = 0.317$, $r = 0.5$. Fifthly, the 'Wilcoxon Signed-Ranks Test' showed that for the variable 'Life satisfaction' the pre-test ($Mean Rank = 1.50$) and the post-test ($Mean Rank = 0$) do not differ significantly. There is a large effect, $z = -1.414$, $p = 0.157$, $r = 0.707$. Lastly, the 'Wilcoxon Signed-Ranks Test' showed that for the variable 'Quality of life' the pre-test ($Mean Rank = 1.50$) and the post-test ($Mean Rank = 0$) do not differ significantly. There is a large effect, $z = -1.414$, $p = 0.157$, $r = 0.707$.

So whereas the differences between the pre- and post-tests of all variables are not significant (as shown by the p-values), the practical relevance of these results is revealed in the large effect sizes found (except for the variable 'Openness to new and challenging ideas and experiences', for which there was no effect). These large effect sizes accompany the statistical test in the interpretation of the results, namely that the found differences were of a great magnitude. That the current study has a very small sample size might explain that the results were still not significant, even though the effect sizes were large. A smaller sample size increases the standard error, which reduces the chance of discarding the null hypothesis and thus makes it less likely to detect statistical significance.

In the present study it was hypothesized that a mindfulness meditation intervention might be beneficial for the aforementioned variables and thus create higher mean scores on the post-test. The results of the 'Wilcoxon Signed-Ranks Test' show that this was the case for the variables 'Reflecting on the self as a critical thinker' (pre-test, $Mean Rank = 0$; post-test, $Mean Rank = 1.50$) and 'Flexible coping with stress' (pre-test, $Mean Rank = 0$; post-test, $Mean Rank = 1$). Even though these differences were not significant, the higher mean scores on the post-test and their large effect sizes were quite in line with my hypothesis. Furthermore, the lower mean scores for the post-test and accompanied large effect sizes on most other variables were not expected. However, with only one participant having completed a mindfulness intervention, the chance of the mindfulness intervention having affected the mean scores positively or negatively on the post-test and the effect sizes to a large degree does not seem that likely. Other factors such as the time interval between the pre- and post-test, the variability in self-report and changing life conditions might have also contributed to these results.

Table 4*Paired Sample T-test Statistics for the Pre- and Post-test Measures of Each Variable Pair*

Pairs		Mean	<i>N</i>	Std. Deviation	Std. Error Mean
Pair 1	The degree of mindfulness (pre-test)	114.00	4	5.033	2.517
	The degree of mindfulness (post-test)	120.25	4	7.676	3.838
Pair 2	Adaptive expertise (pre-test)	161.75	4	35.556	17.778
	Adaptive expertise (post-test)	175.25	4	43.752	21.876
Pair 3	Mind-wandering and creative ideas (pre-test)	6.25	4	3.500	1.750
	Mind-wandering and creative ideas (post-test)	6.25	4	3.304	1.652
Pair 4	Reflecting on the self as creative (pre-test)	6.75	4	.957	.479
	Reflecting on the self as creative (post-test)	6.50	4	2.646	1.323
Pair 5	Vitality and energy (pre-test)	7.50	4	1.291	.645
	Vitality and energy (post-test)	7.00	4	1.414	.707

Note. *N* = number of participants.

Table 4 concerns the paired sample t-test statistics for the variables that met the assumption of normality as tested by the ‘Shapiro-Wilk test’ in Table 2 (in contrast to those variables that did not meet the assumption of normality and hence were included in the ‘Wilcoxon Signed-Ranks Test’). Table 4 shows an overview of the statistical measures of both the pre-test and the post-test for the variables included in the paired sample t-test. In contrast to Table 1 (‘Descriptive Statistics’ with $N = 7$), Table 4 only includes the pairs of pre- and post-test measures, thereby excluding the three participants ($N = 3$) that only completed the pre-test. This is the case, because the purpose of the paired

sample t-test is to research a potential mean difference between a before- and after coupled measure, which only applied to the four participants ($N = 4$) that completed both the pre- and post-test.

For the variable pairs of ‘The degree of mindfulness’ and ‘Adaptive expertise’ it is shown that the values for the mean on the post-test are higher than the values for the mean on the pre-test. Specifically, values are as follows: ‘The degree of mindfulness’ (pre-test, $M = 114.00$, $SD = 5.033$; post-test, $M = 120.25$, $SD = 7.676$) and ‘Adaptive expertise’ (pre-test, $M = 161.75$, $SD = 35.556$; post-test, $M = 175.25$, $SD = 43.752$). These mean increases are in line with the hypothesis that a mindfulness meditation intervention could be beneficial for these aspects. However, that these increases are due to the intervention is deemed less probable with only one participant in this study actively completing the intervention. For the variable ‘Mind-wandering and creative ideas’ (pre-test, $M = 6.25$, $SD = 3.500$; post-test, $M = 6.25$, $SD = 3.304$) the mean remained the same and for the variables ‘Reflecting on the self as creative’ (pre-test, $M = 6.75$, $SD = .957$; post-test, $M = 6.50$, $SD = 2.646$) and ‘Vitality and energy’ (pre-test, $M = 7.50$, $SD = 1.291$; post-test, $M = 7.00$, $SD = 1.414$) the mean of the post-test was lower than the mean of the pre-test. This is contrary to the hypothesized beneficial effect that mindfulness meditation could have for these aspects. However, as aforementioned only one participant in this study completed the mindfulness intervention. Hence, that these results are due to mindfulness meditation having a negative effect or no effect on these aspects is considered less probable. The different points of measurement in time, changes in life circumstances and/or the variability in self-report could also play a role in this variety of scores. Furthermore, these findings will be put into context in the upcoming section of Table 6.

Table 5

Paired Sample T-Test Correlations of the Pre- and Post-test Scores of Each Variable Pair

Pairs		N	Correlation	p
Pair 1	The degree of mindfulness (pre- and post-test)	4	.889	.111
Pair 2	Adaptive expertise (pre- and post-test)	4	.955	.045*
Pair 3	Mind-wandering and creative ideas (pre- and post-test)	4	.973	.027*
Pair 4	Reflecting on the self as creative (pre- and post-test)	4	.855	.145
Pair 5	Vitality and energy (pre- and post-test)	4	.548	.452

Note. N = number of participants.

* $p < .05$.

Table 5 shows the Pearson correlations between the variable pairs and the two-tailed significance values, indicating the degree to which the score on the pre-test correlates with the score on the post-test and whether this correlation is statistically significant. Presenting these correlations is relevant for hypothesis testing on the mean difference and for measure reliability. An elaboration on this will follow later in this section. Due to the fact that the same participants are repeatedly measured at two time points for each variable, it is not unexpected to find a certain consistency in the pre- and post-test scores. For instance, for the same participant to have a high score on the pre-test of 'The degree of mindfulness' and a low score on the post-test relative to the other participants only three weeks later would seem less probable.

Cohen's (1992) guidelines can be used for interpreting Pearson correlations, in order to state the strength of a correlation (Universiteit Utrecht, 2017). In line with these guidelines, it can be noted that for the following variables there was a very strong positive correlation between the pre- and post-test score: 'The degree of mindfulness' ($r = 0.889$), 'Adaptive expertise' ($r = 0.955$), 'Mind-wandering and creative ideas' ($r = 0.973$) and 'Reflecting on the self as creative' ($r = 0.855$). This indicates that the scores on the pre- and post-test for each variable are quite similar in terms of ranking for a participant relative to the other participants. Thus, a lower score on the pre-test is related to a lower score on the post-test and a higher score on the pre-test is related to a higher score on the post-test. The presence of these very strong positive correlations is relevant for this research, because it decreases the standard error in testing if there is a mean difference. Hence, it is relevant for the potential to discard the null hypothesis for there being no mean difference. Also, these strong correlations contribute to the reliability of the measures. Furthermore, the variable 'Vitality and energy' ($r = 0.548, p = 0.452$) shows a strong, positive and nonsignificant correlation between the pre- and post-test score. The strength of its correlation is lower than the aforementioned variables, however it is still a strong and relevant correlation that contributes to a lower standard error and more measure reliability.

It is shown that for the variables 'Adaptive expertise' ($p = 0.045$) and 'Mind-wandering and creative ideas' ($p = 0.027$) the correlations are statistically significant ($p < 0.05$). This indicates that the probability for obtaining the presented correlation coefficients is low if the null hypothesis (no relationship) would be the case, so it can be stated that there is a statistically meaningful relationship between the pre- and post-test scores for these variables. Thus, the alternative hypothesis of there being a relationship is accepted. Together with the aforementioned (very) strong correlations these results are beneficial for the hypothesis testing on the mean difference and for the reliability of the measures. Thus, they support the strength of the paired sample t-test of the paired differences that follows in Table 6.

Table 6*Paired Sample T-test Analysis of the Difference Scores of Each Variable Pair*

Pairs		Paired Differences						
		Mean	Std. Deviation	Std. Error Mean	95% CI of the Difference [LL, UL]	<i>t</i>	<i>df</i>	Sig. (2-tailed)
Pair 1	The degree of mindfulness (pre-test) – (post-test)	-6.250	3.948	1.974	[-12.531, .031]	-3.167	3	.051
Pair 2	Adaptive expertise (pre-test) – (post-test)	-13.500	14.387	7.194	[-36.394, 9.394]	-1.877	3	.157
Pair 3	Mind-wandering and creative ideas (pre-test) – (post-test)	.000	.816	.408	[-1.299, 1.299]	.000	3	1.000
Pair 4	Reflecting on the self as creative (pre-test) – (post-test)	.250	1.893	.946	[-2.762, 3.262]	.264	3	.809
Pair 5	Vitality and energy (pre-test) – (post-test)	.500	1.291	.645	[-1.554, 2.554]	.775	3	.495

Note. CI = confidence interval; LL = lower limit; UL = upper limit.

Table 6 presents the paired sample t-test section for the difference score of each variable pair. It is relevant to include this analysis in order to research whether there is a statistically meaningful difference between the pre-test and the post-test for each variable, so that the null hypothesis of there being no mean difference can be tested. Table 6 shows that the two-tailed p-values for all variable pairs are larger than 0.05, which indicates that none of the difference scores between the pre- and post-test measures are significant. Thus, the null hypothesis of there being no mean difference between the pre- and post-test scores is accepted for all four participants. Also, the value 0 is included in all 95% confidence intervals, which supports the statement that the null hypothesis is accepted. It was on the contrary hypothesized that the mean differences of these variables might be significantly different, however with only one completed mindfulness intervention in this study the nonsignificant results are not completely surprising.

Due to the small sample size of the current study (which increases the standard error and can make it harder to discard the null hypothesis) and in order to research the practical relevance of these difference scores, ‘Cohen’s d’ effect sizes were calculated by dividing the mean and standard deviation of each paired difference in Table 6. Firstly, for the variable ‘The degree of mindfulness’ ($d = 1.58$; large effect) it is shown that the difference between the higher post-test score in comparison

with the lower pre-test score can be considered to be a large effect. Secondly, for the variable 'Adaptive expertise' ($d = 0.94$; large effect) it is shown that the difference between the higher score on the post-test compared to the lower score on the pre-test is a large effect. Thirdly, for the variable 'Mind-wandering and creative ideas' ($d = 0$; no effect) it was revealed that there was no difference between the pre- and post-test, hence no effect. Fourthly, for the variable 'Reflecting on the self as creative' ($d = 0.13$; very small effect) it is shown that the difference between the higher score on the pre-test compared to the lower score on the post-test is a very small effect. Lastly, for the variable 'Vitality and energy' ($d = 0.39$; small effect) it is shown that the difference between the higher score on the pre-test in comparison with the lower score on the post-test is a small effect.

So even though none of the aforementioned difference scores were statistically significant, still two large effect sizes were found for 'The degree of mindfulness' and 'Adaptive expertise'. This is relevant for the current study, because it shows that the difference score for these variables is quite substantial and important to take into account, even though no statistical significance was present. It was hypothesized that a mindfulness meditation intervention could be positively related to 'The degree of mindfulness' and 'Adaptive expertise', hence finding higher scores on the post-test and large effect sizes for these variables is not unexpected. It might be so that the scores of the one participant that completed the mindfulness intervention contributed to this large effect, however it could also be the case that, due to this small number of a completed intervention, simply the different time intervals, the variability in self-report and changes in life circumstances contributed to the difference score.

Thus, also taking into account the paired sample t-test statistics in Table 4, the following conclusive remarks can be stated. Firstly, a paired sample t-test showed for the variable 'The degree of mindfulness' that the mean of the pre-test ($M = 114.00$, $SD = 5.033$) and the mean of the post-test ($M = 120.25$, $SD = 7.676$) are not significantly different. It concerns a large effect, $t(3) = -3.167$, $p = 0.051$, $d = 1.58$, 95% CI [-12.531, 0.031]. Secondly, a paired sample t-test showed for the variable 'Adaptive expertise' that the mean of the pre-test ($M = 161.75$, $SD = 35.556$) and the mean of the post-test ($M = 175.25$, $SD = 43.752$) are not significantly different. It concerns a large effect, $t(3) = -1.877$, $p = 0.157$, $d = 0.94$, 95% CI [-36.394, 9.394]. Thirdly, a paired sample t-test showed for the variable 'Mind-wandering and creative ideas' that the mean of the pre-test ($M = 6.25$, $SD = 3.500$) and the mean of the post-test ($M = 6.25$, $SD = 3.304$) are not significantly different. It concerns no effect, $t(3) = 0$, $p = 1$, $d = 0$, 95% CI [-1.299, 1.299]. Fourthly, a paired sample t-test showed for the variable 'Reflecting on the self as creative' that the mean of the pre-test ($M = 6.75$, $SD = 0.957$) and the mean of the post-test ($M = 6.50$, $SD = 2.646$) are not significantly different. It concerns a very small effect, $t(3) = 0.264$, $p = 0.809$, $d = 0.13$, 95% CI [-2.762, 3.262]. Fifthly, a paired sample t-test showed for the variable 'Vitality and energy' that the mean of the pre-test ($M = 7.50$, $SD = 1.291$) and the mean of the post-test ($M = 7.00$, $SD = 1.414$) are not significantly different. It concerns a small effect, $t(3) = 0.775$, $p = 0.495$, $d = 0.39$, 95% CI [-1.554, 2.554]. The details of these conclusive remarks have already been elaborated on in the previous two paragraphs.

3.1.3. Correlation analysis between variables

In the current study many hypotheses were formulated for the potential relationships between multiple aspects of the mind. In order to statistically reveal certain relationships and to expose the strength and direction of the associations between these different aspects, a bivariate correlation analysis was performed (a bivariate correlation is a correlation between two variables). The results in this section concern all bivariate correlations specifically related to the different combinations of hypothesized correlations (as discussed in the different sections of the introductory part of this thesis) and furthermore significant new correlations that were found and that were not yet hypothesized and discussed. By creating a separate table of results for each different section of the introductory part of this thesis, a clear comparison of the results with the different combinations of hypothesized correlations was provided. Thus, allowing for a direct and contextual interpretation, in order to see whether these hypothesized correlations were significantly present in the current study or not. Cohen's (1992) guidelines were used for stating the strength of the Pearson correlations, as part of the interpretation (Universiteit Utrecht, 2017).

The tables in this section (3.1.3.) also include the correlational data of the pre-test of a variable with its post-test (e.g. 'Adaptive expertise' pre- and post). However, the previous results sections have already discussed these correlations. Thus, the current section includes them only in order to be complete, but will not include them in the interpretation. Furthermore, the correlations that will be discussed in this section are not interpreted in terms of why a variable of specifically a pre-test is correlated with a variable of specifically a post-test (e.g. the pre-test of 'Mind-wandering and creative ideas' with the post-test of 'Reflecting on the self as creative'), due to only one completed mindfulness meditation intervention. If such a correlation is the case, then the correlation is interpreted in terms of the general hypothesis (e.g. a relationship between mind-wandering and creative ideas and reflecting on the self as creative was (not) hypothesized). Thus, why it specifically concerns the pre-test of 'Mind-wandering and creative ideas' and specifically the post-test of 'Reflecting on the self as creative' is not considered relevant to interpret with only one completed mindfulness meditation intervention. The pre- and post-tests are however mentioned in the text, in order to be complete and to make a clear referential connection to the data in the tables.

Abbreviations of the variables are clarified in the notes section below each table and significant correlations are also in boldface for the purpose of clarity. The structure is as follows. Table 7 relates to section 1.2.1. 'Mindfulness meditation, metacognition, mind-wandering and critical thinking'. Table 8.1 and Table 8.2 relate to section 1.2.2. 'Mindfulness, cognitive flexibility, flow and adaptive expertise'. Table 9 relates to section 1.2.3. 'Mindfulness, subjective well-being and flexible coping with stress'. Table 10 relates to section 1.2.5. 'Personality, academic success, mindfulness and student's well-being'. Lastly, Table 11 includes new correlations between variables found in the current study, which were not yet hypothesized and discussed in the introductory part of this thesis.

Table 7*Correlations DoM, MwC, RsCT and RsCREA (section 1.2.1.)*

	DoM (pre)	DoM (post)	MwC (pre)	MwC (post)	RsCT (pre)	RsCT (post)	RsCREA (pre)	RsCREA (post)
DoM (pre)	-	.889	.576	.621	.207	.474	.422	.551
DoM (post)	.889	-	.245	.207	.044	.043	.601	.107
MwC (pre)	.576	.245	-	.973*	.808*	.927	.439	.990*
MwC (post)	.621	.207	.973*	-	.960*	.982*	.869	.972*
RsCT (pre)	.207	.044	.808*	.960*	-	.990*	.435	.899
RsCT (post)	.474	.043	.927	.982*	.990*	-	.761	.951*
RsCREA (pre)	.422	.601	.439	.869	.435	.761	-	.855
RsCREA (post)	.551	.107	.990*	.972*	.899	.951*	.855	-

Note. - = Not applicable, for when it's the same variable; DoM = The degree of mindfulness; MwC = Mind-wandering and creative ideas; RsCT = Reflecting on the self as a critical thinker; RsCREA = Reflecting on the self as creative; pre = pre-test; post = post-test.

* $p < .05$. In boldface for the purpose of clarity.

Table 7 shows the correlations between variables related to section 1.2.1. of the introductory part of this thesis ('Mindfulness meditation, metacognition, mind-wandering and critical thinking'). For the variable 'The degree of mindfulness (DoM; pre- and post)' it is shown that there are no significant correlations with the variables 'Mind-wandering and creative ideas (MwC; pre- and post)', 'Reflecting on the self as a critical thinker (RsCT; pre- and post)' and 'Reflecting on the self as creative (RsCREA; pre- and post)'. Thus, the null hypothesis of there being no relationship between these variables in the current study is accepted. This is contrary to the hypothesized correlations. It was hypothesized that the degree of mindfulness could be significantly positively correlated to mind-wandering and the surfacing of creative ideas, whereby more creative ideas and insights could be positively related to reflecting on the self as creative. Also, it was hypothesized that the degree of mindfulness would be strongly positively related to reflecting on the self as a critical thinker, through the reflective and evaluative shared nature of mindfulness and critical thinking.

For the other variables, it is shown that 'MwC (pre)' is significantly correlated with 'RsCT (pre)' ($r = .808, p < .05$) and with 'RsCREA (post)' ($r = .990, p < .05$). Thus, the null hypothesis of

there being no relationship between these variables is rejected. Both are very strong and positive correlations. This indicates that a higher degree of mind-wandering and creative ideas (pre) relates to a higher degree of reflecting on the self as a critical thinker (pre) and reflecting on the self as creative (post). That 'Mind-wandering and creative ideas' could be positively related to 'Reflecting on the self as creative' was also hypothesized in this research study. No hypothesis had yet been formulated about a specific correlation between 'Mind-wandering and creative ideas' and 'Reflecting on the self as a critical thinker' in the introductory section of this thesis. However, it had been suggested that both variables might have a potential mutual link in terms of 'metacognitive awareness' in the integrative framework (figure 7).

Furthermore, it is shown that 'MwC (post)' is significantly correlated with 'RsCT (pre)' ($r = .960, p < .05$), with 'RsCT (post)' ($r = .982, p < .05$) and with 'RsCREA (post)' ($r = .972, p < .05$). Thus, the null hypothesis of there being no relationship between these variables is rejected. These correlations are very strong and positive. This indicates that a higher degree of mind-wandering and creative ideas (post) relates to a higher degree of reflecting on the self as a critical thinker (pre), reflecting on the self as a critical thinker (post) and reflecting on the self as creative (post). See the previous paragraph for further interpretation.

Also, it is shown that 'RsCT (post)' is significantly correlated with 'RsCREA (post)' ($r = .951, p < .05$). Thus, the null hypothesis of there being no relationship between these variables is rejected. It is a very strong and positive correlation. This indicates that a higher degree of reflecting on the self as a critical thinker (post) relates to a higher degree of reflecting on the self as creative (post). No hypothesis had yet been formulated about a specific correlation between 'Reflecting on the self as a critical thinker' and 'Reflecting on the self as creative' in the introductory section of this thesis. However, it had been suggested that both variables might have a potential mutual link in terms of 'metacognitive awareness' and 'reflective evaluation' in the integrative framework (figure 7).

Table 8.1*Correlations DoM, Flow, AE and RsCREA (section 1.2.2.)*

	DoM (pre)	DoM (post)	Flow (pre)	Flow (post)	AE (pre)	AE (post)	RsCREA (pre)	RsCREA (post)
DoM (pre)	-	.889	.416	-.937	.38	.598	.422	.551
DoM (post)	.889	-	-.858	-.921	.638	.55	.601	.107
Flow (pre)	.416	-.858	-	.913	.137	-.044	-.331	0
Flow (post)	-.937	-.921	.913	-	-.351	-.334	-.739	-.356
AE (pre)	.38	.638	.137	-.351	-	.955*	.276	.016
AE (post)	.598	.55	-.044	-.334	.955*	-	.575	.289
RsCREA (pre)	.422	.601	-.331	-.739	.276	.575	-	.855
RsCREA (post)	.551	.107	0	-.356	.016	.289	.855	-

Note. - = Not applicable, for when it's the same variable; DoM = The degree of mindfulness; Flow = The presence of flow experiences; AE = Adaptive expertise; RsCREA = Reflecting on the self as creative; pre = pre-test; post = post-test.

* $p < .05$. In boldface for the purpose of clarity.

Table 8.1 shows the correlations between variables related to section 1.2.2. ('Mindfulness, cognitive flexibility, flow and adaptive expertise'). For all variables it can be seen that there are no significant correlations present with any of the other variables. Thus, the null hypothesis of there being no relationship between these variables in the current study is accepted. For practical relevance, the presence of several very strong nonsignificant correlations could be mentioned however, such as three very strong and negative correlations between 'The degree of mindfulness' and 'The presence of flow experiences' and one very strong and negative correlation between 'The presence of flow experiences' and 'Reflecting on the self as creative'.

All of the aforementioned is contrary to what was hypothesized. It was hypothesized that the degree of mindfulness could be significantly positively correlated with adaptive expertise, through increased metacognition and cognitive flexibility. With creativity as an aspect of adaptive expertise, it was furthermore hypothesized that a significant positive correlation with reflecting on the self as creative could be present. Also, it was hypothesized that the degree of mindfulness could be significantly positively correlated with the presence of flow experiences through increased attentional

control, in contrast to the nonsignificant and negative correlation that was found. Furthermore, a potential mutual link of reflecting on the self as creative and flow with ‘cognitive flexibility’ was suggested in the integrative framework (figure 7) for perhaps creating a positive correlation between the two (in contrast to the very strong negative correlation that was found in this study).

Table 8.2

Correlations Flow and Subjective well-being (section 1.2.2.)

	Flow (pre)	Flow (post)	LS (pre)	LS (post)	QoL (pre)	QoL (post)	VaE (pre)	VaE (post)
Flow (pre)	-	.913	-.292	.990*	.129	.913	.609	.913
Flow (post)	.913	-	.913	.904	.913	1**	.548	1**
LS (pre)	-.292	.913	-	.990*	.656	.913	-.044	.913
LS (post)	.990*	.904	.990*	-	.990*	.904	.707	.904
QoL (pre)	.129	.913	.656	.990*	-	.913	-.171	.913
QoL (post)	.913	1**	.913	.904	.913	-	.548	1**
VaE (pre)	.609	.548	-.044	.707	-.171	.548	-	.548
VaE (post)	.913	1**	.913	.904	.913	1**	.548	-

Note. - = Not applicable, for when it’s the same variable; Flow = The presence of flow experiences; LS = Life satisfaction; QoL = Quality of life; VaE = Vitality and energy; pre = pre-test; post = post-test.
 * $p < .05$. In boldface for the purpose of clarity.
 ** $p < .01$. In boldface for the purpose of clarity.

Table 8.2 shows the correlations between variables related to section 1.2.2. (‘Mindfulness, cognitive flexibility, flow and adaptive expertise’). It is shown that ‘Flow (pre)’ is significantly correlated with ‘LS (post)’ ($r = .990, p < .05$). Thus, the null hypothesis of there being no relationship between these variables in the current study is rejected. The correlation is very strong and positive. This indicates that a higher presence of flow experiences (pre) relates to a higher degree of life satisfaction (post). That this positive correlation could be the case was hypothesized in the current research study.

For 'Flow (post)' there are significant correlations with 'QoL (post)' ($r = 1, p < .01$) and 'VaE (post)' ($r = 1, p < .01$). Thus, the null hypothesis of there being no relationship between these variables in the current study is rejected. Both of these correlations are perfect and positive. This indicates that a higher presence of flow experiences (post) relates to a higher degree of quality of life (post) and vitality and energy (post). That the correlations are perfect, shows that the increase of the presence of flow experiences (post) is accompanied by the increase of the degree of quality of life (post) and vitality and energy (post) of a proportionate amount. These positive correlations were also hypothesized in the current research study.

Furthermore, the variable 'LS (post)' is significantly correlated with 'QoL (pre)' ($r = .990, p < .05$). Thus, the null hypothesis of there being no relationship between these variables in the current study is rejected. It concerns a very strong and positive correlation. This indicates that a higher degree of life satisfaction (post) relates to a higher degree of quality of life (pre). Both of these variables were considered to be components of subjective well-being in the introductory part of this thesis, so it is not unexpected that a significant relationship between the two was found.

Also, the variable 'QoL (post)' is significantly correlated with 'VaE (post)' ($r = 1, p < .01$). Thus, the null hypothesis of there being no relationship between these variables in the current study is rejected. It concerns a perfect and positive correlation. This indicates that a higher degree of quality of life (post) relates to a higher degree of vitality and energy (post). That this correlation is perfect, shows that the increase of the degree of quality of life (post) is accompanied by the increase of the degree of vitality and energy (post) of a proportionate amount. Both of these variables were considered to be components of subjective well-being in the introductory part of this thesis, thus it is not unexpected that a significant relationship between the two was found.

Table 9*Correlations DoM, Subjective well-being and FcS (section 1.2.3.)*

	DoM (pre)	DoM (post)	LS (pre)	LS (post)	QoL (pre)	QoL (post)	VaE (pre)	VaE (post)	FcS (pre)	FcS (post)
DoM (pre)	-	.889	-.512	-.725	-.256	-.937	.357	-.937	-.307	-.718
DoM (post)	.889	-	-.858	-.904	-.858	-.921	-.824	-.921	-.464	-.32
LS (pre)	-.512	-.858	-	.990*	.656	.913	-.044	.913	.742	.2
LS (post)	-.725	-.904	.990*	-	.990*	.904	.707	.904	.321	.141
QoL (pre)	-.256	-.858	.656	.990*	-	.913	-.171	.913	.124	.2
QoL (post)	-.937	-.921	.913	.904	.913	-	.548	1**	.69	.548
VaE (pre)	.357	-.824	-.044	.707	-.171	.548	-	.548	.006	-.2
VaE (post)	-.937	-.921	.913	.904	.913	1**	.548	-	.69	.548
FcS (pre)	-.307	-.464	.742	.321	.124	.69	.006	.69	-	.983*
FcS (post)	-.718	-.32	.2	.141	.2	.548	-.2	.548	.983*	-

Note. - = Not applicable, for when it's the same variable; DoM = The degree of mindfulness; LS = Life satisfaction; QoL = Quality of life; VaE = Vitality and energy; FcS = Flexible coping with stress; pre = pre-test; post = post-test.

* $p < .05$. In boldface for the purpose of clarity.

** $p < .01$. In boldface for the purpose of clarity.

Table 9 shows the correlations between variables related to section 1.2.3. ('Mindfulness, subjective well-being and flexible coping with stress'). Specifically, the interpretation of this table firstly focuses on the correlations of 'DoM (pre- and post)' with the variables of subjective well-being and with 'FcS (pre-and post)'. Secondly, it focuses on the correlations of 'FcS (pre- and post)' with the variables of subjective well-being and with 'DoM (pre- and post)'. The correlations of the variables within subjective well-being with each other (the correlations between 'Life satisfaction', 'Quality of life' and 'Vitality and energy' specifically) have already been discussed in Table 8.2, hence will not be repeated here.

It can be seen in Table 9 that the variable 'DoM (pre- and post)' is not significantly correlated with any of the other variables. Thus, the null hypothesis of there being no relationship between these

variables in the current study is accepted. This is contrary to the hypothesized correlations. It was hypothesized that the degree of mindfulness could be significantly positively correlated with the flexible coping with stress through increased cognitive flexibility, which in turn could be positively correlated with subjective well-being.

Also, the variable 'FcS (pre- and post) shows no significant correlations with any of the other variables. Thus, the null hypothesis of there being no relationship between these variables in the current study is accepted. This is contrary to the hypothesized correlations (see the previous paragraph).

Table 10

Correlations DoM, Subjective well-being and Personality (section 1.2.5.)

	DoM (pre)	DoM (post)	LS (pre)	LS (post)	QoL (pre)	QoL (post)	VaE (pre)	VaE (post)
DoM (pre)	-	.889	-.512	-.725	-.256	-.937	.357	-.937
DoM (post)	.889	-	-.858	-.904	-.858	-.921	-.824	-.921
LS (pre)	-.512	-.858	-	.990*	.656	.913	-.044	.913
LS (post)	-.725	-.904	.990*	-	.990*	.904	.707	.904
QoL (pre)	-.256	-.858	.656	.990*	-	.913	-.171	.913
QoL (post)	-.937	-.921	.913	.904	.913	-	.548	1**
VaE (pre)	.357	-.824	-.044	.707	-.171	.548	-	.548
VaE (post)	-.937	-.921	.913	.904	.913	1**	.548	-
Extroversion	.156	.178	.048	.166	.063	-.255	.116	-.255
Agreeable- ness	.888**	.764	-.662	-.42	-.393	-.64	.289	-.64
Conscientious- ness	-.636	-.596	.05	.216	-.193	.326	.291	.326
Neuroticism	-.461	-.587	.763*	.397	.107	.752	.007	.752
Openness to experience	.374	.348	-.193	-.425	.044	-.68	-.031	-.68

Note. - = Not applicable, for when it's the same variable; DoM = The degree of mindfulness; LS = Life satisfaction; QoL = Quality of life; VaE = Vitality and energy; pre = pre-test; post = post-test.

* $p < .05$. In boldface for the purpose of clarity.

** $p < .01$. In boldface for the purpose of clarity.

Table 10 shows the correlations between variables related to section 1.2.5. ('Personality, academic success, mindfulness and student's well-being'). Specifically, the interpretation of this table firstly focuses on the correlations of 'DoM (pre- and post)' with the variables of personality. Secondly, it focuses on the correlations of the variables of subjective well-being with the variables of personality. The correlations of the variables within subjective well-being with each other (the correlations between 'Life satisfaction', 'Quality of life' and 'Vitality and energy' specifically) have already been discussed in Table 8.2, hence will not be repeated here. Also, the correlations of the variables 'DoM (pre- and post)' with the variables of subjective well-being were already discussed in Table 9, thus will not be included in the current interpretation.

The current Table 10 shows that 'DoM (pre)' significantly correlates with the personality trait 'Agreeableness' ($r = .888, p < .01$). Thus, the null hypothesis of there being no relationship between these variables in the current study is rejected. The correlation is very strong and positive. This indicates that a higher degree of mindfulness (pre) relates to a higher degree of the personality trait agreeableness. That the degree of mindfulness could correlate with the personality trait of openness was accounted for, however no hypothesis had yet been formulated in the current study about the link with the personality trait agreeableness.

Furthermore, there is a significant correlation between 'LS (pre)' and the personality trait 'Neuroticism' ($r = .763, p < .05$). Thus, the null hypothesis of there being no relationship between these variables in the current study is rejected. It concerns a very strong and positive correlation. This indicates that a higher degree of life satisfaction (pre) relates to a higher degree of the personality trait neuroticism. That a lower level of the personality trait conscientiousness could be related to academic failure and stress and hence potentially well-being, had been accounted for. However, a positive link between life satisfaction (an aspect of well-being) and the personality trait neuroticism had not been hypothesized. For the other variables of subjective well-being ('Quality of life' and 'Vitality and energy') no significant correlations were found with any of the personality traits. Thus, the null hypothesis of there being no relationship between these variables in the current study is accepted. However, potentially significant correlations between personality traits such as openness and conscientiousness with subjective well-being were actually hypothesized.

Table 11*New Correlations*

	Agreeableness	AE (pre)	AE (post)	FcS (pre)	FcS (post)	Neuroticism	Openness to experience
OncIE (pre)	.844*	.551	.964*	-.549	-.258	-.587	-.238
Conscientiousness	-.605	-.781*	-.98*	.071	.204	.236	-.199
MwC (pre)	.685	.27	.376	-.736	-.996**	-.756*	.56
MwC (post)	.385	-.079	.168	-.96*	-.977*	-.896	.892
RsCREA (pre)	.234	.276	.575	-.117	-.944	-.211	.801*
RsCREA (post)	.434	.016	.289	-.922	-.976*	-.868	.763
RsCT (pre)	.191	-.196	-.116	-.7	-.877	-.653	.785*
Neuroticism	-.624	-.392	-.508	.982**	.954*	-	-.408

Note. - = Not applicable, for when it's the same variable; OncIE = Openness to new and challenging ideas and experiences; AE = Adaptive expertise; FcS = Flexible coping with stress; MwC = Mind-wandering and creative ideas; RsCREA = Reflecting on the self as creative; RsCT = Reflecting on the self as a critical thinker; pre = pre-test; post = post-test.

* $p < .05$. In boldface for the purpose of clarity.

** $p < .01$. In boldface for the purpose of clarity.

Table 11 shows new correlations between variables, as revealed in the present research, that were not yet hypothesized and discussed in the introductory sections of this thesis. It is shown that there is a significant correlation between 'OncIE (pre)' and the personality trait 'Agreeableness' ($r = .844, p < .05$). Thus, the null hypothesis of there being no relationship between these variables in the current study is rejected. It concerns a very strong and positive correlation. This indicates that a higher degree of openness to new and challenging ideas and experiences (pre) relates to a higher degree of the personality trait agreeableness. Also, the variable 'OncIE (pre)' is significantly correlated with 'AE (post)' ($r = .964, p < .05$). Thus, the null hypothesis of there being no relationship between these variables in the current study is rejected. It concerns a very strong and positive correlation. This indicates that a higher degree of openness to new and challenging ideas and experiences (pre) relates to a higher degree of adaptive expertise (post). Even though no hypothesis had been formulated in the introductory section of this thesis on this specific relationship, a potential

mutual link of both variables with ‘cognitive flexibility’ had been suggested in the integrative framework (figure 7).

For the personality trait ‘Conscientiousness’ there are significant correlations with ‘AE (pre)’ ($r = -.781, p < .05$) and ‘AE (post)’ ($r = -.98, p < .05$). Thus, the null hypothesis of there being no relationship between these variables in the current study is rejected. Both correlations are very strong and negative. This indicates that a higher degree of the personality trait conscientiousness relates to a lower degree of adaptive expertise (pre- and post).

For the variable ‘MwC (pre)’ a significant correlation was found with ‘FcS (post)’ ($r = -.996, p < .01$). Thus, the null hypothesis of there being no relationship between these variables in the current study is rejected. It concerns a very strong and negative correlation. This indicates that a higher degree of mind-wandering and creative ideas (pre) relates to a lower degree of flexible coping with stress (post). No hypothesis had been formulated in the introductory section of this thesis about this specific relationship, however a potential mutual link with ‘cognitive flexibility’ had been suggested in the integrative framework (figure 7). Specifically, the pathway concerning mind-wandering and creative ideas was related to a flexibility in dealing with emotions and behaviour, which was linked to cognitive flexibility. Cognitive flexibility was in turn related to the flexible coping with stress.

Furthermore, ‘MwC (pre)’ was significantly correlated with the personality trait ‘Neuroticism’ ($r = -.756, p < .05$). Thus, the null hypothesis of there being no relationship between these variables in the current study is rejected. It concerns a very strong and negative correlation. This indicates that a higher degree of mind-wandering and creative ideas (pre) relates to a lower degree of the personality trait neuroticism.

The variable ‘MwC (post)’ is significantly correlated with the variables ‘FcS (pre)’ ($r = -.96, p < .05$) and ‘FcS (post)’ ($r = -.977, p < .05$). Thus, the null hypothesis of there being no relationship between these variables in the current study is rejected. Both correlations are very strong and negative. This indicates that a higher degree of mind-wandering and creative ideas (post) relates to a lower degree of flexible coping with stress (pre- and post). See the paragraph on the variables ‘MwC (pre)’ and ‘FcS (post)’ for further interpretation.

The variable ‘RsCREA (pre)’ shows a significant correlation with the personality trait ‘Openness to experience’ ($r = .801, p < .05$). Thus, the null hypothesis of there being no relationship between these variables in the current study is rejected. The correlation is very strong and positive. This indicates that a higher degree of reflecting on the self as creative (pre) relates to a higher degree of the personality trait openness to experience. No hypothesis had been formulated in the introductory section of this thesis about this specific relationship, however a potential mutual link of creativity and the openness to new and challenging ideas and experiences with ‘cognitive flexibility’ had been suggested in the integrative framework (figure 7). Also, a potential mutual link between creativity and the openness to new and challenging ideas and experiences with ‘curiosity and openness’ had been suggested.

The variable ‘RsCREA (post)’ is significantly correlated with ‘FcS (post)’ ($r = -.976, p < .05$). Thus, the null hypothesis of there being no relationship between these variables in the current study is rejected. It is a very strong and negative correlation. This indicates that a higher degree of reflecting on the self as creative (post) relates to a lower degree of flexible coping with stress (post). No hypothesis had been formulated in the introductory section of this thesis about this specific relationship, however a potential mutual link with ‘cognitive flexibility’ had been suggested in the integrative framework (figure 7).

For the variable ‘RsCT (pre)’ there is a significant correlation with the personality trait ‘Openness to experience’ ($r = .785, p < .05$). Thus, the null hypothesis of there being no relationship between these variables in the current study is rejected. It concerns a very strong and positive correlation. This indicates that a higher degree of reflecting on the self as a critical thinker (pre) relates

to a higher degree on the personality trait openness to experience. No hypothesis had been formulated in the introductory section of this thesis about this specific relationship, however a potential mutual link of critical thinking and openness with 'reflective evaluation' had been suggested in the integrative framework (figure 7).

The personality trait 'Neuroticism' shows significant correlations with 'FcS (pre)' ($r = .982$, $p < .01$) and with 'FcS (post)' ($r = .954$, $p < .05$). Thus, the null hypothesis of there being no relationship between these variables in the current study is rejected. Both correlations are very strong and negative. This indicates that a higher degree of the personality trait neuroticism relates to a higher degree of flexible coping with stress (pre- and post).

3.2. Qualitative data: Meditative Experiences and Reflection Questionnaire (MERQ)

See the Appendix for the qualitative data of the MERQ, including the qualitative remarks of the participants concerning the research variables. The following section will put the qualitative remarks into the context of this research study.

3.2.1. Flow and subjective well-being

With regards to the presence of flow experiences, the variables of subjective well-being and the qualitative remarks of the MERQ, I found that in both the variables of 'Life satisfaction' and 'Quality of life' participants frequently noted the urge that they could 'get more out of life'. I would argue that this points towards the student's awareness that a higher life satisfaction and quality of life is possible for them. A flow experience has been regarded to be satisfactory in itself (Moore, 2013). So, I would say that a higher degree of flow experiences might increase life satisfaction, which in turn might decrease the urge to get more out of life due to a higher contentment being present. Also, it can be noted that participants experienced flow mainly during sports, when something is very interesting or in stressful situations. That sports can be related to flow experiences has already been scientifically noted (Jackson, Kimiecik, Ford, & Marsh, 1998). For instance, research projects with athletes show that flow plays a relevant role in their sport experience (Jackson et al., 1998). This can be expressed as the intense involvement in the physical exercise, which is intrinsically pleasurable and can be driven by a high personal absorption in the activity (Jackson et al., 1998). I would argue that the situations as mentioned by the students initiate a heightened attentional focus in order to meet the needs of these situations, which in turn allows for a more intense involvement that facilitates a flow experience.

Qualitative remarks on the variable 'Vitality and energy' were mixed, varying from participants feeling very fit, to it being dependent on self-image/eating well and exercising, with high peaks and lows, generally or sometimes, and moderately but not so much as desired. Sports/exercise was a recurrent theme in several remarks and generally relates to being more fit. As aforementioned, flow experiences have been related to sports and life satisfaction, hence a mutual component of sports in 'Vitality and energy' and flow is shown. This shows that flow could be related to multiple components of subjective well-being.

3.2.2. Mind-wandering and creative ideas

There was a moderate presence of 'Mind-wandering and creative ideas' in this study, although there were quite a few quantitatively very high values. Qualitative remarks of the participants that support these higher values concern daydreaming with the random occurrence of new ideas, without specific supportive arguments for why they arose for instance. Public transport was given as an example for a place where the new creative ideas might arise. With the results of this research and the lack of active practitioners of the meditation intervention, no statement can be made about the hypothesis that mindfulness meditation might facilitate the receptivity of the mind for new creative ideas.

3.2.3. Reflecting on the self

Qualitative remarks of the participants are in line with being a critical thinker and a reflection upon its importance. Several remarks concern the statements that, for instance, every university student should be a critical thinker and that reflecting on knowledge is part of the developmental process. Also, they emphasize that they don't just take things for granted without investigation and that critical thinking is a skill that can be developed, which for one of the participants is clearly stated as a gradual process. Thus, the fact that the research population of this study concerns university students together with the content of the previous statements, could explain well that the quantitative scores on the variable 'Reflecting on the self as a critical thinker' were quite high.

With regards to the variable 'Reflecting on the self as creative' it is interesting to see that the qualitative remarks did not really relate to creativity in the artistic sense, but more so to the following aspects: problem-solving, out-of-the-box thinking, and making compromises. Furthermore, the quantitative results showed a very positive and significant correlation between the variable 'Reflecting on the self as creative' and the variable 'Reflecting on the self as a critical thinker'. Also, creativity has been related to problem-solving and thinking critically (DeHaan, 2009). Thus, with higher education students as a research population, who value critical thinking, it is not so surprising to notice that the reflection on the self as creative mostly includes creativity in the sense of out-of-the-box thinking, making compromises and solving problems.

3.2.4. Openness to new and challenging ideas and experiences

The qualitative remarks of the participants with regards to the variable 'Openness to new and challenging ideas and experiences' quite support the very high quantitative scores that were found. The following expressions showed this: wanting to explore more of the world, a love for learning and trying new things, and a high curiosity. Also, new challenges were seen as taking you further in your development, but the step for action and engaging in these challenges was also remarked as difficult. For another participant the openness was mainly present as long as the experience is interesting and another participant reported on not being open so often. With one participant having a lower level of openness and another participant noting that it is not easy for him/her to engage in challenges, their voluntary participation in this study also stands out. I would argue that the online method of participation and the personal research focus might have lowered the threshold for engagement, due to the flexibility and potential self-improvement they offer. These aspects might have made it easier and more valuable for them to participate in this specific research project.

3.2.5. Flexible coping with stress

In the MERQ the lowest quantitative scores were found for the variable 'Flexible coping with stress'. Several qualitative remarks were provided by participants that might illustrate this. For example, one participant reported to be bad at managing stress, whereby the stress often turns into an anxiety for doing things wrong. Another participant simply stated that he/she can't cope well with stress. For other participants this was less the case. For example, another participant is not easily stressed and is good at relativizing and creating solutions. Another participant reported that if he/she did have stress, he/she often knows it is his/her own fault and that stressing about it only makes it worse, hence this knowledge lowers the stress.

This last remark is interesting in the context of metacognition. Being aware of the stress seems to create some more mental space for allowing a reflection on the stress and seeing that worrying

about it only makes it worse. As a result, the participant noted that the stress-levels decrease. Hence, I would state that creating more awareness of the stress accompanied with the insight that worrying tends to be ineffective for dealing with stress, is quite an adaptive and flexible way of preventing a chronic stress build-up. This could in turn be positively related to health and well-being, since it is suggested that less build-up of chronic stress is beneficial for physical and psychological health (Juster, McEwen, & Lupien, 2010). This is the case, because chronic stress has been related to impairments in physical functioning and the sensitivity for illnesses (Juster et al., 2010). Specifically, the long-term production of stress hormones has been associated with a negative shift in homeostasis, which represents the internal balance in the body (Juster et al., 2010). I would also say that a better overall health might relate to a better cognitive health as well, which could create a more powerful cognitive potential for learning.

In a more acute form however, stress was expressed in a qualitative remark of a participant as working well for focusing and creating flow. This also highlights the interesting beneficial effect stress can have on the short-term on the other hand. Furthermore, the data without the participants that did not complete the post-test measures, included higher scores. I would argue that perhaps the long-term commitment of three weeks played a role as a stress factor, which may have felt as a burden to them. Also, I would say that it could just be the case that the remaining participants were going through a less stressful period or simply thought differently about it due to any reason.

3.3. Qualitative data: Journal

With regards to the experimental group in the present study, there was only one participant who actively completed the intervention, including the meditation practice and keeping track of a journal (15 completed journal entries related to 15 meditation sessions). Concerning the journal, it can be noted that mainly sessions of three and five minutes were followed, with a couple of longer sessions of ten minutes. Since the experience of meditation was quite new and required an investment of time during the day, it is no surprise that relatively more shorter sessions were chosen as a way to get acquainted. Furthermore, in the journal of the participant there was a remark about the presence of slight frustration that it takes a lot of effort to focus. I would argue that the focus needed for meditation may make it a bit harder to maintain a longer session in the beginning, which might also explain why mainly the shorter sessions of three and five minutes were chosen. Also, the sessions were generally characterized by increasing energy levels, the generation of a bit more focus, creating less drowsiness, and as being a relaxed and calm moment. These aspects could be related to the potential positive association between mindfulness meditation and well-being (Howells et al., 2016). Several expressions of this beneficial impact of mindfulness on well-being are as follows: more positive emotions, less depressive features, less fear and less stress (Howells et al., 2016; Cash & Whittingham, 2010). Also, subjective vitality has been negatively associated with negative emotions, stress and anxiety (Gocet Tekin & Satici, 2014; Deniz & Satici, 2017). Thus, the qualitative remarks might be in line with an association between mindfulness practice and well-being, however further research is needed to establish more sound evidence.

There were also remarks that concerned the statements that not a lot of impact of the meditation practice was felt on life so far and that there was some frustration about there being so many thoughts present during meditation. With regards to the last remarks, it may indeed be the case that meditating for a longer time is needed to really start to notice more differences in daily life, due to the mindfulness facets having to integrate into the patterns of personality. The sustaining presence of the mindfulness tendency in daily life is called ‘dispositional mindfulness’ (Hanley, 2016).

With regards to the location for meditation practice, it was performed at home by the participant. I would argue that this location provides a calm space for practising meditation. Furthermore, the participant mostly meditated in the evening. I would say that this could be due to the evening being the closure of the day, which might be an appropriate time for meditative practice. Firstly, as a way to relax from the daily activities and secondly as a suitable time for reflecting upon what has passed during the day.

4. Discussion and conclusion

4.1. The current study, the research question and the structure of the discussion section

The current study investigated the potential network of relationships between the practice of mindfulness meditation and multiple aspects of the mind of higher education students. With the digital age and the flexibility and practicality of smartphone applications in mind, the ‘Headspace: Meditation & Sleep’ app was selected as an active intervention of guided mindfulness meditation. Specifically, this study concerned the following research question: to what extent could a smartphone application-based guided mindfulness meditation practice be related to aspects of the mind of higher education students concerning the degree of mindfulness, metacognition, adaptive expertise, personality, meditative experiences, and reflective facets on creativity, critical thinking, openness to new ideas and challenges, flexible coping with stress, and subjective well-being? An experimental design was used for potentially exposing these relationships, whereby participants in the experimental group used the Headspace app for three weeks while keeping track of a journal, and the participants in the control group had no intervention for the same period. Self-report questionnaires were filled in once before this period and once afterwards.

This experimental design allowed for a comparison between measures at two time points, whereby a potential influence of the intervention in the interval in between on the scores could be exposed. However, due to the small sample size of seven participants in this study, an attrition rate of three participants and only one participant actively completing the meditation intervention, no valid conclusive answer can be provided for the research question, with regards to the extent to which the intervention has an influence on the aspects of the mind of higher education students. Thus, with this in mind, a specific comparison between the experimental group on the one hand and the control group on the other hand was not found to be appropriate. A larger sample size and a larger number of completed interventions would have made this comparison more suitable (which was the initial intention of the current research design), however this turned out not to be the case. As a consequence, it was decided to focus on the comparative results of the pre- and post-test measures and the correlation analysis between constructs of the available collective data. The discussion of these results is organized in multiple sections, in which each section discusses different combinations of related themes.

4.2. General discussion

4.2.1. The degree of mindfulness and familiarity with mindfulness

First of all, the ‘Five Facet Mindfulness Questionnaire (FFMQ)’ measured the construct ‘The degree of mindfulness’, for which the sum scores were used (Bohlmeijer et al., 2011; Veehof et al., 2011). That a small to medium degree of mindfulness was present at both measures, might be associated with the familiarity of the participants with mindfulness meditation, which included well-known familiarity and lesser familiarity. More familiarity might strengthen the view of seeing mindfulness as a valuable practice. This might increase the knowledge of what type of answers to the ‘FFMQ’ are in line with being mindful and hence affect/slightly bias the answers to be more in line with this understanding

(Van Dam, Earleywine, & Danoff-Burg, 2009). I would argue that these factors might contribute to the small to medium presence of mindfulness as found in this study. Also, in the study of Van Dam et al. (2009) it was found that being acquainted with mindfulness created higher values by one fourth of the standard deviation on the 'FFMQ' in the group of people that did not meditate. Furthermore, the present study consisted only of participants that did not meditate, but were familiar with mindfulness. Thus, I would state that the degree of familiarity could also explain the small to medium presence of mindfulness in the current study, in line with the results found by Van Dam et al. (2009). If participants were less familiar with mindfulness meditation, the presence of mindfulness might have been lower. Also, due to the fact that participation in this research project was based on a voluntary approach, it could be the case that students who were already slightly familiar with mindfulness meditation would feel more drawn to the research project.

The correlation between the pre- and post-test measures was not significant, however it did concern a very strong and positive correlation, which indicates that the scores for both tests were relatively consistent in terms of ranking for a student in relation to the other students. This finding is beneficial for the reliability of the measure and for the strength of hypothesis testing. The difference scores were not significant either, which is not so surprising due to only one participant actively completing the mindfulness meditation intervention. I hypothesized that this intervention might initiate significant beneficial effects on the degree of mindfulness, in relation to no significant effects on the degree of mindfulness in the control group. However, with the aforementioned small number of a completed intervention no valid conclusion could be formulated with respect to the hypothesis, which suggested that the intervention could have potential positive effects for the degree of mindfulness.

4.2.2. The degree of mindfulness, agreeableness and cognitive flexibility

In this research it was found that the degree of mindfulness has a strong and highly significant positive correlation with the personality trait of 'Agreeableness'. This indicates that an increase in mindfulness is strongly associated with an increase in agreeableness in the current study. Agreeableness is the personality trait which reflects politeness and conformability to other people (Goldberg, 1992). Conforming to others requires adapting one's own behaviour to them and suggests a certain cognitive flexibility in being able to do so, which has been known to be associated with mindfulness (Moore, 2013; Fox & Christoff, 2014). The regulation of attention is an important cognitive aspect of flexible reactivity and is also essential to mindfulness meditation (Moore & Malinowski, 2009). Thus, it might be the case that mindfulness practice could have a beneficial effect on the regulation of attention, which in turn has a positive effect on cognitive flexibility. Together with the aforementioned link between conformability in the personality trait 'Agreeableness' and cognitive flexibility, I would state that this explains the significant positive correlation with the degree of mindfulness. See figure 8 for a visual overview of the relationships discussed in this section (4.2.2.).

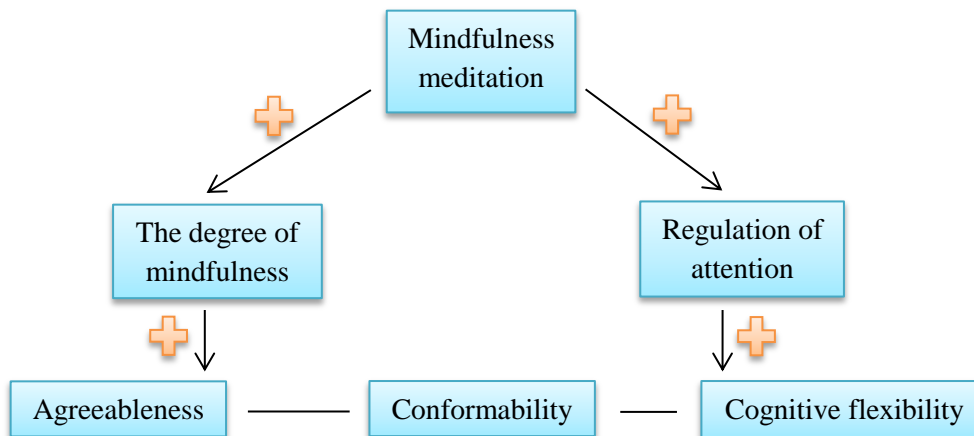


Figure 8. Relationships section 4.2.2. ‘The degree of mindfulness, agreeableness and cognitive flexibility’. Note: an arrow represents a relationship. A positive relationship is indicated by a (+) sign. A straight line represents shared components.

4.2.3. Adaptive expertise, openness and conscientiousness

With regards to the construct ‘Adaptive expertise’, I hypothesized that mindfulness meditation practice could have altered the difference scores to a significant extent. This change was hypothesized, due to the possibility of mindfulness meditation being positively associated with cognitive flexibility and adaptive responses (Fox & Christoff, 2014). A higher presence of these aspects was hypothesized to be significantly associated with at least one or more of the four components of ‘multiple perspectives’, ‘metacognitive self-assessment’, ‘goals and beliefs’, and ‘epistemology’, as measured in the ‘Adaptive Expertise Questionnaire’ (Janssens et al., n.d.). This could be the case via the increased metacognitive ability, as developed by mindfulness meditation, facilitating creative flexibility (Moore, 2013). In turn, this could be beneficial for initiating less routine-based behaviour, which is more inflexible. Also, it might allow for more creative and innovative responses to happen, as well as extent the range to which one is willing to adapt to changes in knowledge and deal with challenges, which are important components of adaptive expertise (Bohle Carbonell et al., 2014).

However, no significant difference score for adaptive expertise was found in the current study. This can be explained due to only one participant completing the intervention. Hence, the data fails to see if a mindfulness meditation intervention can truly initiate a significant effect. If the difference score would have also been nonsignificant even in the case of a sufficient amount of completed interventions, an alternative explanation can be given. For example, it might be so that the intervention period of three weeks is simply too short to establish an effect in one or more components of adaptive expertise. Hence, a longer duration of the intervention might be necessary. Also, it might be so that the expected correlation between mindfulness and adaptive expertise is actually not the case. The lack of clarity on this potential relationship could be due to a lack of scientific research on this matter, which is essential to provide a solid foundation of knowledge about this relationship.

In terms of correlations between constructs, ‘Adaptive expertise’ was significantly positively correlated with the construct ‘Openness to new and challenging ideas and experiences’ and significantly negatively correlated with the personality trait of ‘Conscientiousness’. This means that a rise in the order of adaptive expertise is related to a higher openness to new and challenging ideas and

experiences on the one hand and less conscientiousness on the other hand. An aspect of adaptive expertise is the ability to deal with novel situations, which requires a certain creativity and readiness for new and challenging contexts and problems (Bohle Carbonell et al., 2014). Hence, the first correlation could be in line with this. For measuring personality traits in the current study, ‘The Big Five Personality Test (IPIP-50)’ was used, in which people with high scores on conscientiousness are described as being neat and following rules (Goldberg, 1992). This might also be interpreted as people that have more behavioural tendencies based on routines and are hence less flexible in their responses. I would state that this relates to less adaptive behaviour, which explains the negative correlation between the personality trait ‘Conscientiousness’ and adaptive expertise.

In the introductory part of this thesis it was hypothesized that the personality trait conscientiousness could be beneficial for academic motivation and success. Furthermore, aspects of adaptive expertise such as creativity and an eagerness for learning seem to imply a positive relationship with for instance critical problem-solving skills and motivation needed and fostered in academic education. Thus, due to this potentially mutual positive relationship of adaptive expertise and conscientiousness with academic endeavours, another perspective on the result of the negative association between conscientiousness and adaptive expertise in the current study is provided. On the one hand the finding in this study therefore seems understandable (based on the first explanation), while on the other hand also seems a bit unexpected (based on the second explanation). Furthermore, a solid scientific basis for the link between conscientiousness and academic success is still lacking (even though it is suggested), thus more research on these subjects could provide clarification. See figure 9 for a visual overview of the relationships discussed in this section (4.2.3.).

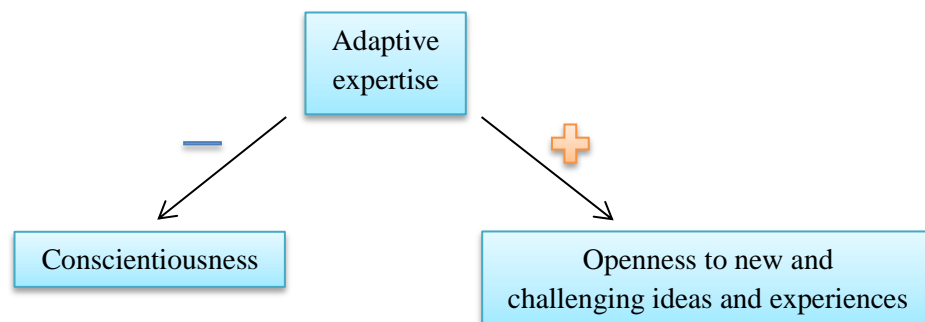


Figure 9. Relationships section 4.2.3. ‘Adaptive expertise, openness and conscientiousness’. Note: an arrow represents a relationship. A positive relationship is indicated by a (+) sign and a negative relationship by a (-) sign.

4.2.4. Flow, mindfulness and subjective well-being

Regarding the construct ‘The presence of flow experiences’, it was included in the current study due to the suggestion for the relationship between attention, flow and well-being (Moore, 2013; Payne et al., 2011). With mindfulness meditation as potentially beneficial for the directing of attention, a positive contribution for the intense attention as needed for the flow-state could be hypothesized (Moore, 2013). However, in the current study the hypothesized relationship between the constructs ‘The presence of flow experiences’ and ‘The degree of mindfulness’ was not found to be the case. There might be an alternative explanation for this. Even though mindfulness and flow have been associated

with each other, it might be that this association is only specifically the case for a certain component of flow. For instance, the division has been made between two aspects of flow: ‘absorption’ and ‘felt control’ (Sheldon, Prentice, & Halusic, 2015). ‘Absorption’ represents the full immersion into experience with low awareness of the self and ‘felt control’ represents the feeling of control accompanied by fluid and easy conscious actions (Sheldon et al., 2015). It could be the case that being more mindful of your actions could be beneficial for the ‘felt control’ aspect of flow, but could actually reduce the degree of absorption into experience due to the increase of awareness of the self through mindfulness, instead of the loss of this sense of self in ‘absorption’ (Sheldon et al., 2015). Hence, the aforementioned explanation points to the possibility that my hypothesis, with regards to mindfulness being beneficial for flow experiences, does not have to be the case for flow as a whole. Also, that no significant correlation was found between the constructs ‘The presence of flow experiences’ and ‘The degree of mindfulness’ in the current study could be explained by the small sample size, which simply does not contain the participant size, diversity and power needed to reveal the relationship.

Furthermore, very positive and significant correlations were found between the construct ‘The presence of flow experiences’ and the constructs concerning well-being: ‘Vitality and energy’, ‘Quality of life’ and ‘Life satisfaction’. This signifies that these constructs are strongly related with each other in the current study, in such a way that an increase in the degree of flow experiences is related to an increase in the degree of well-being as measured by the three constructs. With flow being characterized by optimal engagement with a certain task, it can be hypothesized that an optimal engagement might be very satisfactory in itself and hence could contribute to life satisfaction. That this might be the case, has already been pointed at by Mihaly Csikszentmihalyi, who described flow as a positive experience in which an intrinsic motivation for involvement in the experience is related to the satisfaction gained from the involvement itself (Moore, 2013). Furthermore, a potential relationship between flow and well-being has also already been suggested (Payne et al., 2011). Zullig, Valois, Huebner, Oeltmann and Drane (2001) noted that life satisfaction is one component of the construct quality of life, hence increasing the life satisfaction could in turn affect the overall quality of life. Since flow is intrinsically satisfying, the degree of the presence of flow could affect the quality of life. The construct ‘Vitality and energy’ is also regarded as a component of quality of life (Bakhshani, Amirani, Amirifard, & Shahrakipoor, 2016). I would state that feeling more vital and energetic could be related to flow in the sense that more cognitive resources are available for maintaining the attention needed for flow experiences. This is in contrast with the negative relationship found between vitality and energy and feeling exhausted (Nix, Ryan, Manly, & Deci, 1999). Exhaustion in turn has been linked to less ability for concentration and attentional focus (Boksem, Meijman, & Lorist, 2005). Thus, feeling less exhausted could increase the focal ability of attention, which in turn could be beneficial for facilitating the attentive energy needed for flow. As mentioned before, mindfulness meditation can come into play here as being potentially beneficial for attention (Moore, 2013). So, I would argue that the constructs concerning well-being are found to have a strong relationship with flow in the current study due to the aforementioned explanations. See figure 10 for a visual overview of the relationships discussed in this section (4.2.4).

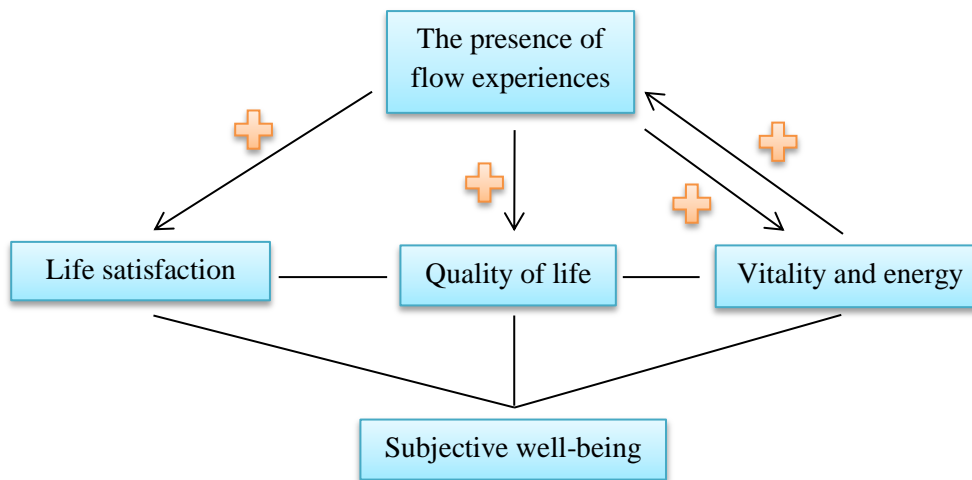


Figure 10. Relationships section 4.2.4. ‘Flow, mindfulness and subjective well-being’. Note: an arrow represents a relationship. A positive relationship is indicated by a (+) sign. A straight line represents shared components.

4.2.5. *Mind-wandering, flexible coping with stress, neuroticism and reflection on the self*

There was a very negative and significant correlation between ‘Mind-wandering and creative ideas’ and the ‘Flexible coping with stress’, which indicates that in the current study more presence of daydreaming and the arising of creative ideas is associated with less flexibility in dealing with stress. This is contradictory to what I would have expected. I would have argued for a positive relationship, with the hypothesis that students who are daydreaming more might detach easier from stressful situations and let go of stress more flexibly. This hypothesis finds some support in current scientific research, with daydreaming being a way in which a dissociation from a stressful situation can be created (Blouin-Hudon & Zelenski, 2016). Also, daydreaming has been associated with relieving emotional stress and a lower physiological response to stressful situations (Mar, Mason, & Litvack, 2012). On the other hand, mind-wandering has also been associated with negative mood and lower reaction time (Ottaviani, Shapiro, & Couyoumdjian, 2013). Furthermore, the expectancy about the capacity to deal with negative moods has been related with flawed coping skills (Flett, Blankstein, & Obertynski, 1996). Based on the last two remarks, I would state that the association between mind-wandering and negative mood could be related with a lower coping capability, hence less flexibility in dealing with stress.

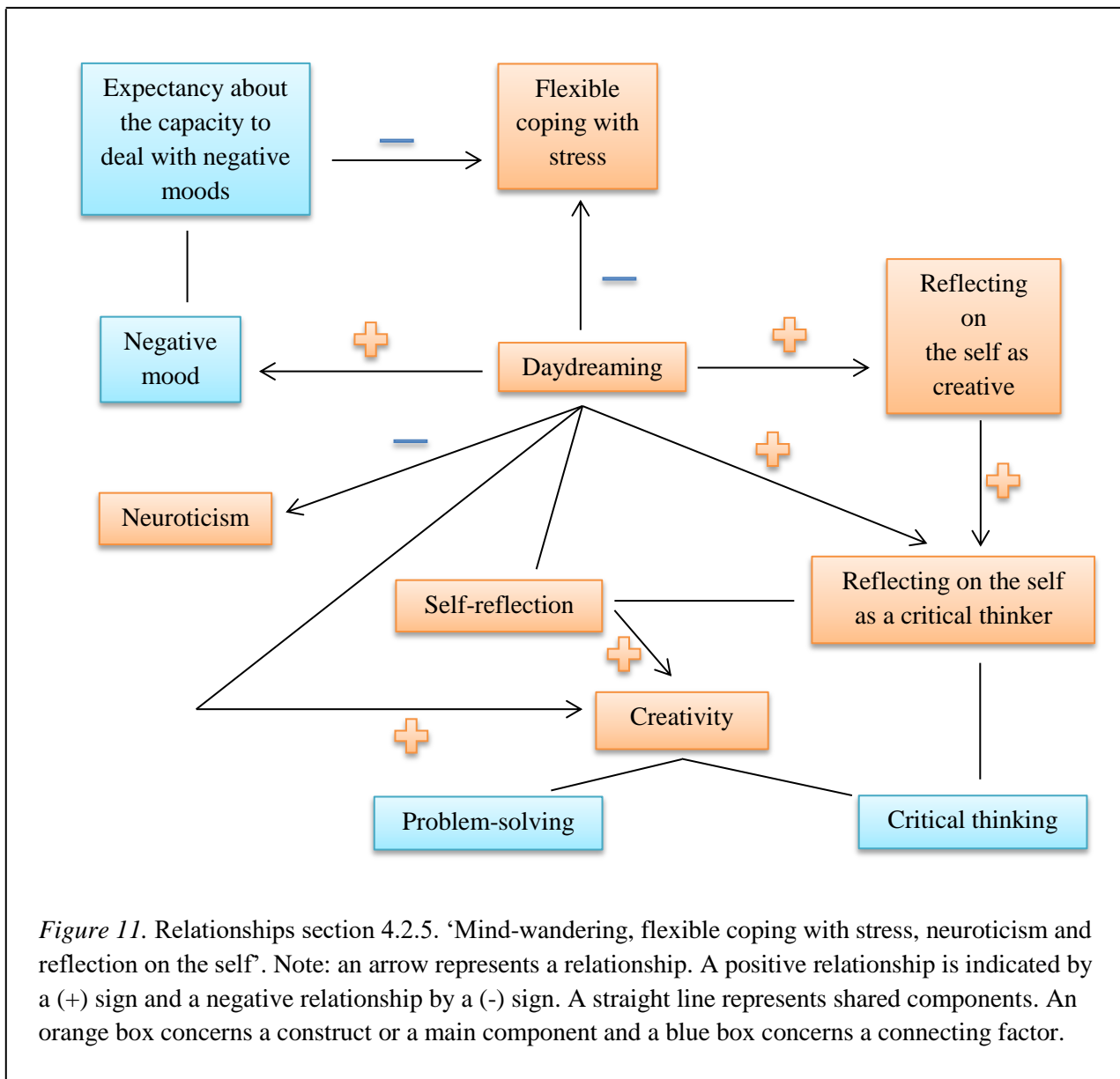
Also, the ability for daydreaming might explain the negative correlation with the personality trait ‘Neuroticism’. This indicates that a greater presence of daydreaming is associated with a lower degree of neuroticism in the current study. As aforementioned, daydreaming has been positively related with the reducing of emotional stress (Mar et al., 2012). Furthermore, neuroticism is characterized by the inclination towards negative emotions. Thus, based on the previous remarks I would state that daydreaming could play a role in shifting the mental balance away from negative and emotionally stressing emotions. This might explain the negative correlation as found in the current study.

Furthermore, the construct 'Mind-wandering and creative ideas' was also found to be very positively related to the construct 'Reflecting on the self as creative'. Both mind-wandering and self-reflection share certain positive associations with being creative (Shrimpton et al., 2017). For instance, self-reflection has been positively linked with beneficial and useful ideas, which can be related to the tendency for internal inquiry and the accompanied openness to experience (Shrimpton et al., 2017). Also, reflecting on the self has been positively related with a manner of daydreaming that is dominated by enjoyable thoughts (Shrimpton et al., 2017). Furthermore, mind-wandering has been linked with more overall creativity and a higher self-report on behaving creatively and involvement in pursuits related to creativity (Zedelius & Schooler, 2015). Thus, I would state that self-reflection and mind-wandering can complement each other, by expanding the scale and utility of valuable thoughts for the creative process. So, due to the shared relationship with creativity in both constructs, it may be expected that a high presence of daydreaming and creative ideas could be related to the view of yourself as being creative.

In the current study it was found that both the construct 'Mind-wandering and creative ideas' and the construct 'Reflecting on the self as creative' had very positive and significant correlations with the construct 'Reflecting on the self as a critical thinker'. This indicates that participants in this study with a higher degree of mind-wandering and creative ideas and a reflection on oneself as being creative, had a higher degree of reflecting on oneself as a critical thinker. It has already been stated that creativity is an important part of problem-solving skills and critical thinking (DeHaan, 2009). Also, creative thinking and critical thinking have been noted to interrelate with each other, in which critical thinking can provide the aspects of logic, analytics and evaluation needed in problem-solving and creative thinking can complement these facets by initiating a high quantity of thoughts and elaborations (Alghafri & Ismail, 2014). The overlap between creativity and critical thinking could be in line with the positive correlations found between the constructs 'Mind-wandering and creative ideas' and 'Reflecting on the self as creative' with the construct 'Reflecting on the self as a critical thinker'. I would argue that these constructs could be positively affected through the practice of mindfulness meditation, which could train metacognitive abilities. These metacognitive abilities include a higher awareness of and reflection upon the cognition of oneself (Napora, 2011). I would suggest that a higher awareness of and reflection upon one's own thinking and behavioural patterns, could allow for more creative flexibility and critical evaluative skills to be present. This statement is based upon the suggestion that a higher awareness and metacognitive evaluation could be related to critical thinking, in the sense that it could be beneficial for the role of executive functioning (updating, inhibiting, and shifting) in critical thinking (Noone et al., 2016). Furthermore, the hypothesis is based upon the suggestion that has already been made for the beneficial relationship of mindfulness meditation with creative flexibility as a component of cognitive flexibility (Moore, 2013). However, the results of this study show no significant correlations between the degree of mindfulness on the 'FFMQ' and the constructs related to creativity and critical thinking as discussed here. It could be the case that for the small sample size in the current study no correlations were present, but that it might be the case in a larger sample including more diversity in participants. However, with the present results it can be concluded that there are no relationships between the multiple constructs.

The moderate to high mean scores on the construct 'Reflecting on the self as a critical thinker' could be explained in terms of the research population of this study, which includes higher education students. Worldwide, critical thinking is regarded as a valuable and essential academic skill that needs to be developed in higher education (Ku, 2009). Thus, the results of the current study could be in line with the stressed importance of critical thinking skills in higher education. It seems likely that the students in this study have already developed these skills to a certain degree. On the other hand, if this is not really the case, it might be that the expectance in higher education for being critical biased the

answer of the student to be in line with what is desired. See figure 11 for a visual overview of the relationships discussed in this section (4.2.5.).

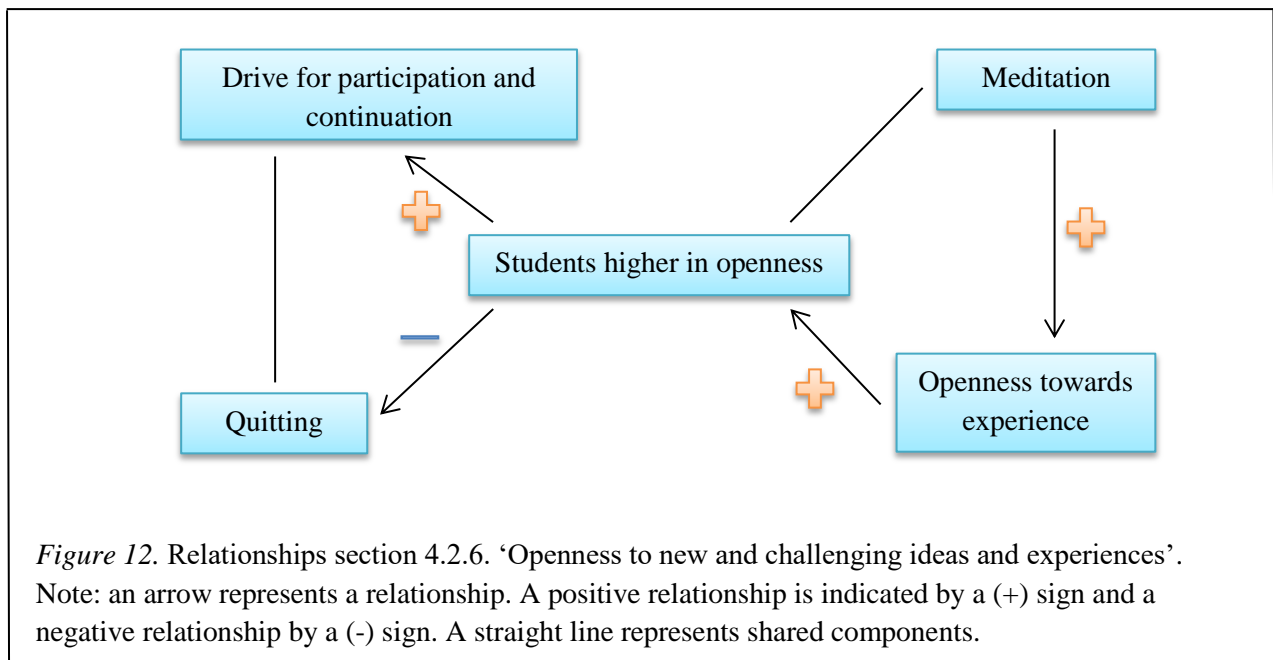


4.2.6. Openness to new and challenging ideas and experiences

The construct ‘Openness to new and challenging ideas and experiences’ was characterized by the presence of very high scores in relation to the other constructs. The high mean on the pre-test could indicate that higher education students who are interested in participating in a research project like the current one, show a relatively high openness. This openness to new experiences could have facilitated the initiative to take part in this research project, even though the full specifications of the project weren’t fully known yet. That there’s such a high mean score and low standard deviation on the post-test, might indicate that guided mindfulness meditation and/or commitment to complete the post-test are positively related to the openness to new and challenging ideas and experiences. In previous

research, there has already been pointed at the relationship between openness and the motivation for involvement (Komarraju et al., 2009). Also, openness has been negatively related with withdrawal behaviour (Komarraju et al., 2009). Thus, I would state that students higher in openness might show less tendency for quitting and a higher drive for participation and continuation. This might apply for the current study, which could explain the high scores on the construct ‘Openness to new and challenging ideas and experiences’.

Furthermore, it was found that there’s no significant difference score between the pre- and post-test measure of the construct ‘Openness to new and challenging ideas and experiences’. I would argue that openness might be a consistent characteristic of those willing to voluntarily participate in a research project like the current one. Furthermore, meditation is characterized by the training of an openness towards experience (Moore & Malinowski, 2009; Noone et al., 2016). So, I would state that the inclusion of meditation in the current study might resonate with people who are already quite consistently open. See figure 12 for a visual overview of the relationships discussed in this section (4.2.6.).

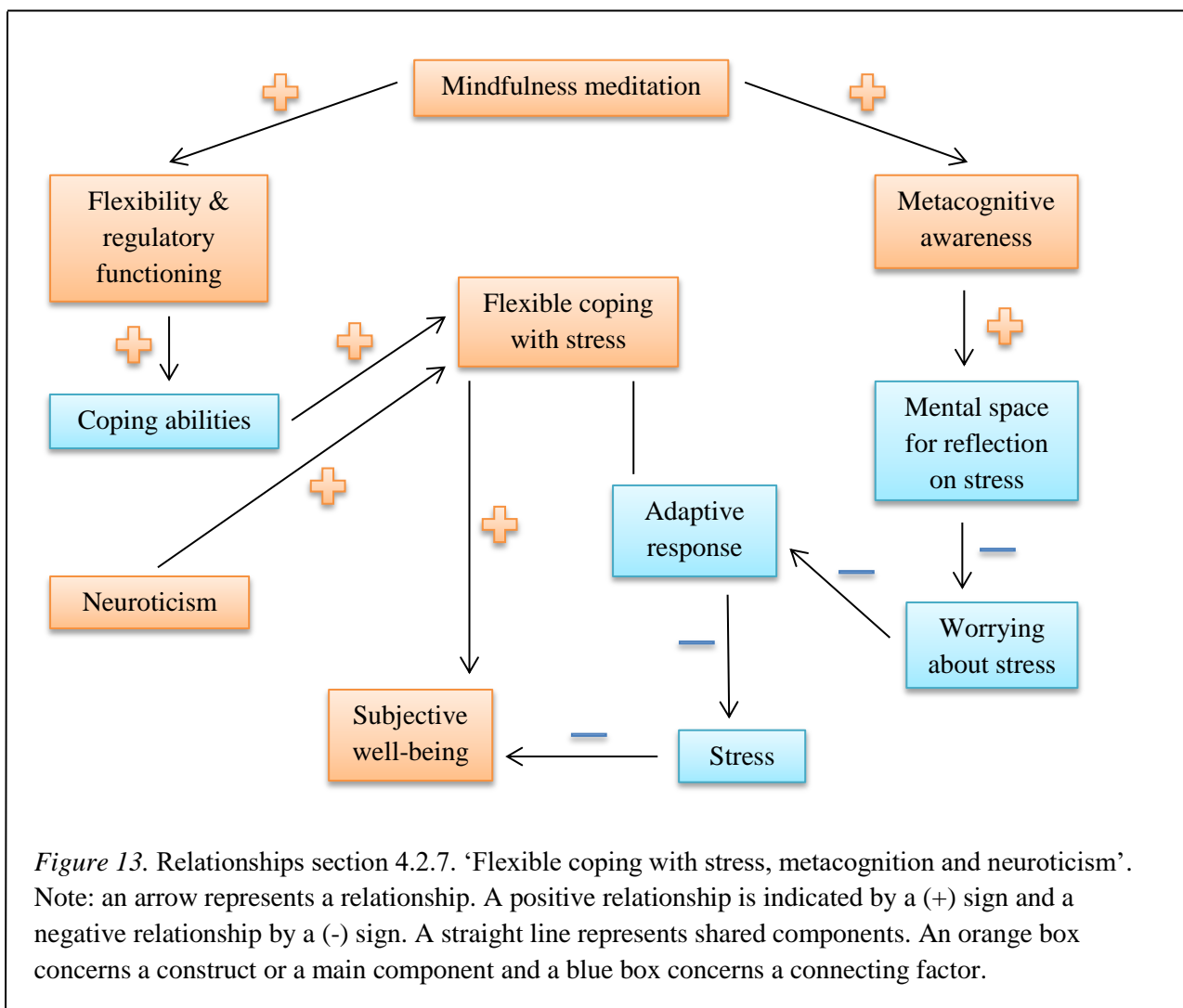


4.2.7. Flexible coping with stress, metacognition and neuroticism

With regards to the construct ‘Flexible coping with stress’ it is remarkable to see that it contains the lowest scores, in comparison with the other constructs. The low minimum scores could indicate that these students in the current study find it difficult to deal with stress in an adaptive way. Mindfulness meditation is known to be able to increase the coping skills with stressors in life through greater flexibility and regulatory functioning and has also specifically been shown to be beneficial for decreasing stress-related psychological issues in university students (Palmer & Rodger, 2009). I would argue that the presence of low scores on the construct ‘Flexible coping with stress’ might be the case, because students who are not coping well with stress and undergo the negative implications of that, might be drawn to meditation as a training for coping better with stress. As shown and explained in the qualitative data section of the results section, I state that meditation and its potential for increasing metacognitive awareness might be an essential factor for better coping. This metacognitive awareness

of the stress might allow for an expanded mental space for reflection and the insight that worrying about it tends to worsen it, which could result in a more adaptive and flexible way of dealing with the stress. Thus, potentially lowering chronic stress-levels, which could be beneficial for subjective well-being due to less negative health impacts of the stress hormones for a long period of time (chronic) (Juster et al., 2010).

Furthermore, the personality trait ‘Neuroticism’ and the construct ‘Flexible coping with stress’ are positively related in this study. This shows that an increase in presence of neuroticism in participants in the current study is associated with a rise in flexibility for coping with stress. It is not entirely clear why this would be the case. Suggestions between neuroticism and more negative reactivity to stress and less adaptive manners of dealing with stress have already been made (Cimboric, Gunther, Cohen, & Armeli, 1999). Hence, in contrary to the results, I would have hypothesized a negative correlation between the construct ‘Flexible coping with stress’ and the personality trait ‘Neuroticism’, since neuroticism encompasses more proneness for fear and worries and has been associated with fewer coping skills (Schneider, Rench, Lyons, & Riffle, 2012). See figure 13 for a visual overview of the relationships discussed in this section (4.2.7.).



4.2.8. Vitality and energy, neuroticism and life satisfaction

Regarding the construct ‘Vitality and energy’ it can be seen that there’s a positive and significant correlation with the personality trait ‘Neuroticism’. This points out that a rise in vitality and energy is linked to an increase in presence of neuroticism in the current study. However, in the scientific literature subjective vitality has been negatively correlated with neuroticism, anxiety, depression, the tendency towards negative emotions, and stress-related psychological issues (Gocet Tekin & Satici, 2014; Deniz & Satici, 2017). Also, it has been suggested that neuroticism and its accompanied suffering could deplete energy, hence negatively impacting feelings of vitality (Ryan & Frederick, 1997). Thus, similar to the relationship between the construct ‘Flexible coping with stress’ and the personality trait ‘Neuroticism’ I would have hypothesized a negative correlation, in contrary to the current findings. I would argue that perhaps the small number of participants in the current study and hence the lack of a greater variety of data could explain the current findings.

Lastly, there was a positive relationship between the constructs ‘Life satisfaction’ and ‘Neuroticism’, which shows that the higher the score for the construct ‘Life satisfaction’ is, the higher the score for the construct ‘Neuroticism’ is in this study. Previous research has however revealed negative relationships between neuroticism and life satisfaction, with neuroticism often being a dominant predicting factor for life satisfaction (Liu, Wang, & Li, 2012). Specifically, it has for instance been suggested that neuroticism could affect the quality of social interaction negatively, with a lower possible life satisfaction as a consequence (Fogle, Huebner, & Laughlin, 2002). Given the previous findings, the positive relationship between neuroticism and life satisfaction as found in the results of the current study was not hypothesized. Based on the literature research, also no positive relationship between the two constructs has been found. Hence, the positive relationship in this study could be related to the small sample size and accompanied lack of diversity and power, or there is simply not enough scientific research yet to explain this positive relationship. Further research might provide (non)supportive evidence for a positive/negative relationship. See figure 14 for a visual overview of the relationships discussed in this section (4.2.8.). Furthermore, see figure 15 for the integrative framework of the discussion section of this thesis.

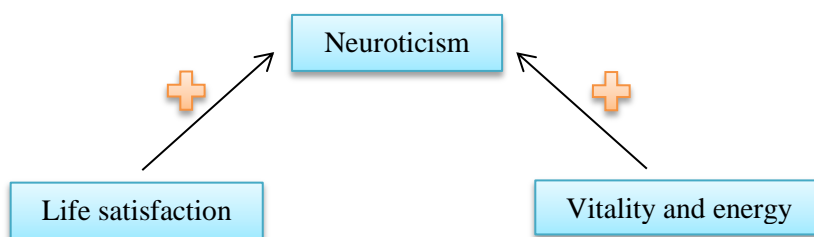


Figure 14. Relationships section 4.2.8. ‘Vitality and energy, neuroticism and life satisfaction’.
Note: an arrow represents a relationship. A positive relationship is indicated by a (+) sign.

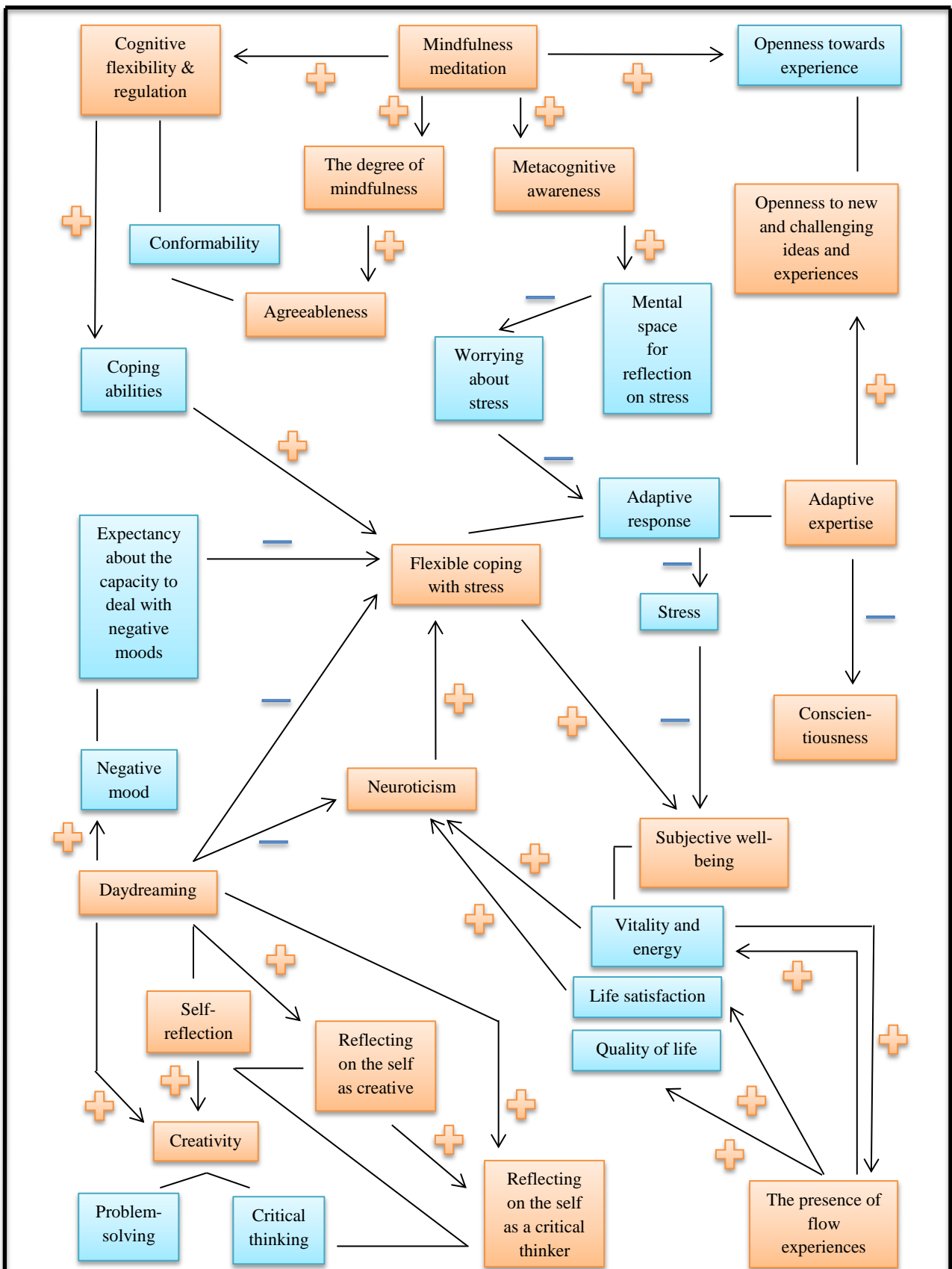


Figure 15. Integrative framework (discussion). Note: an arrow represents a relationship. A positive relationship is indicated by a (+) sign and a negative relationship by a (-) sign. A straight line represents shared components. An orange box concerns a construct or a main component and a blue box concerns a connecting factor.

4.3. Implications for the field of cognitive and neurobiological psychology

Conclusively, due to the lack of data concerning the potential effects of a guided mindfulness meditation intervention, no valid conclusive answer can be formulated on the following research question: to what extent could a smartphone application-based guided mindfulness meditation practice be related to aspects of the mind of higher education students concerning the degree of mindfulness, metacognition, adaptive expertise, personality, meditative experiences, and reflective facets on creativity, critical thinking, openness to new and challenging ideas and experiences, flexible coping with stress, and subjective well-being? However, the formulated hypotheses in the introductory part of this thesis, the correlations found in this research and the discussion in the previous section might contribute to the scientific impulse for further research, with regards to the themes that were covered in this project. Certain correlations were already suggested in previous research, such as the positive correlation between the construct 'The presence of flow experiences' and well-being and the positive correlation between the constructs 'Adaptive expertise' and 'Openness to new and challenging ideas and experiences' (Payne et al., 2011; Bohle Carbonell et al., 2014). Several other correlations were however new and not in line with previous research, such as the negative correlation between the constructs 'Flexible coping with stress' and 'Mind-wandering and creative ideas'. Also, the positive correlation between the constructs 'Vitality and energy' and 'Neuroticism' and the positive correlation between the constructs 'Life satisfaction' and 'Neuroticism' were new.

By statistically exposing and discussing certain relationships between constructs in this research study, an attempt has been made to gain a deeper understanding of the way different aspects of the mind of higher education students can be connected with each other. This understanding could have practical implications. For instance, the insight of the potential relationship between the personality trait 'Agreeableness' and 'The degree of mindfulness', as suggested by the strong positive correlation found in the current study, can imply that the type of personality might be an important factor for how mindful someone is or can be. The implication of this exposure could thus add to the psychological understanding of the mindful person, for which the aforementioned positive correlation points towards someone who is generally more able to adapt to and cooperate with other people. Also, the exposure of the correlational nature between personality traits and the degree of mindfulness might spark further research into the cognitive and neurobiological investigation of personality traits. This further investigation might contribute to a better understanding of those personality traits that might be positively associated with the degree of mindfulness and those traits that might be negatively associated with it. Practically, this might be beneficial for the effective targeting of vulnerable students with a mindfulness meditation intervention to contribute to their well-being, for which the correlation has been suggested in the current study as well as in other research (Palmer & Rodger, 2009). By noticing the degree in which students have certain personality traits that are more negatively oriented towards the degree of mindfulness, these students might be more easily recognized for a potential mindfulness intervention. Thus, potential meditation benefits could be received at an earlier educational stage, which might contribute to well-being and a better learning experience. It has already been suggested that the implementation of mindfulness practice in the classroom could be a way to enhance metacognitive skills for learning (Napora, 2011). So, by increasing our psychological knowledge on these themes through research projects as the current one, as well as through previous and future research, a more rigorous scientific framework within the field of cognitive and neurobiological psychology might be created for the potential support or lack of evidence for this mindfulness implementation.

Even though this study had a small sample size and many hypotheses remain speculative, the attempt to connect the multiple constructs together in an integrative framework could be inspirational and innovative for the research field of cognitive and neurobiological psychology. This could be the

case, due to the potential of an integrative framework to create a more comprehensive understanding of how the different sets of relationships could work complementary together within the whole. This could contribute to a thorough and in-depth scientific insight into different sets of relationships between mindfulness and the mind, while situating the findings within a larger network of relationships, in line with the holistic nature of mindfulness. This might encompass a more inclusive range of knowledge about how the mind works, which might be beneficial for strengthening the foundation of knowledge that is used for further innovative research. Also, the inclusion of qualitative data in the current study provided the accompaniment of a phenomenological perspective on certain quantitative results. Contextualizing the quantitative results within this perspective was regarded to contribute to a more inclusive and integrative scientific approach, which could allow for a more complete interpretation of experience and thus a deeper understanding of the mind.

4.4. Limitations and suggestions

There are several limitations of the current study. First of all, only seven participants were recruited. Due to this small sample size, the probability of not rejecting an incorrect null hypothesis while it should have been rejected (type II error) increases. This negatively affects the statistical power and reduces the chance that significant correlations reflect true effects. An explanation for this small sample size could be that participation in the project was on a voluntary basis. This is in contrast with projects that are part of the bachelor's degree in psychology, in which participation in the research projects of fellow students is mandatory for graduating.

Secondly, this study had a high attrition rate, with two drop-outs in the experimental group after the pre-test measure and with one participant in the control group only completing the pre-test measure very late. Hence, for these three participants there was no data available for the pre- and post-test measure comparison. The very delayed response of the student in the control group on the pre-test measure, could be explained by the fact that he was engaged in a busy internship abroad. For a future project, it might be a consideration to restrict the recruitment to students currently in the Netherlands, in order to prevent this type of attrition. Also, for this specific study a fairly moderate amount of time and effort needed to be committed, in contrast to for instance one quick completion of a survey. This may have made the threshold higher for continuation in the project after the pre-test measure. For a future research project concerning the participation of university students on a voluntary basis, it might be wiser to create a research design that requires less commitment than the current one. This might increase the degree of completion.

Thirdly, of the two participants in the experimental group that remained, only one was actively engaged in the guided mindfulness meditation practice during the period of three weeks. This limited the amount of data that could actually be related to the potential effects of meditation. I would argue that whether a participant will be actively engaged in an intervention like the current one, which doesn't take place at a controlled laboratory setting for instance, will always be a slight gamble based upon trust. However, by creating a journal myself in which participants could keep track of their meditation sessions and reflect upon it, I hoped to provide a guidance. Also, due to the electronic nature of the journal, I could see whether reflections on the sessions took place and hence the degree of engagement. Due to the reliance on the commitment of the participant, I would argue that for future research perhaps a better screening prior to the intervention period could be made in terms of the willingness for consistent commitment. By selecting students based on their motivation this might be done and more data could be obtained. On the other hand however, this could create a higher selection bias, which is not desirable. A larger sample size might be the best solution, since an active intervention will most likely often include attrition to some degree.

Fourthly, all measures in this research project were based upon self-report. Logistically, this was a practical and easy method for gathering data, as well as allowing for more privacy for the participants while taking part in the measurements. On the other hand, being reliant on self-report could lead to different interpretations of the questions between the participants, possibly socially desirable answers and other potential biases. However, due to the prominent and important aspect of metacognitive reflection within this research project, self-report was still deemed to be justified. Essential to this metacognitive reflection is the subjective experience, with which self-report as a measure is in alignment.

Fifthly, in hindsight the amount of constructs used in this research project could be critiqued. By narrowing down the amount of constructs, a contribution could have been made to sharpen the focus of the themes covered. This might have created a more specialized analysis. However, with the consideration of the relevance of an integrative framework of mindfulness and the mind and an appreciation of the holistic nature of mindfulness, as aforementioned in this thesis, it was intended to be innovative and contribute to a more comprehensive and inclusive understanding of mindfulness and aspects of the mind. Also, containing many constructs in one research study seemed an appropriate method for creating a broad thematic appeal and a display for the diversity that the field of cognitive and neurobiological psychology has to offer. On the one hand for the variety, potential and ambition of the research project and the research field in general. I had not come across another study yet that made an attempt to combine this diversity of constructs in one study, even though the potential inclusiveness on such a scale could prove worthy to investigate. On the other hand the variety of research themes could be an attractor for participants to voluntarily join the project. Having a less specialized and more broad thematic setup might have sparked a wider range of interest and appeal for more people. However, the recruitment of participants for this study worked out less well than what was hoped for. Also, it can be confirmed that the scale of this research project turned out to be more elaborate and extensive than expected. That the inclusion of the variety of constructs in this study would lead to such a large degree of analysis was not completely expected, mainly due to the fact that this thesis concerned the first empirical study I have ever designed. A very valuable lesson has been learned in terms of the broad scope of analysis. Creating an own questionnaire and taking into account such a wide degree of constructs was ambitious, however in hindsight manifested a very extensive project. I value the unifying and integrative approach, but it is wise for further endeavours that the scale of inclusion will be significantly smaller for a research study.

Looking back at the totality of this research project, I would state that a thorough and ambitious thesis has been created, for which many of the theoretical themes that were covered also expressed themselves practically in the process of working on it. This relates to aspects such as: being mindful of the details as well as the bigger picture, being mindful of the arising of feelings of frustration while writing and allowing these feelings to be present in a non-judgemental way, experiencing flow while writing, the initiation of creative ideas while daydreaming (on how to critically analyse, evaluate and structure components of this thesis), and remaining physically and psychologically fit through exercise and meditation in order to stay productive and creative in the writing process. Thus, the creative process of manifesting the current thesis has been intimately connected to me as a valuable teacher, on both a research level and a personal level.

4.5. Future directions

So far several suggestions for improving the quality of a study like the current one have already been provided in the previous section. As a continuation, extending the research on the potential relationship between mindfulness meditation in the context of a smartphone application and aspects of the mind of higher education students is encouraged. The digital age and the increasing need for intricate cognitive abilities creates a relevant context for further investigation (Napora, 2011). With the dominant presence of easily accessible self-help smartphone applications in daily life, such as for meditation, enough practical research potential is present (Howells et al., 2016; Mani et al., 2015; Wen et al., 2017; Economides et al., 2018). Continued research with student populations is deemed very relevant for potentially improving their learning capacities and well-being, as well as potentially making universities more ‘creativity-fostering places’ (Napora, 2011; Palmer & Rodger, 2009; Plucker et al., 2004). I would say that this might in turn make a significant difference for the students, as well as for society with higher education students being potential leading figures. Also, further research could contribute to an enrichment of knowledge in the scientific field of cognitive and neurobiological psychology. With the current study pointing towards a potential network of correlating constructs, future research could provide more evidence for either the validity of this network or not. Future research could also investigate certain sets of combinations of correlations, such as the specific combination of the constructs ‘The presence of flow experiences’ and ‘Life satisfaction’, for which the current study found a significant positive correlation. This continued investigation is encouraged and could contribute to the further unravelling of the complexities of the mind of higher education students, with potentially relevant implications for student’s well-being and learning experience.

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Appendix

Qualitative data MERQ

General remarks:

Qualitative remarks are presented below, as filled in by the participants on the ‘Meditative Experiences and Reflection Questionnaire (MERQ)’. With regards to structure: this is done thematically, showing per research variable (e.g. ‘The presence of flow experiences’, ‘Mind-wandering and creative ideas’) the remarks of the participants for both the experimental and control group, as well as the pre- and post-test. Each research variable is numbered differently. Furthermore, all of the translations from Dutch to English below were done by myself. The data analysis is presented in section 3.2. of this thesis.

(1) The presence of flow experiences

Question:

Heb je regelmatig ervaringen waarin je volledig en optimaal betrokken bent bij een bepaalde taak, ofwel: ervaringen waarbij er een hoge mate van concentratie aanwezig is en het gevoel heerst dat je in de *flow* van het moment zit? [Do you regularly have experiences in which you’re totally and optimally involved in a certain task, also formulated as: experiences in which there is the presence of a high degree of concentration and the feeling that you’re in the *flow* of the moment?]

Experimental group

Pre-test

Participant 1

Tijdens hockey en programmeren. [During hockey and programming.]

Participant 2

Voorals ik yoga doe of aan het boetseren ben. [Especially when I’m doing yoga or when I’m molding.]

Participant 5

Alleen als het iets is waar ik gepassioneerd om/gemotiveerd voor ben. [Only when it is something which I’m passionate/motivated about.]

Participant 7

Soms heb ik dit met studeren of sporten. [Sometimes I have this while studying or while doing sports.]

Post-test

Participant 1

Met sporten of programmeren. [With sports or programming.]

Participant 5

Vooral vóór deadlines lukt het heel goed. [Especially before deadlines it works out very good.]

Control group

Pre-test

Participant 3

Ja. [Yes.]

Participant 4

Het ligt aan de taak die uitgevoerd moet worden, maar als ik iets zeer interessant vind of ik ervaar een mate van stress om de taak te volbrengen, kan ik mij goed focus op de taak. [It depends on the task that needs to be done, but if I find something very interesting or if I experience a degree of stress in order to complete the task, I can focus well on the task.]

Participant 6

Vroeger wel, tegenwoordig vaak niet meer. [In the past yes, in the present not so often anymore.]

Post-test

Participant 4

Dit ontstaat als ik iets echt wil doen of als ik het gevoel heb dat er niet genoeg tijd is. [This is initiated when I really want to do something or if I have the feeling that there is not enough time left.]

Participant 6

Normaal gezien wel, maar de laatste tijd het veel te druk voor gehad om echt te ervaren of dieper op onderwerpen in te gaan. [Normally yes, but lately I've been too busy to really experience or to delve deeper into topics.]

(2) Mind-wandering and creative ideas

Question:

Staan ongerichte, spontane gedachten die in je opkomen regelmatig aan de basis van creatieve ideeën die je hebt? [Do undirected, spontaneous emerging thoughts frequently form the initiation of creative ideas you have?]

Experimental group

Pre-test

Participant 1

Soms. [Sometimes.]

Participant 2

Vaak. [Often.]

Participant 5

Ik heb niet echt veel spontane gedachten. [I do not really have a lot of spontaneous thoughts.]

Participant 7

Ik heb vaak spontane ongerichte gedachten, en als ik creatief bezig ben staan deze ook aan de basis hiervan. [I often have spontaneous undirected thoughts, and when I am creatively active these form the basis of it.]

Post-test

Participant 1

Soms. [Sometimes.]

Participant 5

Heb niet echt creatieve ideeën. [Do not really have creative ideas.]

Control group

Pre-test

Participant 3

Dit is meestal een langer proces. [This is usually a longer process.]

Participant 4

Ik dagdream veel en hierin ontstaan mijn nieuwe ideeën. [I daydream a lot and this is when my new ideas arise.]

Participant 6

Ja vaak heb ik opeens random ideeën die me eigenlijk wel leuk lijken. Vaak zijn ze wel onderbouwd, maar toch soort van 'random' in de zin dat er onderbouwing nodig is

en dat ik niet op zoek was naar die gedachten. [Yes often I suddenly have random ideas that actually seem nice to me. Often they are substantiated, but still sort of 'random' in the sense that there is a need for substantiation and that I was not searching for those thoughts.]

Post-test

Participant 4

Er ontstaan vaak momenten als ik in het OV zit waar ik nieuwe ideeën krijg. [Often moments occur while I am in public transport in which I gain new ideas.]

Participant 6

Ja, vaak heb ik gedachtes die ik niet koppel aan waar ze vandaan komen maar zijn ze wel onbewust tot stand gekomen. [Yes, often I have thoughts that I do not relate to where they came from but they have arisen unconsciously.]

(3) Reflecting on the self as creative

Question:

Beschouw je jezelf als creatief? [Do you reflect upon yourself as a creative person?]

Experimental group

Pre-test

Participant 1

Wel creatief op het gebied van oplossingen bedenken, kan goed out-of-the-box denken. Niet creatief op het gebied van dingen maken zoals schilderen etc. [Creative in the sense of problem-solving, can think out-of-the-box well. Not creative in the sense of making things such as painting etc.]

Participant 3

Ik vind mezelf wel creatief. [I think I am creative.]

Participant 5

Creatief op bepaalde vlakken? Niet artistiek, maar misschien wel een beetje in oplossingen bedenken/compromissen sluiten. [Creative in certain fields? Not artistically, but maybe a bit in problem-solving/making compromises.]

Participant 7

Ligt eraan wat ik moet doen. [Depends on what I have to do.]

Post-test

Participant 1

Wel in de zin van oplossingen bedenken voor problemen, out of the box denken. Niet in de zin van kunst. [Yes in the sense of problem-solving, thinking out of the box. Not in the sense of art.]

Participant 5

Ik doe niks met kunst etc., maar kan soms wel creatieve oplossingen bedenken voor problemen. [I do not do anything with art etc., but can sometimes think of creative solutions for problems.]

Control group

Pre-test

Participant 3

Ja. [Yes.]

Participant 4

Ja, ik houd van schilderen en muziek maken. Wel vind schilder ik vaak dingen na en trommel bestaande ritmes al. [Yes, I love to paint and make music. But I do often paint already existing things and drum existing rhythms.]

Participant 6

Relatief wel denk ik. [Relatively so I think.]

Post-test

Participant 4

Ik luister veel muziek en schilder. [I listen to music a lot and paint.]

Participant 6

Ja, hoewel ik betwijfel of het echte creativiteit is. [Yes, but I doubt if it is real creativity.]

(4) Reflecting on the self as a critical thinker

Question:

Beschouw je jezelf als een kritisch denker? [Do you reflect upon yourself as a critical thinker?]

Experimental group

Pre-test

Participant 1

Ik neem dingen niet zomaar aan. [I do not just take things for granted.]

Participant 2

Ik denk dat iedere student aan de universiteit een kritische denker moet zijn. [I think that every student at university should be a critical thinker.]

Participant 5

Ik ben ver van kritisch genoeg, maar het is een skill die je ook moet aanleren (denk ik). Bij mij begint het langzaam te komen als het om bepaalde onderwerpen gaat waarin ik me heb verdiept. [I am far from critical enough, but it is a skill that you also have to learn (I think). For me it is slowly starting to come when it concerns certain topics in which I have immersed myself in.]

Participant 7

Heel erg. [Very much.]

Post-test

Participant 1

Ja ik trek dingen vaak in twijfel. [Yes I often doubt things.]

Participant 5

Het is een skill die ik nog steeds moet ontwikkelen (imo), er zijn zo veel mensen kritischer dan ik. [It is a skill that I still have to develop (imo), there are so many people that are more critical than me.]

Control group

Pre-test

Participant 3

Ja, hangt van de situatie af. [Yes, it depends on the situation.]

Participant 4

Ligt er erg aan in welke context. Bij mijn studie reflecteer ik vaak op het werk dat ik maak en de keuzes die ik maak ik mijn leven maak ik zo rationeel mogelijk. [It depends very much on the context. Concerning my study I often reflect on the work that I do and the choices that I make in my life are as rational as possible.]

Participant 6

Ik kan gewoon niet anders dan op elk ding een vraag verzinnen. Vaak tot frustratie van anderen in mijn buurt. Maar goed. Vragen. [I just cannot do anything other than raise a question on everything. Often frustrating others close to me. But well. Questions.]

Post-test

Participant 4

Ja, het reflecteren van kennis is onderdeel van het ontwikkelingsproces. [Yes, the reflecting of knowledge is part of the developmental process.]

Participant 6

Ja, teveel denken komt me bekend voor. [Yes, too much thinking is familiar to me.]

(5) Openness to new and challenging ideas and experiences

Question:

Sta je vaak open voor nieuwe en uitdagende ideeën en ervaringen? [Are you frequently open to new and challenging ideas and experiences?]

Experimental group

Pre-test

Participant 1

Ik hou van reizen, nieuwe dingen zien en proeven en leren. [I love to travel, see new things and taste and learn.]

Participant 2

Ik hou van nieuwe dingen uitproberen. [I love to try new things.]

Participant 5

Het is geweldig om nieuwe dingen uit te proberen: nieuwe baan(tjes), ander eten, bungeejumpen etc etc. Het is soms wel een beetje een uitdaging om de stap daadwerkelijk te nemen. Dus ik sta open, maar het daadwerkelijk doen is soms wat lastiger. [It is great to try new things: new job(s), different food, bungee jumping etc etc. It is sometimes a bit of a challenge to actually take the step though. So I am open, but the actual doing is sometimes harder.]

Participant 7

Ja dit wel, ik ben vooral nieuwsgierig. [Yes this is, I am especially curious.]

Post-test

Participant 1

Ja ik wil meer van de wereld zien en dingen ontdekken. [Yes I want to see more of the world and explore things.]

Participant 5

Zeker, nieuwe dingen uitproberen is altijd wil leuk, zolang het interessant lijkt/is. [Sure, trying new things is always fun, as long as it seems/is interesting.]

Control group

Pre-test

Participant 3

Niet vaak. [Not often.]

Participant 4

Ik sta erg open voor nieuwe uitdagingen, want zo kom je verder. [I am very open to new challenges, because that is how you progress.]

Participant 6

Ja, zolang ze niet gevaarlijk zijn en passen in mijn tijdsbestedingen enz. [Yes, as long as they are not dangerous and fit in my time schedule etc.]

Post-test

Participant 4

Ja zo vaak mogelijk. [Yes as often as possible.]

Participant 6

Ja, willen jullie hier echt een uitleg over? Ik vind nieuwe ideeën altijd geweldig? [Yes, do you really want an explanation about this? I think new ideas are always great?]

(6) Flexible coping with stress

Question:

Ga je meestal flexibel om met stress? [Do you mostly deal with stress in a flexible manner?]

Experimental group

Pre-test

Participant 1

Ik ben niet gauw gestresst en als ik dit wel ben kan ik het goed relativeren en oplossingen bedenken. [I am not easily stressed and if I am so I can relativize it well and think of solutions.]

Participant 2

Ik ben slecht in het managen van stress, het slaat vaak om in een soort angst om dingen fout te doen. [I am bad at managing stress, it often turns into a sort of fear of doing things wrong.]

Participant 5

Ik ben lichtelijk stressbestendig?? Heb geen tentamenstress of iets dergelijks ook al is het één dag voor het tentamen. Maar als het druk is in de winkel (HEMA) dan beginnen mijn stresslevels wel iets hoger te worden doordat ik alle mensen zo snel mogelijk wil helpen, hoewel dat niet betekent dat ik slechter presteer (subjectief gezien). [I am slightly immune to stress?? Do not have stress for exams or something like that even if it is one day before the exam. But if it is busy in the shop (HEMA) then my stress levels do begin to rise because I want to help all people as fast as possible, even though that does not mean that I perform worse (subjectively).]

Participant 7

Ik kan niet goed tegen stress. [I cannot cope well with stress.]

Post-test

Participant 1

Ja, ik ben niet snel gestresst en als ik dat wel ben kan ik het altijd relativeren. [Yes, I am not easily stressed and if I am so then I can always relativize it.]

Participant 5

Wat is stress? (Heb bijna nooit stress, en als ik er ooit last van heb, dan weet ik dat het meestal mijn eigen schuld is, en dat het uiteindelijk geen zin heeft om te stressen want daar wordt alles juist erger van. En daardoor daalt de stress juist, want wat is het nut van stressen). [What is stress? (I almost never have stress, and if I ever suffer from it, then I usually know it is my own fault, and that there is ultimately no point in stressing because that makes everything worse. And because of that the stress lowers, because what is the point of stressing).]

Control group

Pre-test

Participant 3

Ja ik ben best stress bestendig. [Yes I am fairly immune to stress.]

Participant 4

Ik kan wat minder goed om gaan met stress, hierdoor zorg ik ervoor dat ik dingen meestal ruim voor de deadlines af heb. Als ik stress ervaar zonder ik mezelf meestal af zodat ik het zo min mogelijk laat merken. [I cope with stress less well, which is why I usually make sure to finish things far in advance of the deadlines. When I experience stress I usually isolate myself so that I show it as little as possible.]

Participant 6

Ik snap niet goed wat flexibele omgang met stress zou zijn. Ik ga heel wisselend om met stress, soms goed, soms totaal niet goed. [I do not really get what flexible coping with stress would be. I deal with stress in a very variable way, sometimes well, sometimes not well at all.]

Post-test

Participant 4

Ik werk niet fijn met deadlines, wil het graag ver van te voren af hebben. [I do not work well with deadlines, want to have it finished far in advance.]

Participant 6

Soms wel, soms niet. [Sometimes yes, sometimes not.]

(7) Vitality and energy

Question:

Voel je je over het algemeen vitaal en energiek? [Do you generally feel vital and energetic?]

Experimental group

Pre-test

Participant 1

Ja, helemaal fit. [Yes, totally fit.]

Participant 2

Soms heel erg, soms minder. Afhankelijk van zelfbeeld/of ik goed eet en beweeg. [Sometimes very much so, sometimes less. Depends on self-image/if I eat well and exercise.]

Participant 5

Ik sport niet .. [I do not exercise..]

Participant 7

Alleen op de momenten dat ik erg moe ben heeft dit nog wel invloed op mijn gemoedstoestand, maar voor de rest ben ik vrijwel altijd in een goede bui. [Only the moments in which I am very tired my mood is affected, but besides that I am virtually almost in a good mood.]

Post-test

Participant 1

Ja. [Yes.]

Participant 5

Over het algemeen, maar niet wanneer ik te lang achter de computer heb gezeten of op werk ben (want ik wil er niet meer werken, maar 'moet' nog wel blijven i.v.m. zo veel mogelijk geld willen sparen). [Generally, but not when I have spent too much time behind the computer or at work (because I do not want to work there anymore, but 'have' to stay in order to save as much money as possible.)]

Control group

Pre-test

Participant 3

Soms. [Sometimes.]

Participant 4

Ja, dat komt door het sporten. [Yes, that is due to exercising.]

Participant 6

Relatief wel, absoluut niet zo vitaal als ik me zou willen voelen en ooit gevoeld heb. [Relatively so, absolutely not as vital as I would want to feel and have ever felt.]

Post-test

Participant 4

Ja, dat komt door het sporten. [Yes, that is due to exercising.]

Participant 6

Soms wel, soms niet, heb hele hoge pieken en dalen de afgelopen weken. [Sometimes yes, sometimes not, I have very high peaks and lows in the past weeks.]

(8) Life satisfaction

Question:

Haal je genoeg voldoening uit het leven? [Do you get enough satisfaction from life?]

Experimental group

Pre-test

Participant 1

Ja! Voor mij gaat het leven om genieten en dat doe ik genoeg. [Yes! For me life is to be enjoyed and I do that often enough.]

Participant 2

Ik mis iets. [I miss something.]

Participant 5

Het voelt alsof ik meer kan doen/ervaren. [It feels as if I can do/experience more.]

Participant 7

Ik heb het gevoel dat ik er veel meer uit kan halen. [I have the feeling that I can get much more out of it.]

Post-test

Participant 1

Ik vind dat het leven draait om genieten en ik geniet ervan. [I think that life is about enjoyment and I enjoy it.]

Participant 5

Nog niet echt .. ik moet er wel zelf de stappen voor zetten. Ik heb bijvoorbeeld vrienden die meer extravert zijn en een groot sociaal leven hebben of meer hebben bereikt (vanuit mijn perspectief) en dan denk ik: ik zou ook meer willen/moeten doen. Maar het is niet zo dat ik daardoor diep ongelukkig ben - het is meer een besef van: er is meer in het leven. [Not really yet .. I have to take the steps for it. For example I have friends who are more extraverted and have a big social life or have accomplished more (from my perspective) and then I think: I should/must also do more. But it is not the case that I am deeply unhappy because of that – it is more a realization of: there is more to life.]

Control group

Pre-test

Participant 3

Ja. [Yes.]

Participant 4

Alles wat ik nu doe, vind ik erg leuk om te doen. [Everything I do now, I very much enjoy to do.]

Participant 6

Voordat ik in slaap val niet, en wanneer ik moet opstaan niet, maar overdag soms/vaak toch wel. [Before I fall asleep I do not, and when I rise in the morning I do not, but during the day sometimes/often I do.]

Post-test

Participant 4

Zeer zeker. [Most definitely.]

Participant 6

Soms wel, soms niet, word soms heel droevig van hoe vaak mensen niet dieper nadenken over dingen en van dingen die ik observeer. [Sometimes yes, sometimes not, sometimes I get very sad about how often people do not think deeper about things and about things I observe.]

(9) Quality of life

Question:

Ben je tevreden met je algehele kwaliteit van leven? [Are you content with your overall quality of life?]

Experimental group

Pre-test

Participant 1

Ja. [Yes.]

Participant 2

Ik mag niet klagen. [I cannot complain.]

Participant 5

Ik moet zelf de stappen zetten om mijn levenskwaliteit te verhogen. (Ik woon thuis en er wordt nog voor me gekookt, waar ik dankbaar voor ben; het slaat ook wel een beetje terug op de vraag 'haal je genoeg voldoening uit het leven?'). [I need to take the steps myself to raise the quality of my life. (I live at home and the cooking is still done

for me, for which I am grateful; it also connects a bit with the question ‘do you get enough satisfaction from life?’]

Participant 7

Ik heb het gevoel dat het beter kan, maar ik ben wel heel dankbaar voor alle basisbehoeften die ik heb. [I have the feeling that it can be better, but I am very grateful for all the basic needs that I have.]

Post-test

Participant 1

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Participant 5

Ik woon comfortabel (bij ouders), heb werk, ben zelfstandig, studeer en leer dingen die ik interessant vind.....it's a good life. [I live comfortably (with my parents), have a job, am independent, study and learn things that I find interesting..... it's a good life.]

Control group

Pre-test

Participant 3

Ja. [Yes.]

Participant 4

Zeker! [Sure!]

Participant 6

Als tijd iets was waarvan je nu meer kon kopen? Wil vaak heel veel doen maar heb vaak niet de tijd voor alles. & veel deadlines. & veel dingen waardoor ik in mijn ogen (en ook vaak in andere mensen hun ogen) te weinig tijd overhoud voor simpele dingen als goed eten maken, slaap, onderhoud, verzorging etc. [If time was something of which you could buy more? I often want to do a lot but often do not have the time for everything. & a lot of deadlines. & many things so that from my perspective (and often also from the perspective of other people) there is little time left for simple things such as making a good meal, sleep, maintenance, care etc.]

Post-test

Participant 4

Zeker! [Sure!]

Participant 6

Ja, ik heb voedsel, onderdak, goede mensen en ouders en dergelijke om me heen etc. [Yes, I have food, shelter, good people and parents and such surrounding me etc.]